Aug 23

TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

THE

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OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR

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1885 Snellen, P. C. T., *Rotterdam.*

1893 Wattenwyl, Hofrath Dr. Carl Brunner Von, *Lerchenfeldstrasse* 28, *Vienna.*

1898 Weismann, Dr. August, *Freiburg, Baden.*

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*Marked * have died during the year.*

Date of Election.

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1877 Adams, Herbert J., *Roseneath, London-road, Enfield*, N.

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1907 Arnold, G., *University of Liverpool, Liverpool.*

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1887 Barker, H. W., 147, *Gordon-road, Peckham*, S.E.
1902 Barraud, Philip J., *Bushey Heath, Watford.*
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1898 Gordon, R. S. G. McH., *Corsemalzie*, *Whauphill*, *R.S.O.*, *Wigtownshire.*
1855 Gorham, The Rev. Henry Stephen, F.Z.S., *Highcroft*, *Great Malvern.*
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1891 † Green, E. Ernest, Government Entomologist, *Royal Botanic Gardens*, *Peradeniya*, *Ceylon* ; and *Mote Hall*, *Bearsted*, *Kent.*
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1898 Greenshields, Alexander, 38, *Blenheim-gardens*, *Willesden*, N.W.
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1906 Guinness, H. S. A., *Balliol College*, *Oxford*, and *Chesterfield*, *Blackrock*, *County Dublin.*
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1891 Isabell, The Rev. John, *Sunnycroft, St. Sennen, R.S.O., Cornwall.*

1907 Jack, Rupert Wellstood, Assistant Entomologist, Department of Agriculture, *Cape of Good Hope.*

1907 Jackson, P. H., 112, *Balham-park-road*, S.W.

1907 Jacobi, Professor Doctor A., Director of Zoology, and Anthropology in the Ethnographical Museum, *Dresden, Saxony.*

1886 * Jacoby, Martin, 1, *The Mansions, Hillfield-road, West Hampstead*, N.W.

1869 Janson, Oliver E., *Cestria, Claremont-road, Highgate*, N.; and 44, *Great Russell-street, Bloomsbury*, W.C.

1898 Janson, Oliver J., *Cestria, Claremont-road, Highgate*, N.

1886 Jenner, James Herbert Augustus, 209, *School Hill, Lewes.*

1899 Jennings, F. B., 152, *Silver-street, Upper Edmonton*, N.

1886 John, Evan, *Llantrisant, R.S.O., Glamorganshire.*

1907 Johnson, Chas. Fielding, *Mayfield, Brinington Crescent, Stockport.*

1889 Johnson, The Rev. W. F., M.A., *Acton Rectory, Poyntz Pass, Co. Armagh.*

1888 Jones, Albert H., Treasurer, *Shrublands, Eltham, Kent.*

1894 † Jordan, Dr. K., *The Museum, Tring.*

1902 Joy, Norman H., M.R.C.S., L.R.C.P., *Bradfield, Reading.*

1884 Kane, W. F. de Vismes, M.A., M.R.I.A., *Drumleaske House, Monaghan.*

1884 Kappel, A. W., F.L.S., *Linnean Society, Burlington House*, W.

1876 † Kay, John Dunning, *Leeds.*

1896 † Kaye, William James, *Caracas, Ditton Hill, Surbiton.*

1907 Kelly, Albert Ernest McClure, Assistant Entomologist, Department of Agriculture, *Natal, S.A.*

1902 Kemp, Stanley W., 21, *Upper Fitzwilliam-street, Dublin.*

1890 Kenrick, G. H., *Whetstone, Somerset-road, Edgbaston, Birmingham.*

1904 Kershaw, G. Bertram, *Ingleside, West Wickham, Kent.*

1898 Kershaw, J. A., *Morton Banks, Lewisham-road, Windsor, Melbourne, Victoria.*

1901 Kershaw, John C., *Macao, China.*

1906 Keynes, John Neville, M.A., D.Sc., 6, *Harvey-road, Cambridge.*

1900 Keys, James H., *Morwell, Freedom-villas, Lipson-road, Plymouth.*

1889 King, J. J. F. X., Lecturer on Economic Entomology at the West of Scotland Agricultural College, 1, *Athole Gardens-terrace, Kelvinside, Glasgow.*

1861 Kirby, William F., F.L.S., *Hilden*, 18, *Sutton Court-road, Chiswick*, W.

1893 Kirkaldy, George Willis, *Honolulu, Hawaii.*

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1889 Klapálek, Professor Franz, *Karlín* 263, *Prague, Bohemia.*

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1900 Lang, The Rev. H. C., M.D., *All Saints' Vicarage, Southend-on-Sea.*

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1895 Latter, Oswald H., M.A., *Charterhouse, Godalming.*

1899 Lea, Arthur M., Government Entomologist, *Hobart, Tasmania.*

1901 Leigh, George F., 4, *Cuthbert's Buildings, West-street, Durban, Natal.*

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1892 Leslie, J. Henry, 5, *Cecil Mansions, Marius-road, Balham,* S.W.

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1893 Lower, Oswald B., *St. Oswalds, Bartley Crescent, Wayville, South Australia.*

1901 Lower, Rupert S., *Davonport-terrace, Wayville, South Australia.*

1898 Lucas, William John, B.A., 28, *Knight's Park, Kingston-on-Thames.*

1904 Luff, W. A., *La Chaumière, Brock-road, Guernsey.*

1880 Lupton, Henry, *Devonia, Torquay.*

1903 Lyell, G., Junr., *Gisborne, Victoria, Australia.*

1901 Lyman, Henry H., M.A., F.R.G.S., 74, *McTavish-street, Montreal, Canada.*

1906 McCarrison, D. L., *Indian Police Forces, Madras Club, Madras.*

1887 M'Dougall, James Thomas, *Dunolly, Morden-road, Blackheath,* S.E.

1888 Mackinnon, P. W., *Lynndale, Mussoorie, N.W.P., India.*

1900 Mackwood, The Hon. F. M., M.L.C., *Colombo, Ceylon.*

1898 Maddison, T., *South Bailey, Durham.*

1899 † Main, Hugh, B.Sc., *Almondale, Buckingham-road, South Woodford,* N.E.

1905 Mally, Charles Wm., M.Sc., *Graham's Town, Cape Colony.*

1887 Manders, Lieut.-Colonel Neville, R.A.M.C., F.Z.S., c/o Sir C. McGrigor, 25, *Charles-street, St. James's-square,* S.W.

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1895 Marshall, Guy Anstruther Knox, 6, *Chester-place, Hyde Park-square,* W.

1896 Marshall, P., M.A., B.Sc., F.G.S., *University School of Mines, Dunedin, New Zealand.*

1856 † MARSHALL, William, V.M.H., F.R.H.S., *Auchinraith*, *Bexley*, *S.O.*, *Kent.*
1897 MARTINEAU, Alfred H., *Solihull*, *Birmingham.*
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1883 MILES, W. H., *The New Club*, *Calcutta.*
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1890 Newstead, R., *Johnston Tropical Laboratory, University, Liverpool.*
1900 Nicholl, Mrs. M. De la B., *Merthyr Mawr, Bridgend, Glamorganshire.*
1904 Nicholson, W. A., 36, *Promenade, Portobello, N.B.*
1886 Nicholson, William E., *School Hill, Lewes.*
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1877 Oberthür, René, *Rennes (Ille-et-Vilaine), France.*
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1893 Oliver, John Baxter, 22, *Ranelagh Villas, Hove, Brighton.*
1873 Olivier, Ernest, *Ramillons, près Moulins (Allier), France.*

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1898 Palliser, H. G., *Holmwood, Addlestone, Surrey.*
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1879 Perkins, Vincent Robert, *Wotton-under-Edge.*
1907 † Perrins, J. A. D., *Ardross Castle, by Alness, N.B.*
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1884 † Poulton, Professor Edward B., D.Sc., M.A., F.R.S., F.L.S., F.G.S., F.Z.S., Hope Professor of Zoology in the University of Oxford, *Wykeham House, Banbury-road, Oxford.*
1905 Powell, Harold, 7, *Rue Mireille, Hyères (Var), France.*

1906 Pratt, H. C., Government Entomologist, Federated Malay States, *Kwala Lumpur, Malay States.*
1878 Price, David, 48, *West-street, Horsham.*
1904 Priske, Richard A. R., 9, *Melbourne Avenue, West Ealing.*
1893 Prout, Louis Beethoven, 246, *Richmond-road, Dalston*, N.E.

1900 Rainbow, William J., *The Australian Museum, Sydney, N.S.W.*
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1874 Reed, E. C., Director del Museo de Concepcion, *Concepcion, Chile.*
1893 Reid, Captain Savile G., late R.E., *The Elms, Yalding, Maidstone.*
1898 Relton, R. H., c/o Perkins and Co., Ltd., *Brisbane, Queensland.*
1890 Rendlesham, The Right Honble. Lord, *Rendlesham Hall, Woodbridge.*
1898 Reuter, Professor Enzio, *Helsingfors, Finland.*
1894 Riding, William Steer, B.A., M.D., *Buckerell Lodge, Honiton.*
1853 Ripon, The Most Honble. the Marquis of, K.G., D.C.L., F.R.S., F.L.S., etc., 9, *Chelsea Embankment*, S.W.
1905 Robinson, Herbert C., *Curator of State Museum, Kuala Lumpur, Selangor.*
1892 Robinson, Sydney C., 10, *Inchmory-road, Catford*, S.E.
1869 † Robinson-Douglas, William Douglas, M.A., F.L.S., F.R.G.S., *Orchardton, Castle Douglas.*
1886 Rose, Arthur J., *Glanmor, Berkhamstead.*
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1868 Rothney, George Alexander James, *Pembury, Tudor-road, Upper Norwood*, S.E.
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1888 † Rothschild, The Honble. Walter, D.Sc., M.P., F.L.S., F.Z.S., 148, *Piccadilly*, W.; and *Tring Park, Tring.*
1890 Routledge, G. B., *Tarn Lodge, Heads Nook, Carlisle.*
1887 Rowland-Brown, Henry, M.A., Secretary, *Oxhey-grove, Harrow Weald.*
1903 Rowlands, Osbert William, *Lickey Grange, nr. Bromsgrove.*
1898 Russell, A., *Wilverley, Dale-road, Purley.*
1892 Russell, S. G. C., 19, *Lombard-street*, E.C.
1899 Ryles, William E., B.A., 14, *Arthur-street, Nottingham.*

1905 St. Quintin, W. H., *Scampton Hall, Rillington, York.*
1906 Sampson, Major F. Winns, *Senior Officers' Mess, Calabar, Southern Nigeria*, and *Junior Carlton Club, Pall Mall*, S.W.
1865 † Saunders, Edward, Vice-President, F.R.S., F.L.S., *St. Ann's, Mount Hermon, Woking.*
1861 † Saunders, G. S., F.L.S., 20, *Dents-road, Wandsworth Common*, S.W.
1886 Saunders, Prof. Wm., *Central Experimental Farm, Ottawa, Canada.*
1901 Schaus, W., F.Z.S., *Trentham House, Twickenham.*

1907 Schmassman, W., 2, *Kinnoul-villas, Freezywater, Waltham Cross, Herts.*

1881 Scollick, A. J., 8, *Mayfield-road, Merton Park, Wimbledon.*

1864 Semper, George, *Klopstock-strasse* 23, *Altona, Elbe, Germany.*

1862 Sharp, David, M.A., M.B., F.R.S., F.L.S., F.Z.S., *Lawnside, Brockenhurst, Hants.* ; and *University Museum of Zoology and Comparative Anatomy, Cambridge.*

1902 Sharp, W. E., 9, *Queen's-road, South Norwood*, S.E.

1905 Sheldon, W. George, *Youlgreave, South Croydon.*

1901 Shelford, Robert, M.A., F.L.S., C.M.Z.S., *University Museum* (*Hope Department*), *Oxford.*

1883* †Shelley, Capt. George Ernest, F.G.S., F.Z.S., 39, *Egerton-gardens*, S.W.

1900 † Shepheard-Walwyn, H. W., M.A., *Dalwhinnie, Kenley, Surrey.*

1887 Sich, Alfred, *Corney House, Chiswick*, W.

1904 Simmonds, Hubert W., *The Mansions, Wellington, New Zealand.*

1902 Sladen, Frederick William Lambart, *The Firs, Ripple, Dover.*

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1901 Smith, Arthur, *County Museum, Lincoln.*

1898 Sopp, Erasmus John Burgess, F.R.Met.S., 104, *Liverpool-road, Birkdale, Lancashire.*

1906 Southcombe, Herbert W., J.P., 16, *Stanford Avenue, Brighton.*

1885 South, Richard, 96, *Drakefield-road, Upper Tooting*, S.W.

1889 Standen, Richard S., F.L.S., *Townlands, Lindfield, Sussex.*

1898 Stares, C. L. B., M.R.C.S., L.R.C.P., *The Limes, Swanley Junction, Kent.*

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1895 Studd, E. F., M.A., B.C.L., *Oxton, Exeter.*

1882 Swanzy, Francis, *Stanley House, Granville-road, Sevenoaks.*

1884 Swinhoe, Colonel Charles, M.A., F.L.S., F.Z.S., 19, *Cecil-court, Redcliffe-Gardens*, S.W.

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1894 Turner, Thomas, *Cullompton, Devon.*

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1906 Walton, Captain H. J., M.B., F.R.C.S., Indian Medical Service; c/o Messrs. King, King & Co., *Bombay.*

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1906 Wheeler, The Rev. George, M.A., *Briarfield, Guildford.*

1907 White, Harold J., 42, *Nevern-sq., Kensington*, S.W.

1906 Wickar, Oswin S., *Crescent Cottage, Cambridge Place, Colombo, Ceylon.*

1903 Wiggins, Clare A., M.R.C.S., *Entebbe, Uganda.*

1896 Wileman, A. E., c/o H.B.M.'s Consul, *Anping, Formosa.*

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1881 Wood, The Rev. Theodore, *The Vicarage, Lyford-road, Wandsworth Common*, S.W.

1905 Woodbridge, Francis Charles, *The Briars, Gerrard's Cross, S.O., Bucks.*

1891 Wroughton, R. C., Inspector General of Forests, Indian Forest Service, c/o Army and Navy Co-operative Society, Ltd., 105, *Victoria-street*, S.W.

1888 Yerbury, Colonel John W., late R.A., F.Z.S., *Army and Navy Club, Pall Mall*, S.W.

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Adlerz (Gottfrid). Lefnadsförhållanden och Instinkter inom Familjerna Pompilidæ och Sphegidæ, II.
[Kungl. Svenska Vetensk.-Akad. Handlinger, Band XLII, No. 1.]
The Author.

Apiaries, Report of Inspectors of.
[U. S. Dept. of Agric., Bull. No. 70, 1907.] *U. S. Dept. Agric.*

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Några iakttagelser öfver insekter från trakten af Varberg.
[Entomologisk Tidskrift, 1907.]

Carl von Linné sasom entomolog. Uppsala, 1907.

Neue westafrikanische Cerambyciden des Deutschen Entomologischen National-Museums. (Col.).
[Deutsche Ent. Zeitschr. 1907.]

Diagnosen neuer Lepidopteren aus Afrika.
[Arkiv för Zoologi, Vol. III, No. 19.]

Neue oder wenig bekannte Coleoptera Longicornia.
[Arkiv för Zoologi, Vol. III.]

Ueber einige formen des Weibchens von *Papilio dardanus*, Brown.
[Arkiv för Zoologi, Vol. III.] *The Author.*

Austen (Ernest E.). British Blood-Sucking Flies, London, 1906.
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ERRATA.

TRANSACTIONS.

Page 40, line 19 from top, for *Metæcus* read *Metœcus*.
Page 63, line 4 from bottom, for *latriellei* read *latreillei*.
Page 90,

The Larva of *Collyris emarginatus*, Dej. [A correction.]

Mr. C. J. Gahan has directed my attention to a mistake that I have made in my determination of the segments of the leg in the larva of *Collyris emarginatus*. On p. 87 I state, "Of the legs the following parts can be distinguished :—femur, tibia and tarsus." *For* femur *read* coxa, *for* tibia *read* femur, *for* tarsus *read* tibia and tarsus. The tarsus is one-jointed, not three-jointed. On a re-examination of mounted specimens of the larvæ, I find that there are distinct indications of a trochanteral joint in the mid- and hind-legs. The exact homology of the larval leg-segments with the adult leg-segments can only be determined accurately by a study of their development, but Mr. Gahan's identification of the segments brings *Collyris* into line with other Cicindelid larvæ, and consequently is preferable to my identification.—R. Shelford.

Page 151, lines 7 and 22 from top, *for* Casayo *read* Casoya.
Page 163, line 2 from bottom, for *Corœbus* read *Coræbus*.
Page 164, line 11 from top, } for *coruscans* read *corruscans*.
Page 166, line 23 from top, }
Page 166, line 12 from top, for *cinerus* read *cinereus*.
Page 166, line 9 from bottom, for *Corœbus* read *Coræbus*.
Page 169, line 5 from bottom, for *Chysomela* read *Chrysomela*.
Page 239, line 15 from top, *for* Banguay *read* Banguey.
Page 332, line 3 from bottom, for *Pœderus* read *Pæderus*.
Page 344, line 26 from top, for *Cephanodes* read *Cephonodes*.
Page 377, line 11 from bottom, for *Luceola* read *Luciola*.
Page 393, line 5 from top, for *furcatus* read *furcatus*.
Page 400, line 10 from top, for *albidentalus* read *albidentatus*.
Page 406, line 8 from top, for *cilus* read *leilus*.
Page 412, line 13 from top, }
Page 413, line 4 from top, } for *tuttidactyla* read *tuttodactyla*.
Page 413, line 13 from bottom, }
Page 423, footnote, line 2 from bottom, for *O.* read *C.*
Page 438, line 3 from top, } for *urticefolia* read *urticæfolia*.
Page 438, line 14 from bottom, }
Page 452, line 3 from bottom, for *Paniseum* read *Panicum*.

PROCEEDINGS.

Page xv, footnote, lines 9 and 10 from bottom, delete *Hab.* Tumatumari . . . sub. sp. *magnifica*.
Page xx, line 2 from bottom, *insert* is.
Page xli, line 25 from top, for *Euplæini* read *Euplœini*.
Page xli, line 11 from bottom, for *Euplæas* read *Euplœas*.

THE

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1907.

Wednesday, February 6th, 1907.

Mr. C. O. WATERHOUSE, President, in the Chair.

Nomination of Vice-Presidents.

The PRESIDENT announced that he had nominated Mr. FREDERICK MERRIFIELD, Mr. EDWARD SAUNDERS, F.R.S., F.L.S., and Mr. GEORGE HENRY VERRALL to be Vice-Presidents for the Session 1907–8.

Bi-centenary of Linnæus.

The SECRETARY announced that the Society had been invited by the University of Upsala to be represented at the Bi-centenary celebrations there of the birth of Linnæus, on May 23rd and 24th next.

Election of Fellows.

Mr. CHARLES KIMBERLIN BRAIN, of 29, Rosmead Avenue, Cape Town; Mrs. CATHERINE MARIA MOORE, of Holmefield, Oakholme Road, Sheffield; and Mr. ALFRED ERNEST TONGE, of Aincroft, Reigate, were elected Fellows of the Society.

Exhibitions.

LEPIDOPTERA FROM SUTHERLAND.—Mr. E. A. COCKAYNE brought for exhibition three cases containing a collection of

Lepidoptera made by him at Tongue, North Sutherlandshire, between June 30th and July 13th, 1906, comprising the following species not hitherto reported from the county:—*Trichiura cratægi* (larvæ), *Hydrilla arcuosa*, *Phytometra ænea*, *Cabera pusaria*, *C. exanthemaria*, *Macaria liturata*, *Hybernia progemmaria*, and *H. defoliaria* (larvæ), *Ephyra pendularia*, *Acidalia fumata*, *Coremia ferrugata*, *Venusia cambrica*, *Cidaria prunata*, *C. suffumata*, *Cheimatobia boreata* and *C. brumata* (larvæ), *Eupithecia castigata*, *E. subfulvata*, var. *cognata*, *E. assimilata*, *E. fraxinata*, and *Tanagra chærophyllata*. The Exhibitor further remarked that the birch trees in the neighbourhood visited were entirely denuded of their leaves by the ravages of the larvæ of the Hybernidæ, on which again the Black-headed Gulls preyed in great numbers. It was noticeable also that the several species showed little tendency to melanism.

Melanism in Hastula hyerana.—Dr. T. A. Chapman, exhibiting fifteen specimens of *Hastula hyerana*, Mill., made the following remarks:—

"Two months ago (December 5th, 1906) I exhibited to the Society a long series of *Hastula hyerana*, Mill. They were shown to illustrate how the species varied in two, not very strongly separated, localities. But as it seems possible to find many interesting details in this species, I now show a few specimens to demonstrate how it may vary under other circumstances. The majority of those I had last year emerged in August, September and October, to the number of over 400 specimens, in the pale (*hyerana*), and the dark (*marginata*) form. Of these I exhibit for comparison an average pair of each form, and the darkest pair of each form that emerged up to the end of October. In November four pale and three dark specimens emerged; of these I exhibit three of the pale and two of the dark ones. These are very decidedly darker than the darkest selected from the earlier emergences.

"Then there are four specimens that came out in December, all of them *hyerana*. Three of these are males, and are remarkably dark forms, like nothing amongst the preceding specimens. The ♀ is very dark but not extremely so. There were still four specimens that came out in January, 1907, completing the series; no further larvæ or pupæ remaining. These four include three pale (*hyerana*) forms and one dark (*marginata*). The *hyerana* are a dark ♀, darker than anything preceding, which happens also to be the only ♀ specimen at all referable to var. *alpha*, Mill., another very dark ♀, and a male that met with some unaccountable accident in emerging, and whose precise form is therefore indeterminable; it was further remarkable in the pupal stage possessing mandibles of a larval structure, although the imago appears to have no peculiarities in this region. The fourth January specimen is a female, the very darkest of the *marginata* form I have seen. Summarising, we have out of a total of fifteen specimens that emerged in November, December (1906), and January (1907), thirteen that are darker than any that appeared in the normal season of August, September and October, although the latter were over 400 in number. We should like to know why these were so late in emerging, and why they are so dark; and what is the co-relation between these two facts. Why they are so late, I do not know. They were kept along with the others that emerged at the normal dates. Three months is a long period for a normal emergence to last over. One must suppose, therefore, that it has an advantage in securing that some specimens shall appear when weather or other circumstances are favourable to them, either in early, late, or mid-season, and if early specimens are selected one year and late another, and so on, the race will acquire a habit of prolonged emergence and a variability in date of emergence that will include extreme specimens, beginning, as I have shown, in June and extending to the following March.

"This does not involve any explanation of the darkness, and, as a matter of fact, late specimens in preceding years did not present any special darkening to attract my attention. It happens that this season we have had various spells of cold weather, and the room in which I kept the larvæ and pupæ was only intermittently warmed and often fell in November to as low as 50° and even 47°. This would of course make still later those specimens that were late enough to fall under its influence. But it had the further effect of delaying emergence after the pupal state was assumed, so that whilst the normal emergences were only some three or four weeks as pupæ, these late ones were seven, eight or even nine weeks. It is almost certain that the darkness does not depend on the late date, but that it does, either on the prolonged pupal period, or on the low temperature the pupæ were subjected to during the maturation of the imago. A temperature of 47° to 60° must certainly be low for an insect that expects the temperature of an August on the Riviera, even when all allowance be made for their being possibly deeply hidden under stones, etc., in their natural habitats. Looking to the results of Mr. Merrifield's experiment, I entertain little doubt that the effective agent for darkening is the low temperature, and not the prolonged pupal period, though it may be difficult to disentangle the two causes in these or in any other instances.

"The effect of cold is here to produce darkening as it appears to be in a majority of temperature experiments.

"It is to be specially observed that the dark effect is to make the *hyerana* form darker and the *marginata* form darker, without any indication that it has the slightest tendency to make the pale from *hyerana* into the dark form *marginata*. These are special varieties, selected no doubt after they appear on the same grounds as dark and pale forms might be selected, but not arising in the same way as ordinary darkening (increase of pigment) does. One or two specimens, especially the two darkest December males, strongly suggest that whatever caused the darkening, also produced a less robust specimen. If this be so then the darkening is due to injury by cold, not to a more perfect, because prolonged, maturation."

Mr. F. Merrifield made some further observations on the effects of temperature on seasonal forms, resulting not only in difference of colour, but in difference of structure.

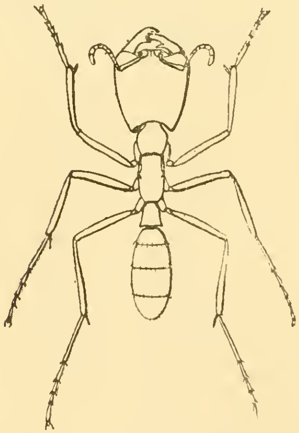
Palæarctic Anthocharid and Melitæid Butterflies.—Miss M. E. Fountaine exhibited a number of Anthocharid and Melitæid butterflies from various localities in the palæarctic regions, showing a wide range of variation. They included the following:—

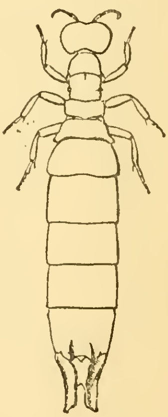
Pieris napi, 3 ♀ ♀: 1 from Algeria, and 2 var. *flavescens*, summer brood, from Mödling, near Vienna. *Pontia daplidice*, showing an extreme form of var. *bellidice*, from Aix-en-

Provence in April; a typical ♂ from Sicily in June; and 1 ♂ var. *raphani*, Esp., from Algeria in July; this being a more or less constant form of the summer brood in that country, though all the specimens, especially amongst the ♀ ♀, were not quite so pale as this one. *P. chloridice*, ♂ and ♀ summer brood from Asia Minor. *Anthocharis belemia*, 2 ♂ ♂ from Algeria: to show the difference between that species and *A. falloui* (2 ♂ ♂), a species occurring only on the tops of the desert mountains: *A. tagis*, var. *bellezina*, 2 ♂ ♂ from Aix-en-Provence. *A. tagis*, var. *insularis*, 2 ♂ ♂ and 1 ♀ from Corsica. *A. pechi*, 2 ♂ ♂ from Algeria, a species which occurs on mountains clothed with Alfa grass, in close proximity to the desert, but never actually in it. *A. charlonia*, 2 ♂ ♂ and 1 ♀; another desert species from Algeria, also found in the same localities as *A. pechi*, being much the commonest *Anthocharis* in southern Algeria, during the months of February and March. *A. charlonia*, gen. vern. *penia*, Frr., 2 ♂ ♂ from the Lebanon; the Syrian form always much paler, and, in the exhibitor's experience, very scarce. *A. cardamines*, 1 ♂ from Draguignan, and 1 ♀ from Le Vernet. *A. gruneri*, 2 ♂ ♂ and 1 ♀ from Greece in May. *A. damone*, 2 ♂ ♂, one with and one without the black streak dividing the ground colour from the orange tip: also 1 ♀ and 1 ♂ and 1 ♀ under-side; all from the Lebanon in April. *A. eupheno*, 2 ♂ ♂ showing extremes in size, the smaller having the black streak entirely absent on fore-wings, with the apical orange spot much reduced in size, and crossed by grey veins (an aberration); the larger having the black streak unusually broad and distinct; 2 ♀ ♀, one typical, the other having the orange tip almost extended to the discoidal spot. Also one ♂ and one ♀ under-side; all from Algeria in March and April. *A. euphenoides*, 2 ♂ ♂ and 1 ♀ from the South of France for comparison. *Melitæa didyma*, 1 typical ♂ from Digne, 3 ♂ ♂ from Spain and the Pyrenees, in which the black spots were unusually large, and showed an inclination to be coalescent; 4 ♀ ♀ from Spain and the Pyrenees, also having the black spots unusually large and prominent; 3 ♂ ♂ of *Melitæa didyma*, var. *occidentalis*, Stgr., 1 from Spain, 1 from Syria, and 1 (with the ground-colour creamy-white) from North Italy. Also 2 diminutive ♀ ♀ from Asia Minor in August, and

4 ♂ ♂ and 2 ♀ ♀ of *M. didyma*, var. *deserticola*, Oberth., from Algeria. *M. didyma*, var. *nexra*, 3 ♂ ♂ and 4 ♀ ♀ from Syria and Asia Minor, and 1 large dark ♀ from Sicily = var. *meridionalis.*

♀ OF GENUS DORYLUS.—The PRESIDENT exhibited a female example of the genus *Dorylus.* It was sent to the Museum from Mengo in Uganda by the Rev. Ernest Millar. There were with it in the same tube one small and two large workers, which may probably be the means of identifying the species at some future time. The workers closely resembled specimens in the Museum named *D. arcens,* which are said to be the same as *nigricans.* The specimens just received were, however, perfectly smooth and shining, whereas those named *arcens* were somewhat dull.





The female measured $1\frac{1}{4}$ inches in length. It was of blackish mahogany colour, smooth and shining, with the jaws, flagellum of the antennæ, sides of the head, the middle of the thorax, the legs, and a narrow margin to each abdominal segment, pitchy red.

The female of one species of this genus from Java was described by Dr. Gerstaecker in the Stettin "Entomologische Zeitung," for 1863, p. 91, and figure on plate 1. Three others have been discovered since.

The present insect agreed in general form with that figured by Dr. Gerstaecker, but the prolongations of the apical segment of the abdomen instead of being acuminate, were rather broad, obliquely truncate at the apex, slightly concave above, dull.

Mr. Millar in his letter said—"I have only once heard of such a thing being seen here; the boys who brought it me told me it was being fed by the others."

Mr. G. A. K. Marshall gave an account of his experiences with this genus in Rhodesia, South Africa, and Colonel C. T. Bingham said he had dug three days in India, but failed to find the females.

Aberrant forms of Swiss Butterflies.—The Rev. F. E. Lowe showed various aberrant forms of Swiss butterflies, including (*a*) *Melanargia galatea*, ab. *fulvata*, Lowe, from Martigny, in which the ordinary black markings were replaced by coffee-brown, the antennæ being also of the same colour, and the ground-colour primrose; (*b*) *Lycæna arion*, ab., from Pontresina, with the black spots on the under-side of the wings almost entirely absent, save one very large kidney-shaped spot, slightly tinged with white at the centre of each wing; (*c*) *Apatura iris*, ab. trans. ad *iole* on the upper-side, taken at Éclépens, near Lausanne; the under-side very dark, the broad chestnut bands, which cross the wings diagonally, without the least intersection of bluish-white as in the type; no eyed chestnut spots at the lower angle of the primaries. It is not usual for *iole* to display any variation from the type on the under-side; (*d*) two *Cœnonympha pamphilus*, one from Éclépens, suffused with a purplish-flush, and the whole ground-colour more tawny-red than the type; the other, from Orta Novarese, a ♀, rich cream-white with the borders light grey, and not sharply defined but somewhat cloudy; over the whole wing surface an opalescent reflection, suggesting a parallel to *Chrysophanus phlæas*, ab. *schmidtii*, Gerhard.

Gynandromorphous Sawfly.—The Rev. F. D. Morice exhibited a very remarkable gynandromorphous specimen of the common fern-visiting Sawfly, *Strongylogaster cingulatus*, F. It was taken at Silchester on June 10th, 1906, by Mr. Philip Harwood, of Newbury, and communicated to the exhibitor by his brother, Mr. Bernard Harwood, of Colchester.

Its general size and habit were those of a ♂, but the left antennæ, the right side of the abdomen, and the left side of the genitalia were obviously ♀; and its other sexual characters (as far as they could be recognized) seemed to be distinguished in much the same way—the ♂ and ♀ elements being everywhere separated by the longitudinal axis of the insect, but some of each lying to the right, and others to the left of that axis.

Mr. Morice said that Mr. Harwood had kindly authorised him to present the specimen to the National Collection at South Kensington.

A discussion followed on the occurrence and forms of gynandromorphism in the various orders of insects, in which Mr. Merrifield, Mr. A. J. Chitty, Mr. Hugh Main and other Fellows joined, Mr. H. St. J. Donisthorpe mentioning that in his experience the phenomenon never appeared in Coleoptera, while the President gave it as his opinion that the form assumed in the exhibit under notice was unique.

Protection in Tineid Pupa.—Colonel Charles T. Bingham exhibited the remarkable pupa of a Tineid, in appearance exactly like the head of a snake. This pupa and the moth shown with it, and figured in the Society's Transactions for the current year, were procured at Maymyo in Upper Burma by Col. Waller-Barrow, R.A.M.C.

Association of Butterflies with Aphides.—Colonel Bingham also explained an exhibit made by him in illustration of the curious habits of butterflies belonging to the genera *Gerydus* and *Allotinus*. Col. Waller-Barrow discovered that these butterflies join with ants in attending *Aphidæ* for the sake of the sweet liquid exuded by the latter when touched gently. For this tapping the ants, as is well known, use their antennæ. *Gerydus*, and *Allotinus*, it seems, use for the same purpose their abnormally long fore-legs. In the specimen of *Gerydus boisduvali*, Moore, which was exhibited, it was to be noted that the tibiæ of the legs were flattened. Whether function in this case has modified form or not he could not presume to say: he only drew attention to the fact of the flattening. Col. Waller-Barrow had informed him that the butterflies hover over the aphides for a long time before settling, and that though numerous ants might be attending the same lot of Aphides at the time, the ants did not interfere with the butterflies. He noticed, however, that an ant occasionally reared itself up against the long legs of the butterfly, as if to investigate what strange monster had sat down among them, but in no way was there any attempt made to drive off or molest the intruder.

Papers.

"Notes on the Indo-Australian Papilionidæ," by PERCY I. LATHY, F.Z.S.

"On the Hymenopterous Parasites of Coleoptera," by ERNEST A. ELLIOTT, F.Z.S., and CLAUDE MORLEY.

Wednesday, March 6th, 1907.

Mr. C. O. WATERHOUSE, President, in the Chair.

Election of Fellows.

Mr. JOHN C. MOULTON, of the Hall, Bradford-on-Avon, Wilts.; Mr. W. SCHMASSMAN, of 2, Kinnoul Villas, Freezywater, Waltham Cross, and Mr. R. J. TILLYARD, B.A., The Grammar School, Sydney, New South Wales, were elected Fellows of the Society.

Resolution.

After a discussion, in which the destructive and fatal results to our national Fauna, of indiscriminate collecting by inexperienced persons, was commented upon, the PRESIDENT proposed the following resolution which was seconded by Professor E. B. POULTON, D.Sc., F.R.S., etc., and carried unanimously:—

"That this Society, being informed that a proposal has been made that children in our schools be instructed to collect objects of Natural History for the purpose of exchanging them for similar objects collected by school-children in our Colonies, deprecates the adoption of any such system."

Exhibitions.

PROTECTIVE SUBSTANCES IN ♂ SCENT-GLANDS.—Professor E. B. POULTON, F.R.S., exhibited male specimens of the Danaine butterflies *Amauris egialea*, Cram., and *Limnas chrysippus*, L., collected at Ibadan, near Lagos (December 5–12, 1906), by Mr. H. S. Gladstone. The interest of the specimens lay in the fact that the scent-producing patch near the anal angle of the hind-wing had been eaten out on both sides—very cleanly and neatly in the case of the *Amauris*—although only a minute portion of any other part of the wing-surface had been attacked. The abdomen was almost entirely wanting, but the basal portion which remained showed that it had been almost certainly devoured. The head and thorax also appeared to be quite empty. Professor Poulton stated that he had occasionally observed the evidence of such attacks upon the supposed scent-patches of *Danainæ*, but he believed that the *Amauris* was the best and clearest case he had ever seen. This special attack upon *Danaine* scent-patches becomes of even greater interest and significance when we remember that dead specimens of this and the allied sub-family, the *Ithomiinæ*, are less liable than other specimens to be injured by the pests which destroy insect collections.* On the other hand, the fact that the whole interior of the body was devoured appears to indicate indifference on the part of this particular pest to any specially protective substances existing in a desiccated state; and it may well be that special attack was directed upon the scent-glands merely on account of their substance as compared with the rest of the wing surface. The facts appear to tell strongly against the view that specially protective (aposematic) substances are, as some have supposed, concentrated in the male scent-glands; but it would not be safe to draw any more far-reaching conclusions.

Inasmuch as an alternative view has been mentioned, it may be advantageous to quote the following passage from a paper published in 1882 by Professor MELDOLA, F.R.S. (Ann. Mag.

* H. W. Bates, Trans. Linn. Soc. Lond., vol. xxiii, 1862, p. 510; R. Meldola, Proc. Ent. Soc. Lond., 1877, p. xii. Confirmed also by J. Jenner Weir.

Nat. Hist., Dec. 1882, p. 425). Writing in answer to Mr. W. L. Distant, Professor Meldola states :—

"There is not the least warrant for the supposition that scent-glands or tufts have anything to do with distastefulness. The acrid juices of distasteful butterflies are not generally emitted from any particular organ, but permeate all the tissues of the body. The fact that such organs exist in one sex only is strongly suggestive, if not demonstrative, of the view that they are *secondary sexual characters* ; and as such they are regarded by Dr. Fritz Müller, who has systematically investigated these structures, and has in many cases actually detected the odour emitted, which is often of a pleasant character." (Jen. Zeit., vol. xi, p. 99 ; Trans. Ent. Soc. Lond. 1878, p. 211.)

Remarkable Larva of Spiramiopsis.—Professor E. B. Poulton also exhibited on behalf of Mr. G. F. Leigh, F.E.S., of Durban, a blown specimen of the larva of *Spiramiopsis comma*, Hampson, showing the two pairs of remarkable processes as well as the two eye-like spots, one situated in front of the base of each posterior process. The anterior pair are placed on the second thoracic segment, the posterior on the third. In the dried specimen the ground-colour of the dorsal and dorso-lateral regions of each of these segments is of a brilliant orange-brown tint, making a most effective background for the intensely black, nearly circular eye-like spots. The effect of these latter is also greatly enhanced by a dark semi-circular line placed outside a margin of orange embracing nearly half the circumference of each spot. This line, which is concentric with the eye-spot, bounds it upon the posterior-inferior section of its circumference. A sketch sent by Mr. Leigh in further explanation of his exhibit shows that, when touched, the larva curves the anterior segments so as to conceal its real head and make the central point between the eye-spots anterior in position. From this central point the four relatively immense processes radiate like spokes, while the bright orange colour and jet-black eye-spots placed on each side of the centre must contribute with them to produce an extraordinary and terrifying appearance. By Mr. Leigh's desire the specimen will be placed beside the imagines of the same species in the collection of the British Museum of Natural History. The larva bears the date :—"Durban, Nov. 3, 1906."

New British Leioptilus.—Dr. T. A. Chapman showed several specimens sent for exhibition by Mr. W. Purdey, including *Leioptilus carphodactylus* taken by him near Folkestone. The species is new to the British list, although there is a specimen at South Kensington from the Stainton collection, bred by Gregson and labelled *carphodactylus*, but placed amongst *microdactylus.* It is small for *carphodactylus*, and large for *microdactylus*, and, being a solitary specimen, not very typically marked, it is a question whether its label or its position be the more correct. The exhibition also contained some good varieties of *Acalla cristana* and a very dark *L. tephradactylus*, looking at first sight very like *L. scarodactylus.*

Effect of Artificial Conditions on Seasonally Dimorphic Species.—Dr. F. A. Dixey exhibited specimens of *Teracolus achine*, Cram., and *Belenois severina*, Cram., bred and captured at Salisbury, Mashonaland, by Mr. G. A. K. Marshall.

He remarked that the exhibit, which was supplementary to that shown by him on December 5th (Proc. Ent. Soc. Lond., 1906, p. civ), provided a further instalment of the results of Mr. Marshall's valuable experiments on the effect of artificial conditions on seasonally dimorphic species. In the case of *Teracolus achine*, the exposure to conditions of moist heat in both larval and pupal stages had caused both sexes of a brood that should normally have emerged as the dry-season form, to assume the appearance of a wet-season generation. The same conditions operating in the larval stage alone had produced a close approximation to the same result; while in specimens which had been similarly treated in the pupal stage only, little or no departure could be seen in the direction of the wet-season form. Specimens of both seasonal phases caught in the open were exhibited for comparison, and it was pointed out that these results with *Teracolus achine* showed complete correspondence with those previously announced in the case of *T. omphale*, Godt.

The behaviour of *Belenois severina* contrasted strongly with that of the two species of *Teracolus*, for whereas in the case of the latter the larval was proved to be the susceptible period, exposure of the former to damp heat in the larval condition produced no perceptible effect, the resulting emergences being of the ordinary dry-season phase. Exposure, however, to the same conditions in both larval and pupal stages resulted in a transformation to the full wet-season form. In this species the seasonal changes chiefly affect the under-surface.

A further point of great interest received illustration from the same series of bred *B. severina.* This was the difference in effect between moisture accompanied by heat and moisture alone. Those individuals exposed as both larvæ and pupæ to the combined effect of heat and moisture, emerged, as has been said, in the full wet-season condition. Those, on the other hand, exposed in both these stages to moisture alone without heat, emerged with the ground-colour of the hind-wing underside characteristic of the wet season, while the dark veining of the dry season was in the same specimens not only present but strongly accentuated. It might be said, in fact, that the employment of moisture only, without heat, had produced a well-marked form, unknown under normal conditions in this region, though occurring naturally in some other parts of Africa, as Uganda and Natal.

To sum up: Mr. Marshall by means of these carefully conducted experiments had shown that in the two species of *Teracolus*, *T. omphale* and *T. achine*, a brood which left to itself would produce the dry-season phase of the imago, might by the application of heat and moisture be made to assume the characteristic features of the wet-season form. Further, in each of these cases it was shown that exposure to the artificial conditions during the larval stage only was capable of producing nearly the whole effect, the result of similarly treating the pupa only being scarcely perceptible.

On the other hand, while in *Belenois severina* an equally complete transformation from the dry- to the wet-season form had been accomplished, it was clearly shown that in this case the larval was not the susceptible stage, the result of exposing the larva only to the artificial conditions being practically *nil.* In this species also Mr. Marshall had experimentally dissociated the two conditions of heat and moisture, showing that while in combination they could effect a transformation to the full wet-season form, the employment of the latter only without the former produced an entirely different result, the most distinctive mark of the new form being the accentuation of a feature usually characteristic of the dry season.

ODEZIA ATRATA ABERRATION.—Mr. SELWYN IMAGE brought for exhibition an aberration of *Odezia atrata*, Lin., taken by Dr. G. B. Longstaff at Mortehoe, N. Devon, on June 26, 1906. The specimen differed very obviously from the ordinary form. The fore-wings were rather sharply angulated at the apex instead of rounded. Head dull ochreous. Thorax and abdomen densely irrorated with ochreous. Fore-wings greyish-ochreous irrorated with black. Hind-wings black irrorated with ochreous terminally. Cilia of fore-wings white. Cilia of hind-wings black, shading off into ochreous at the edge. The flight, he said, suggested that of a Pyralid rather than of a Geometrid.

SEPARATION OF HELICONIUS SPECIES.—Mr. W. J. KAYE, who exhibited a series of the genus *Heliconius*, said that they were arranged to show (1) how Herr Riffarth in a paper published in 1901, entitled "Die Gattung Heliconius," divided the genus into two main divisions by a secondary sexual character, viz., Group I, in which the inner margin of fore-wing of ♂ on under-side is composed of smooth scales reaching the median nervure, and Group II, in which the smooth scales do not reach the median nervure by about a millimetre. This classification very nearly gives equal proportions for both I and II. In point of fact, 34 species in I and 37 in II, including very many sub-species in both. The remarkable result of the application of these characters revealed the fact that in several instances what we had hitherto called one species was in reality two species, one belonging to Group I, the other to Group II. Thus *Heliconius hydara* was found to embrace a sub-species of *H. amaryllis* in *euryades*, Riff., *H. xenoclea* included *H. batesi*,* Riff., and *H. phyllis* included *H. nanna*.

* *H. batesi*, Riff., falls as a synonym of *H. xenoclea*, Hw., as Riffarth mistook Hewitson's figure of *H. xenoclea* to represent a species in Group II, and described the species in Group I as *batesi*. In Hewitson's collection (now in the National Collection) no specimen of Group II exists, so that

More than thirty years ago (in 1871) *H. pachinus* was described by Salvin, and four years later an extremely similar species was described by Staudinger and named *H. hewitsoni*, but it was left to Riffarth in 1901 to detect that these two species were not genetically close, but belonged to two different groups.

A remarkable fact not mentioned by Riffarth, or by Riffarth and Stichel in a more recent paper in the "Tierreich," published in 1905, is that all these pairs of species are found together in their respective localities. Thus *H. hydara* flies with *H. amaryllis*, sub-sp. *euryades*, in Trinidad, and I took them there myself though quite unawares in July 1901. *H. xenoclea* (= *batesi*) and *H. microclea* have been sent home in the same parcel of papered insects from Chanchamayo, Peru. *H. pachinus* and *H. hewitsoni* occur together in Panama, and *H. phyllis* and *H. nanna* have been found in identical localities in Southern Brazil. That Riffarth's character is a sound one there can be no doubt, as small distinctions of shape and colour (not, however, always mentioned by Riffarth) are always to be detected, and the group character is never absent without the other. Why this great similarity should exist we have no direct proof. From analogy it is probably a Müllerian association, and one would have expected that either members of Group I or Group II were the more numerous because more distasteful.

But this is apparently not the case. *H. nanna* and *H. amaryllis rosina*, both of Group I, are much rarer than their respective "pairs," *H. phyllis* and *H. hydara colombina.* But *H. xenoclea* also belongs to Group I and is much commoner than

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Hewitson's figure could only be of the Group I species = *H. xenoclea.* I therefore propose re-naming the Group II species as *microclea*, n. sp.

Heliconius microclea, n. sp.

Hab. TUMATUMARI, B. Guiana; taken with *H. phyllis*, sub. sp. *magnifica.*

Very like *H. xenoclea*, Hew., except that the smooth shining scales in ♂ on the under-side of the inner margin of fore-wing do not reach the median nervure. The red apical patch is rounded on its outer edge and sharply cut below. The central red blotch shows no marked contraction within the discoidal cell as it does in *H. xenoclea.* In size rather less than *H. xenoclea.*

Hab. CHANCHAMAYO, Peru.

Taken with *H. xenoclea*, but less plentifully.

H. microclea of Group II. Many parallel cases in unrelated groups are known to exist, and this negative evidence is no proof that these Heliconians are not mimics one of the other. It is quite possible that in *some*, perhaps in the majority of localities, members of one group are always more dominant than in the other. It is also possible that perhaps the exact times of appearance do not quite coincide, and that when the collector is taking one species abundantly the other is not fully out and *vice versa*. In addition to the species already mentioned the following were also exhibited :—*H. vulcanus cythera* with ab. *modesta*, and *H. vulcanus pyrforus** of Group I, *H. amphitrite* and *H. favorinus* of Group II.

The series exhibited is also to show (2) how Herr Riffarth, and later with the collaboration of Herr Stichel in the "Tierreich" for 1905, derives the *melpomene*-like forms of several species from an *amaryllis*-like form with a yellow transverse band on the hind-wings, the system being based on the shape of the red blotch on the fore-wings in conjunction with the main group character. In the series of *H. amaryllis* were shown two of its sub-species, viz. *rosina* from Colombia and *euryades* from Trinidad, and one of the rare intermediates named *euryas* by Riffarth in which the yellow band is almost but not entirely obliterated.

MICROMORPHISM IN COLEOPTERA.— Mr. W. E. SHARP showed a small collection of Coleoptera to illustrate the tendency of some species to micromorphism, and gave an account of the causes of which these small forms were the result.

The exhibition included specimens of *Brachinus crepitans*, *Necrophorus mortuorum*, *Nacerdes melanura*, *Meloë proscarabæus*, *Pissodes notatus*, *Phyllobius argentatus*, *Leiopus nebulosus*, and *Aleochara cuniculorum*. And remarking upon

* *Heliconius vulcanus*, sub-sp. *pyrforus*, n. sub-sp.

Fore-wing with a strong slaty-blue gloss, more so than in *H. vulcanus vulcanus* but less than in *H. vulcanus cythera*. The red blotch across the centre of the wing very large. Cilia white spotted. Hind-wing without markings. Cilia white spotted. Under-side of hind-wing without any trace of a yellow transverse band.

Hab. TUMATUMARI, B. Guiana.

The sub-species is very like *H. crato guarica* = *magnifica*, Riff., except for the white spotted fringe.

them Mr. Sharp said that micromorphism was a not unusual phenomenon among Coleoptera and other orders; that it appeared to be due, neither to heredity, nor reversion, but to defective larval nutrition. Evidence of this was supplied by the fact that such micromorphic forms are most common in those groups whose larval food is specialised and liable to sudden diminution or termination. While the interest of the case lies in the apparent capability of these organisms to respond to such a deficient supply of nutrition as in other animals would result in starvation or atrophy, by a completion of the normal ontogeny perfected to the last specific character in miniature, and that this appears to be a special adaptation to meet the contingency of variable or limited food supply.

Mr. H. St. John Donisthorpe also exhibited a number of similarly stunted specimens in further illustration of this characteristic.

Mimicry in Lycænids.—Mr. Hamilton H. Druce exhibited a case of butterflies illustrating the interesting Lycænid genus *Mimacræa*, including two groups, the one mimicking the Danaine, the other the Acræine butterflies.

Papers.

The Rev. G. A. Crawshay, M.A., read a paper, illustrated by lantern slides, on "The Life History of *Tetropium gabrieli*, Weise."

Dr. T. A. Chapman, M.D., F.Z.S., read a paper, illustrated by several exhibits, on "Some Teratological Specimens."

The following papers were also communicated:—

"Entomology in North-West Spain," by T. A. Chapman, M.D., F.Z.S., and G. C. Champion, F.Z.S.

"The Larva of *Collyris emarginatus*, Dej.," by Robert Shelford, M.A., F.L.S.

"A Preliminary Revision of the *Forficulidæ* and *Chelisochidæ*," by Malcolm Burr, B.A., F.L.S.

"Descriptions of some new Butterflies from Tropical Africa," by Hamilton H. Druce, F.Z.S.

"A Catalogue of the Australian and Tasmanian *Byrrhidæ*, with descriptions of new Species," by Arthur M. Lea, F.E.S.

Wednesday, March 20th, 1907.

Mr. C. O. Waterhouse, President, in the Chair.

Election of Fellows.

Dr. Ernest Edward Octavius Croft, of 28 Hyde Terrace Leeds; Mr. Felix M. Dames, of Berlin; Mr. Thomas Frank Partridge Hoar, of Quex Lodge, West End Lane, Hampstead, N.W.; Professor Dr. A. Jacobi, Director of Zoology and Anthropology in the Ethnographical Museum of Dresden; and Mr. Harold J. White, of 42 Nevern Square, Kensington, S.W., were elected Fellows of the Society.

Bi-centenary of Linnæus.

It was announced that the Rev. F. D. Morice, M.A., and Professor E. B. Poulton, D.Sc., M.A., F.R.S., would represent the Society at the forthcoming celebrations at Upsala and Stockholm.

Exhibition.

Parallelism between the genera Phrissura and Mylothris.—Dr. F. A. Dixey exhibited several species of *Phrissura* and *Mylothris* side by side, in order to illustrate the remarkable parallelism that exists between these two Pierine genera. The forms shown were as follows:—

Phrissura lasti, Grose Smith, ♂	*Mylothris narcissus*, Butl., ♂
P. sylvia, Fabr., ♂	*M. spica*, Mösch., ♂
P. sylvia, Fabr., ♀	*M. spica*, Mösch., ♀
P. sylvia, Fabr., ♂ (western form)	*M. bernice*, Hew., ♂
P. perlucens, Butl., ♂	*M. asphodelus*, Butl., ♂
P. phœbe, Butl., ♀	*M. poppea*, Cram., ♀
P. phœbe, Butl., ♀	*M. poppea*, Cram., ♂
P. phœbe, Butl., ♀	*M. rubricosta*, Mab., ♀

The genus *Phrissura*, he remarked, was closely akin to *Appias*, *Tachyris*, *Catophaga* and *Glutophrissa*; *Mylothris*, on the other hand, occupied an isolated position and was of doubtful affinity. With the exception of two eastern forms, the species of *Phrissura*, like those of *Mylothris*, belonged to Africa. It was remarkable that there scarcely existed a single form of *Phrissura* that did not find a counterpart in the other genus, though there was nothing but a remote relationship between them. The forms that so closely resembled each other were, speaking generally, inhabitants of the same districts, and it was interesting to observe that where a species of the one genus underwent a local modification, the corresponding local race of the other genus was similarly transformed in appearance. Thus the Uganda form of *P. sylvia*, ♂, closely resembled *M. spica*, ♂, from the same region, both being white butterflies with a dark apex to the fore-wing, a row of marginal black spots on the hind-wing, and a basal patch of bright orange. In the representative forms from the Congo region, *P. perlucens*, Butl., ♂, and *M. asphodelus*, Butl., ♂, the basal orange was in each case replaced by lemon yellow. Again, in the West African specimen shown of *P. sylvia*, ♂, the basal orange took on a darker tinge and was somewhat modified in shape, in both of which respects it came into close correspondence with *M. bernice* from the same locality. The facts might lend some apparent colour to the view that the correspondence was due in each case to similarity of surroundings. The speaker, however, thought that the difficulties in the way of such an explanation were insuperable, and that the relation was in every case mimetic. It would not be easy to say whether the mimicry was of the Batesian or of the Müllerian kind, the data being scarcely sufficient; he inclined personally to the belief that it would prove to be of the latter, *i. e.* the Müllerian sort, especially as there appeared to be indications of a diaposematic exchange of characters between the two series of forms.

He regretted that the Hope Collection possessed no specimens of *P. nyasana*, Butl., ♂, for this form together with *M. rüppellii*, Koch, ♂, would have made a striking addition to the exhibit. He should have preferred also to put a specimen of the West African *P. isokani*, Grose Smith, ♀, beside the *M. poppea*, ♀, from Ashanti, had one been available.

Though he had on the present occasion confined himself to the parallelism existing between these two genera, he wished also to remark that in many cases the actual forms shown formed part only of a much larger mimetic association.

Papers.

The following papers were communicated :—

"Studies in the *Tetriginæ* (Orthoptera) in the Oxford Museum," by JOSEPH L. HANCOCK, M.D., F.E.S.

"A List of the Coleoptera of the Maltese Islands," by MALCOLM CAMERON, M.B., R.N., and Dr. A. CARUANA GATTO.

"The Life History of *Spindasis lohita*, Horsf.," by JOHN C. KERSHAW.

"On the Egg Cases and Early Stages of some South-Chinese *Cassididæ*," by JOHN C. KERSHAW and FREDERICK MUIR.

"A Life History of *Tesseratoma papillosa*, Thunb.," by JOHN C. KERSHAW, with "Notes on the Stridulating Organ and Stink Glands," by FREDERICK MUIR.

"The Vinegar Fly (*Drosophila funebris*)," by ERNEST E. UNWIN, communicated by Professor L. C. MIALL, F.R.S.

"On the Structure and Life History of the Holly Fly," by Professor LOUIS COMPTON MIALL, F.R.S., and T. H. TAYLOR.

The Secretary then read the following :—

"NOTE ON XANTHORHOË FERRUGATA, CLERCK, AND THE MENDELIAN HYPOTHESIS," by LEONARD DONCASTER, M.A., F.E.S.

"In the Trans. Ent. Soc. 1906, Part IV., p. 525, appeared a paper by Mr. L. B. Prout on the inheritance of colour in *Xanthorhoë ferrugata*, in which it is concluded that the inheritance of the two colour-varieties is not in accord with Mendel's Law. I have no experience of this insect, but on reading Mr. Prout's paper it seemed to me that he had overlooked one possibility, and that the evidence, as he gives it, is rather in favour of the belief that the inheritance in this case is Mendelian, than opposed to it. Mr. Prout assumes that the black variety is dominant in the Mendelian sense, because it more frequently found in the wild state, but the evidence shows clearly that the purple form is dominant and the black recessive. According to Mendel's hypothesis recessives when paired together must always breed true, and accordingly in Mr. Prout's experiments in every case when black was mated with black, exclusively black offspring were produced, even when the black parents had purple ancestry. The dominant purple form, on the other hand, may contain the recessive character, and if so half the germ-cells which it produces will bear purple, the other half black. If such an insect is paired with a black, which by hypothesis must be pure, then half the offspring will be black (pure) and half will be purple hybrids. In matings of this kind Mr. Prout obtained 171 black, 147 purple and 4 intermediate, where the Mendelian expectation is 161 black and 161 purple. The rare intermediates must be regarded as cases in which the dominance of the purple is not quite complete, and the numbers (roughly 53 per cent. and 47 per cent.) are not far from the expected equality of the two forms.

"If the purple is dominant, when purple is mated with purple either all the offspring will be purple (if one or both of the parents are pure dominants), or there will be three purples to one black (75 per cent. to 25 per cent.), if both contain the recessive character. In all Mr. Prout's matings the latter case was observed, for black occurred in each family. Altogether, including the family described as (1) on p. 529, there were obtained 147 purple, 2 intermediate, 60 black where the Mendelian expectation is 157 purple, 52 black, *i. e.* Mr. Prout obtained about 71 per cent. and 29 per cent. instead of the expected 75 and 25 per cent.

"It is perhaps remarkable that among ten pairings of this nature none should have been pure dominants, but as most of the insects used were the progeny of wild purples, and black is admittedly the commoner form in nature, this need cause no surprise. That the recessive form is the commoner in the wild state is not rare, *e. g.* I have shown that the common form of *Angerona prunaria* is recessive to the var. *sordiata* (P. Z. S. 1906, vol. I, p. 125), and other cases might be added. I think it must be concluded therefore that instead of showing that the two colour-forms of *X. ferrugata* are not inherited in accordance with Mendel's Law, Mr. Prout's experiments indicate that this species affords another clear instance of that type of inheritance.

"Mr. Prout quotes me (p. 529) as saying that the inheritance of Melanism in *Aplecta nebulosa* is not Mendelian, and he assumes that perhaps Mendelian inheritance is confined to certain species. My words were intended to mean that in that species the inheritance of Melanism could not be shown by the evidence at present available to follow Mendel's Law, because neither form is a simple dominant over the other, but this is no evidence that the Mendelian segregation of the germ-cells does not take place. In a species where one colour-form is clearly dominant over the other there can be little doubt as to the Mendelian inheritance, but in more complicated cases such as *A. nebulosa* much careful experiment would be required, before the nature of the inheritance could be worked out."

Commenting also on Mr. Prout's paper, Dr. F. A. DIXEY said that "dominance" in what the author spoke of as the ordinary acceptation of the word might or might not coincide with Mendelian dominance. It seemed tolerably clear that Mr. Doncaster's suggestion was correct, and that in this instance the "black" form, which was dominant in the "ordinary" sense, was a Mendelian recessive. It should, however, be observed that in one instance black and black produced an intermediate (Trans. Ent. Soc. Lond., 1906, p. 527).

The cases recorded on p. 529 of Mr. Prout's very interesting paper presented some difficulty. The only possibility seemed to be that, as Mr. Doncaster had pointed out, the three wild "purple" females there spoken of were hybrids mated with recessives. The Mendelian expectation for the offspring on this supposition would be 50 per cent. purple and 50 per cent. black—a proportion rather widely departed from, especially in the case of female (2), whose recessive offspring considerably exceeded in number the Mendelian prediction. But the numbers of the individual broods were after all far too small to give stable conclusions, and if the several results of presumably DR × R matings mentioned in the same paragraph were added together, the Mendelian proportion would be more nearly approached. The paired offspring of female (1) were probably both hybrids; as also must have been the purple male offspring of female (3), which was paired with a recessive of the same brood.

Dr. Dixey further remarked that it would be interesting to inquire into the causes of the alleged preponderance of the purple form in the Isle of Man. The facts concerning the relative abundance of the two forms in different localities seemed to suggest that some kind of selection was at work, but it was not easy to conjecture what its precise mode of operation might be.

Wednesday, April 10th, 1907.

Mr. C. O. Waterhouse, President, in the Chair.

Election of Fellows.

Mr. Sydney R. Ashby, of 119, Greenvale Road, Eltham Park, Kent; Mr. Arthur Bulleid, F.S.A., of The Old Vicarage, Midsomer Norton, Somerset; Mr. Bernard H. D. Harrison, of Claremont, Ashleigh Road, Barnstaple; and Mr. Charles Fielding Johnson, of Mayfield, Binnington Crescent, Stockport, were elected Fellows of the Society.

Obituary.

The decease was announced of Mr. John Emmerson Robson.

Exhibitions.

Similarity between Dry-season Forms of allied Pierine Species.—Dr. F. A. Dixey exhibited male specimens of the wet- and dry-season phases of the following African and Indian *Pierinæ*:—

Teracolus achine, Cram.	*T. antigone*, Boisd.
T. omphale, Godt.	*Huphina nadina*, Luc.
T. evenina, Wallgrn.	*H. nerissa*, Fabr.

He remarked that the exhibit illustrated two points:—(1) the fact that in *Pierinæ* which were subject to seasonal dimorphism the dry-season form was often conspicuously smaller than its wet-season representative; and (2) the fact that the males of species which were easily discriminated in their wet-season phases might be almost indistinguishable from each other in the dry-season garb, the same applying, though less markedly, to the females. In the case of the four species of *Teracolus* shown, though there was a family likeness between all the wet-season forms, they could nevertheless be distinguished at a glance. On the other hand, the dry-season forms of the same four species resembled each other so closely in aspect, and even in size, that they could not be separated without minute examination. He knew from personal experience that these dry-season forms were most difficult to identify in the field. The two species of *Huphina*, again, bore in their dry-season phase a very close resemblance to each other, but in the wet-season they were quite dissimilar.

He did not advance either of these points as being of universal application; though the former of them, at least, was of very common occurrence.

Forms of Osphya and Concurrent Species.—Mr. G. C. Champion showed on behalf of Mr. J. Edwards specimens of the genus *Osphya* and read the following note communicated by him:—

"This exhibit consists of five forms of *Osphya* together with certain other species occurring at the same time and place, and which, having regard to gait and appearance, resemble them more or less closely. It is not suggested that these resemblances are protective. On the whole, the numbers of *Telephorus pellucidus* much exceed those of the normal male of *Osphya* (*a*), but on some occasions the two species occur in approximately equal numbers; and the same may be said of the normal female (*b*) and *Telephorus lividus*. The '*nigripenne* form of female (*c*) occurs in a proportion of approximately two per cent. to the normal form, and its proportion of occurrences to those of *Telephorus rusticus* is, of course, much smaller; still, the resemblance of the two insects in life is very striking. About five per cent. of all the females are of the small form (*d*), and the resemblance between these and *Telephorus hæmorrhoidalis*, though noticeable, is not very marked. The resemblance between the 'simplex' form of the male (*e*) in which the hind-legs are practically unmodified, there being neither angulation near the base of the tibia nor production inwards at the apex of that member, to the female of *Grammoptera ruficornis* is in life particularly striking, the proportion of the *Osphya* to the Longicorn being approximately two per cent.

"I have kept a number of living specimens of both sexes of *Osphya* in confinement, and had ample direct evidence of one important function of the hind-legs of the male, namely, to secure him in position at the time of pairing. He mounts the back of the female, who struggles to escape, and seizes her with his mandibles by the neck, clasping her in the meantime round the body with his front pairs of legs whilst the hinder pair are so adjusted that the hind tibiæ of the female are held between his femora and tibiæ near the knee-joint (that is, between the joint and the small tooth on the femora), and the remainder of the inner edge of his hind tibiæ is closely applied to the venter of the female abdomen; the large curved tooth at the apex of the tibia fits the curve of the under-surface of the female abdomen and evidently serves to increase the grip. The effect of these circumstances is to secure the pairing of individuals of suitable size, for the small males were quite unable to hold the large females whilst the small females escaped with ease from the embrace of the normal males. It appears remarkable that the small form is not more common, as I observed the males to pair readily enough with females of suitable size. I found no evidence in support of the theory that the strongly modified hind-legs of the normal males serve to give the insects a better grip of their support under ordinary circumstances; on the contrary, during ordinary progression the hind tibia is closely applied to the femur, the tip of the inward prolongation at the apex of the former locking into a cavity in the trochanter and leaving only the tarsus free."

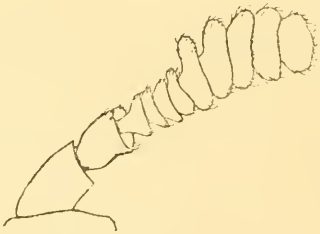
Mr. H. St. J. Donisthorpe expressed his opinion that the resemblance between the forms was most certainly protective, and Mr. A. J. Chitty said that in Monkswood, Hunts., where he had taken *Osphya* in abundance, all the females belonged to the light form.

Antennæ-Joints in Trachyscelis.—Mr. H. J. Carter showed a microscopic slide prepared to demonstrate that the antennæ of the genus *Trachyscelis* have eleven joints, and not ten as hitherto described.

Mr. Carter having made some further observations, also contributed the following note :—

On the Australian Species of Trachyscelis.

"In a late microscopic observation of the antennæ of *T. nigra*, mihi, I noticed a marked discrepancy from Pascoe's tabulation of the species (Ann. and Mag., v, 1870, p. 95). In that table, *Trachyscelis* is differentiated from the other genera of the tribe by the main distinction '*ten-jointed antennæ.*' Moreover, in a footnote, Pascoe refers to Du Val as the 'only author



Antenna of *Trachyscelis nigra*, Carter.

who has given the correct number of antennal joints' (Gen. Col. d'Europe, iii, p. 288.) In reference to his figure (Pl. vii, fig. 352*b*) I have failed to detect the moniliform structure of the club, and the basal joint is much larger and curved almost at a right angle. It must be recollected however that the whole antenna is not larger than the point of a fine needle. M. Du Val himself says, 'Nos auteurs récents, et M. Mulsant lui-même, donnent tous *onze articles* aux antennes des *Trachyscelis*, mais ils ne peuvent avoir contrôlé ce nombre avec soin, car les antennes en question n'offrent *évidemment que dix articles* distincts et articulés. M. Emile Blanchard (Regne An. de Cuvier, Edit. Masson, i, pl. 50, p. 4) a fait mieux. Dans le dessein du reste en tout très mauvais, qu'il a donné de l'antenne du *T. aphodioides*, il a répresenté la massue comme offrant six articles.' On referring to Latreille, the founder of the genus (Gen. Crust. et Insect., IV, p. 379), the antennæ are described as 'Capite vix longiores, articulis sex ultimis clavam perfoliatam abruptam, breviter oratam, efficientibus; basilari elongato, tertio duobusque sequentibus minimis, transversis.' Neither Lacordaire, nor Leconte and Horn, say anything as to the number of antennal joints.

"I present a drawing of the antenna of my species which shows (1) that there are *eleven* clearly articulated joints, (2) that the club consists of *five* well-defined and widened joints.

"Mr. G. C. Champion, who has examined the antennæ of the following species, sends me the enclosed report on the subject. From this it appears that of eight species examined *two* only have ten-jointed antennæ, viz. *T. aphodioides*, Latr., and *T. ciliaris*, Champ., the remaining six species having *eleven*-jointed antennæ. The missing joint in the former is one of the small joints, between the basal two and the apical five. This very extraordinary difference shows the difficulty of relying on such important structural character as number of antennal joints for generic distinction."

Mr. Champion's report is as follows :—

"I now send a slide of *T. aphodioides* and of *T. ciliaris* (hardly dry yet) for your inspection. My report on the various species known to me is as follows (all have two stout basal joints and a five-jointed club) :—

T. aphodioides, Latr., Europe and N. Afr., 10-jointed.
T. tenuestriatus, Fairm., Obock and Perim, 11-jointed.
T. chinensis, Ch., Namoa I., 11-jointed.
T. sabuleti, Lewis, Japan, 11-jointed.
T. pallens, Ch., Ceylon, 11-jointed.
T. niger, Cart., Australia, 11-jointed.
T. lævis, Ch., Australia, 11-jointed.
T. ciliaris, Ch., Australia, 10-jointed.

It is very extraordinary, and shows that no reliance can be placed on this character for generic differentiation. The additional joint is always another very small one (4 instead of 3). No variation in basal joint, as you supposed."

Papers.

Mr. KENNETH J. MORTON communicated a paper on "Odonata collected by Lt.-Colonel C. G. NURSE, chiefly in North-Western India."

Mr. W. J. KAYE communicated a paper on "The Life History of *Cydimon* (*Urania*) *leilus*," by L. GUPPY, Junior, which was followed by a discussion on the migratory habit, and classification of the species. Commander J. J. WALKER said that he had met with an allied species at Panama where it was believed that the insect made daily migrations from one side of the isthmus to the other. Mr. J. W. TUTT said that Mr. Guppy's description of the egg at once determined that the species should be classed no longer as a Geometer. The characteristics described suggested that it belonged to the butterfly stirps. The PRESIDENT and other Fellows also joined in the discussion.

Wednesday, May 1st, 1907.

Mr. C. O. WATERHOUSE, President, in the Chair.

Election of Fellows.

M. ALEXANDRE BONNET, of 36*bis* Boulevard Bineau, Neuilly-sur-Seine, Seine, France; Mr. HENRY MURRAY GILES, of Perth, Western Australia; Mr. ARTHUR LESLIE RAYWARD, of Colebrooke, Park Lane, Wallington, Surrey; and Mr. YEEND DUER, of Tokyo, Japan, were elected Fellows of the Society.

Obituary.

The decease was announced of the Rev. WILLIAM HENRY HEALE, M.A.

Exhibitions.

COLEOPTERA FROM ICELAND.—Mr. O. E. JANSON exhibited a small collection of Coleoptera made by him in Iceland in July 1906, comprising thirty-nine species, of which some were previously unrecorded as inhabiting that island. He also drew attention to the affinity between the beetle-fauna of

Iceland and of Scotland, only one of those taken, *Colymbetes grœnlandicus*, Aubé, not occurring in both countries.

Larvæ of Otiorrhynchus sulcatus.—Mr. J. A. Clark brought for exhibition living larvæ of *Otiorrhynchus sulcatus* feeding on the roots of ferns.

Coleoptera from the South of France.—Commander J. J. Walker showed living specimens of *Oxythyrea stictica*, L., *Epicometis hirtella*, L., and *Anthaxia parallela*, Lap., taken by Dr. T. A. Chapman at St. Maxime, Var, S. France.

Divergent Mimicry by the Females of Leuceronia argia, Fabr.—Dr. F. A. Dixey exhibited specimens of *Leuceronia argia*, Fabr., ♂ and ♀, together with several forms belonging to four other Pierine genera. He remarked on them as follows:—

"Mr. Trimen ('South African Butterflies,' vol. III, 1889, p. 181) has drawn attention to the resemblance borne to *Mylothris agathina*, Cram., and *Belenois ianthe*, Doubl., by certain forms of the female *Leuceronia argia*, Fabr. The female of this Pierine is extremely variable, and the object of the present exhibit is to show that each of its diverse forms is associated in aspect with one or more species of *Mylothris*, *Belenois*, *Pinacopteryx* or *Phrissura*—all these being genera whose affinity with *Leuceronia* is remote.

"The following are the forms now exhibited, together with the types which they respectively resemble:—

Form of *L. argia*, Fabr., ♀	Associated with
1. White, black-bordered form (= f. *typica*, Auriv.).	*Belenois theuszi*, Dewitz ♂.
2. The same, with orange basal flush on forewings (= f. *poppea*, Donov., teste, Butler).	*Mylothris rüppellii*, Koch, ♂.
3. White, slight dark border, pinkish basal flush just showing through upper surface of forewings.	*Phrissura phœbe*, Butl., ♀
4. White, border of conspicuous dark spots, orange-vermilion basal flush.	*Mylothris rüppellii*, Koch, ♀.
5. Yellow, strongly-marked dark border, orange basal flush (= f. *sulphurea*, Auriv.).	*Mylothris rüppellii*, Koch, ♂ (yellow form).

6. White, slightly-marked spotty border, yellowish hindwings, pale orange basal flush.	*Pinacopteryx rubrobasalis*, Lanz, ♀.
7. Ordinary Natal form (= f. *varia*, Trimen), showing under-side.	*Mylothris agathina*, Cram., ♂ (under-side).

"These examples do not exhaust the list of forms of *L. argia*, ♀, which resemble other Pierine species; for besides the black and yellow f. *idotea*, Auriv., which is the form noticed by Trimen for its resemblance to *Belenois ianthe*, there is a modification of f. *varia*, Trim., with a yellowish hind-wing like No. 6 *supra* but without the basal flush, which falls into association with a form of the female *Pinacopteryx pigea*, Boisd. Besides this, f. *semiflava*, Auriv., at once suggests membership of a numerous assemblage characterised by brown upper and pale under-wings, to which group also belong many females of *Mylothris spica*, Mösch., *Phrissura sylvia*, Fabr., *Belenois theuszi*, Dewitz, and *B. theora*, Doubl.

"The question naturally arises, what is the meaning of these resemblances? I am not credulous enough to believe that they represent a mere series of coincidences; it appears to me that they must have some bionomic significance, and that in the present as in similar instances the interpretation least attended with difficulty is that which attributes to them a mimetic value. It is generally admitted that *Mylothris*, forms of which so often take a central position in these supposed mimetic groups, is a well-protected genus. There is therefore good reason for its imitation by *L. argia*, whether this imitation be of the Batesian or of the Müllerian kind. It is true that *L. argia* is seldom a very perfect mimic; its various forms seem to hover on the outskirts of mimetic groups without entirely casting in their lot with them. But cases similar to this are known elsewhere; and much the same, *mutatis mutandis*, might be said of many instances (which few would be found to dispute) of protective resemblance to inanimate objects. We find, indeed, as under the theory of adaptation by selection we should expect to find, every sort of gradation between protection which is only slight, and protection which is all but complete; and this, whatever be the special kind of protection in question. If a species be maintaining its ground, deficiency in one particular will be made up for by excellence in another.

"Some of the forms of *L. argia*, ♀, are restricted to definite regions, and it is natural to ask whether these mimics and their models are always to be found in the same locality. To a great extent this can be shown to be the case, but a wider knowledge than we at present possess of the distribution of both sets of forms would be necessary for a complete answer to the question. Meanwhile, the facts now at our command do not suggest an answer unfavourable to the theory.

"I have heard it remarked that whereas the form *sulphurea* of *L. argia*, ♀, has a well-marked dark margin, the *Mylothris* with which it is here associated has no continuous dark marking, except at the apex of the fore-wing. Experience, however, leads me to think that although a border of black spots on a white or pale-coloured wing—the arrangement so commonly seen in *Mylothris* but obsolescent in this particular form—is a conspicuous feature, a uniform dark border (as in *Belenois severina*, Cram., ♀) is often unnoticeable during flight; the chief effect of such a border being to diminish the apparent size of its possessor, and sometimes (if the internal bounding line is irregular) to convey in addition the impression of a worn or ragged edge to the wings. There is reason therefore to suppose that the resemblance between these two forms is quite close enough to be effective.

"It may, in conclusion, be remarked that the present case is in some respects analogous with that of *Papilio dardanus*. In both we have a series of females, differing widely from the male and from each other, and each bearing a resemblance to a protected form belonging to another group. The differences in *L. argia*, though similar in kind, are far less striking in degree than those shown by *P. dardanus*; this corresponds with the greater family resemblance between the models of the *Leuceronia* as compared with those of the *Papilio*."

MIMICRY AMONG COLEOPTERA.—The PRESIDENT exhibited some Coleoptera collected in Pahang by Mr. H. C. Robinson and recently received at the Natural History Museum. The series contained some interesting cases of mimicry between weevils of the genus *Episomus* and Longicorns of the genus *Niconia*. Also a specimen of a Cicindelid, *Collyris apicalis*, which closely resembles the Heteromerous insect *Styrax tricondyloides*. And lastly a Longicorn of the genus *Zelota*, apparently a new species, which resembled a species of *Amphisternus* of the family *Endomychidæ*.

Living Luminous Coleoptera.—Dr. G. B. Longstaff exhibited living specimens of the luminous Elaterid *Pyrophorus noctilucus*, L., brought from Trinidad by Dr. F. L. J. M. de Verteuil, R.N. Dr. Longstaff had observed that when chloroformed the green lights became very brilliant, but were soon eclipsed. As the lights faded in a normal way they appeared to pulsate.

Rare and New British Coleoptera.—Mr. H. St. J. Donisthorpe exhibited on behalf of Prof. T. Hudson Beare and himself specimens of *Quedius riparius*, Kell., and *Trypodendron quercus*, Eich., taken by them at Porlock, Somersetshire, on April 16th and 17th. The former insect was found somewhat sparingly in flood-refuse caught by fallen logs lying in one of the mountain torrents which came down from Exmoor; it was to be found only in flood-refuse actually over the surface of the water—apparently when the flood-refuse is deposited on the banks the insect very quickly leaves it. There are only records of the capture of this insect—by Mr. Kidson Taylor, in Derbyshire, one specimen —and by Mr. Chitty in flood-rubbish on the river Beauly, Inverness-shire, since Mr. Blatch discovered it at Porlock in 1896. With these the exhibitor showed specimens of *Quedius kraatzii*, new to Britain, taken by him at Chiddingfold in 1898, but not exhibited before, to compare with *Q. riparius*, both species having the same habits. It was stated that unlike the latter, *kraatzii* had never been taken elsewhere in Britain, though he had found it on various occasions since in the old locality. The *Trypodendron* was found in the bark and in the solid wood of a small oak bough; there are few records of its capture outside the Sherwood Forest district. Also *Hydrovatus clypealis*, Shp., taken by them on April 14th at Worle near Weston-super-Mare. This very local little water-beetle is only recorded from Portsmouth by Canon Fowler, but has since been taken at Sandown, I. of Wight, by Prof. Beare, and in the New Forest by Dr. Sharp.

Dipteron associated with Ants.—Mr. Donisthorpe also showed the larva and pupa of a Dipteron of the genus

Microdon, taken in a nest of *Formica fusca* at Porlock last month. A number of larvæ were taken, and one of the nests in which they occurred. The ants are stated to nurse the larvæ as they do their scale insects (*Coccidæ*).

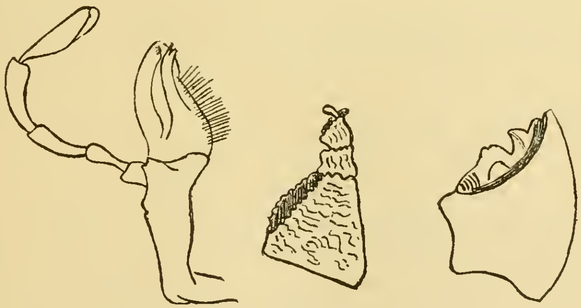
The PRESIDENT warmly congratulated Mr. Donisthorpe upon the nature and extent of his discoveries of species of insects, etc., attendant on ants.

HEMIMERUS TALPOIDES, WALK.—Mr. R. SHELFORD exhibited a specimen of the curious Orthopterous insect *Hemimerus talpoides*, Walk., from Portuguese Guinea; the species is parasitic on a large rat, *Cricetomys gambianus*, and is viviparous.

Mr. R. SHELFORD then read the following note on

"A CASE OF HOMŒOTIC VARIATION IN A COCKROACH."

Homœosis has been defined as "the assumption by one member of a Meristic series, of the form or characters proper to other



Left maxilla. *Right maxilla.* *Right mandible.*

members of the series" (Bateson, "Materials for the Study of Variation," London, 1894, p. 84). This type of abnormality is of rare occurrence; Mr. Bateson is only able to quote four examples of it amongst the Insecta, and two of these are doubtfully genuine. The undoubted cases are *Cimbex axillaris* and *Bombus variabilis*, both insects having the left antenna partially developed as a foot (*l.c.* pp. 146–148). I daresay that other cases of homœosis amongst insects have been recorded during the past twelve years, but if so, I have not come across any accounts of them. The abnormality now to be described seems to be of the nature of a homœotic variation. When dissecting a cockroach of the genus *Panesthia*, apparently a new species allied to *P. sinuata*, Sauss., I observed that the right maxilla was replaced by a hard chitinous structure superficially resembling a mandible; the left maxilla and both mandibles were perfectly normal. On removing and closely examining the right "maxilla" it was seen to be a densely chitinised and rugose organ, roughly approximating in shape and size to a normal mandible. This "maxilla" at the base is large, but it tapers distally and the apex bears a small finger-like process. Traces of segmentation are seen in two circular grooves and in the different size of the parts defined by these grooves; the organ may be regarded as made up of four segments, the terminal small process being one, but it is perfectly rigid and the segmentation is only visible on close examination. The basal segment is hollowed out on its inner face and it is this feature which increases the general resemblance of the structure to a mandible. Without going so far as to say that the abnormal "maxilla" of the cockroach under notice reproduces the ancestral condition of a mandible, attention may be drawn to the view that the mandibles are derived from a four-segmented organ, advocated by Wood-Mason and other entomologists. Wood-Mason moreover has observed that the mandibles of the embryo of *Panesthia javanica* are segmented, and in the larvæ and adults of the same species he distinguished a groove across the back of the mandible at the base, representing in his opinion the remains of a joint. The cockroach exhibiting the variation described above was captured on Mt. Masarang in N. Celebes by Dr. Chas. Hose in 1895.

Wednesday, June 5th, 1907.

Mr. C. O. WATERHOUSE, President, in the Chair.

Election of Fellows.

Mr. C. N. HUGHES, of Knightstone, Cobham; Mr. ALBERT ERNEST McCLURE KELLY, Assistant Entomologist to the Department of Agriculture, Natal; and Mr. M. G. MUKLIE, of Hyderabad, Sind, India, and Cambridge University, were elected Fellows of the Society.

Obituary.

The decease was announced of Dr. FREDERIC MOORE, D.Sc., A.L.S., F.Z.S., the "father" of Indian entomology, and one of the oldest Fellows of the Society, and of Mr. C. J. WATKINS.

Bicentenary of Linnæus.

The PRESIDENT read the following communication from the Rev. F. D. Morice, M.A., the Society's delegate to the celebrations in honour of the bicentenary of Linnæus at Upsala, and Stockholm :—

"*Stockholm, May 28th*, 1907.

"DEAR MR. WATERHOUSE,

"If this reaches you before the June meeting of the Entomological Society, will you kindly announce that I duly delivered their Address of Congratulation to the Rector of the Upsala University, and the President of the Stockholm Academy of Sciences; and that I have been received at both places with great kindness and hospitality, as have all the other delegates bringing similar addresses from other Societies, etc., in Europe and America . . .

"Yours sincerely,

"F. D. MORICE."

A vote of thanks was unanimously given to Mr. Morice for his services in presenting, and as author of the Address, and it was resolved to publish the same, as follows, in Latin and English in the Society's Proceedings:—

REGIÆ ACADEMIÆ
SCIENTARUM SUECICÆ
S. P. D.
SOCIETATIS ENTOMOLOGICÆ
LONDINIENSIS

Præses, Vice-Præsides, Socii.

Litteras vestras gaudentes accepimus, et quia indicio sunt nobis benevolentiæ vestræ animique fraterni, et quia

Caroli Linnæi

potissimum ad memoriam celebrandam invitamur, quem nos entomologiæ studiis dediti tanquam scientiæ nostræ auctorem clarissimum ac pæne parentem veneratione unica et pietate semper prosequimur.

Vestrum quidem fuisse illum civem confitemur, neque gloriæ huic vestræ invidemus sed de ea potius vobis gratulamur. Liceat tamen nobis quoque exteris non alienum vobis putare splendorem viri, qui—ut "Phœbi fax" non Delum solam vel Lyciam, sed terras omnes illuminat—ita hominibus omnibus, qui in qualibet regione terrarum Naturæ arcana perscrutantur, ductorem se lucisque datorem præbuit semperque præbebit.

Etiam atque etiam valete!

Dabamus Londini die X. m. Maii a. 1907.

Charles O. Waterhouse, Præses.
Frederic Merrifield, Edward Saunders, George Henry Verrall — Vice-Præsides.

We were glad to receive your letter, both because it shows us your goodwill and fraternal feeling towards us, and because it is the memory of Carolus Linnæus that we are asked to celebrate—the man whom we entomologists regard with special admiration and affection as a chief authority on our science and almost as its father.

As you say, he was *your* fellow-citizen, and we do not grudge you this boast but rather congratulate you on it. Still, let us foreigners also be allowed to think ourselves not unconcerned in the glory of one, who (as the Sun shines on all lands and not only on Delos and Lycia) so has been, and will ever be the guide and giver of light to all men, who in any country probe the mysteries of Nature.

Most heartily we wish you well!

CHARLES O. WATERHOUSE, President.
FREDERIC MERRIFIELD, EDWARD SAUNDERS, GEORGE HENRY VERRALL — Vice-Presidents.

UNIVERSITATI REGIÆ UPSALIENSI

S. P. D.

SOCIETATIS ENTOMOLOGICÆ

LONDINIENSIS

PRÆSES, VICE-PRÆSIDES, SOCII.

Pergratæ nobis erant litteræ vestræ, primum quia decorum nobis esse honorificumque videbatur cum vestra tam illustri Universitate participes incepti cuiusvis fieri, deinde quia

CAROLI LINNÆI

potissimum in commemorationem invitabamur, quem, ut botanici, ita nos quoque entomologiæ studiis dediti tanquam scientiæ nostræ auctorem clarissimum ac pæne parentem veneratione unica et pietate semper prosequimur.

Quare collegæ nostro, Viro Reverendo, F. D. Morice, Artium Magistro, Collegii Reginensis apud Oxonienses Socio, mandatum dedimus, ut vobis præsens declaret, quantopere gaudeamus licere nobis in nataliciis civis vestri præstantissimi celebrandis vobiscum sociari.

Qua celebratione speramus fore ut accendantur plures ad hæc studia nostra exercenda atque propaganda, quæ non solum nobis ipsis delectationem utilitatemque maximam afferre solent, sed—quod confidenter dixerimus—humani quoque generis communi commodo inservire possunt.

Etiam atque etiam valete!

Dabamus Londini die X. m. Maii a. 1907.

CHARLES O. WATERHOUSE, Præses.
FREDERIC MERRIFIELD, EDWARD SAUNDERS, GEORGE HENRY VERRALL — Vice-Præsides.

Your letter was very welcome to us, first because it seemed to us an honour and compliment to be associated with your illustrious University in any undertaking whatever, and next because it was Carolus Linnæus in particular that we were invited to commemorate, the man whom we students of entomology regard, even as the botanists, with a special reverence and filial affection as the most distinguished advancer of our science, indeed almost as its parent.

Accordingly we have commissioned our colleague, the Rev. F. D. Morice, M.A., Fellow of Queen's College, Oxford, to express to you on the spot how glad we feel to be allowed to join with you in celebrating the birthday of your illustrious fellow-countryman.

We hope that by this celebration others will be incited to practise and advance these studies of ours, which not only are wont to afford to us personally the greatest pleasure and advantage, but also—as we can confidently assert—are capable of conducing to the general benefit of mankind.

Most heartily we wish you well!

CHARLES O. WATERHOUSE, President.
FREDERIC MERRIFIELD
EDWARD SAUNDERS
GEORGE HENRY VERRALL
} Vice-Presidents.

International Congress of Entomology.

The PRESIDENT read the following letter received from Dr. KARL JORDAN, F.E.S., of the Museum, Tring—

"*Zoological Museum, Tring, Herts., England,*
"*June* 1*st*, 1907.

"SIR,

"The undersigned Entomologists consider it opportune to organise an International Congress of Entomology, to meet for the first time in 1908. In order to render the Congress a success the moral support by the Entomological Societies is an absolute necessity for the undertaking, and we therefore write to solicit the kind co-operation of the Officers and Fellows of the Entomological Society of London. Should the Council, as we venture to hope, favour our plan, we beg the Hon. Secretary to read at the next meeting, and to publish in the Proceedings, the note here appended, a similar note being sent to the various Entomological Societies abroad.

"Yours faithfully,

Chr. Aurivillius, E. L. Bouvier, I. Bolivar, L. Bedel, M. Bezzi, P. Bachmetjew, S. Bengtsson, J. C. Bradley, W. Beutenmüller, C. J. S. Bethune, C. H. Carpenter, T. D. A. Cockerell, Ph. P. Calvert, T. A. Chapman, K. Daniel, F. A. Dixey, W. L. Distant, E. C. Van Dyke, Ed. Everts, A. Forel, J. Fletcher, H. C. Fall, L. Ganglbauer, A. Giard, R. Gestro, F. Du Cane Godman, W. Horn, A. Handlirsch, K. M. Heller, G. von Horvath, H. J. Kolbe, F. Klapalek, P. Lesne, Th. Becker, P. Mabille, J. C. U. de Meijere, A. L. Montandon, P. Magretti, F. Merrifield, L. W. Mengel, Chas. Oberthür, R. Oberthür, H. Osborn, P. Pavesi, E. B. Poulton, H. Rebel, F. Ris, W. Rothschild, H. Schoutenden, A. v. Schulthess-Rechberg, G. Severin, F. Silvestri, Y. Sjöstedt, H. Skinner, J. B. Smith, M. Standfuss, J. W. Tutt, G. H. Verrall, E. Wassmann, Chas. O. Waterhouse, and others."

"As a result of an extensive correspondence with Entomologists of various countries of Europe and America it has been agreed upon to issue in the course of this summer invitations for an International Congress of Entomology to meet in 1908.

"The purpose of the Congress is to promote the interests of entomological research, and therefore of Biology in general, by furthering cordial co-operation between the Entomologists of different countries, and by discussing questions of general entomological interest, thereby stimulating research and directing it into channels where it may be most fruitful or where special research is most needed. Questions of applied Entomology will likewise be dealt with in the discussions and lectures, the great experience gained by the devotees to pure Entomology being applicable with profit in economic and hygienic Entomology.

"Entomologists are cordially invited to advise and assist in the organisation of the Congress. All communications, till further notice, to be addressed to Dr. K. Jordan, Zoological Museum, Tring (Herts.).

"To the Hon. Secretary of the
ENTOMOLOGICAL SOCIETY OF LONDON."

On the motion of Professor R. MELDOLA, F.R.S., seconded by Mr. G. C. CHAMPION, F.Z.S., a resolution, cordially approving the Congress, and offering the support and co-operation of the Society, was carried unanimously.

Exhibitions.

LEIOPTILUS CARPHODACTYLUS IN BRITAIN.—Dr. T. A. CHAPMAN exhibited a living example of *Leioptilus carphodactylus*, Hb., one of the first bred in Britain, which emerged June 2nd, 1907, from larvæ found by Mr. J. Ovenden in Kent. The first British specimen was exhibited to the Society at the meeting of March 6th (p. xii, *antea*).

MICRODON MUTABILIS, AND KLEDITOMA MYRMECOPHILA.—Mr. H. St. J. DONISTHORPE showed a specimen of *Micordon mutabilis*, with the empty pupa-case, bred from a larva taken in the nest of *Formica fusca* at Porlock, April 1907; also ♂ ♂ and ♀ ♀ of *Kleditoma myrmecophila*, n. sp., bred last month from a nest of *Lasius fuliginosus* found at Wellington College in March 1907. He said that this species of parasitic *Cynipidæ*, which was new to science, had been named by Professor Dr. J. J. Kieffer.

NEW PHYTOPHAGA FROM AUSTRALIA.—Mr. M. JACOBY brought for exhibition examples of small beetles, new to science, of the family *Clythridæ* (*Phytophaga*) including *Leasia australis*, n. sp. Jac.

THE SIGNIFICANCE OF SOME SECONDARY SEXUAL CHARACTERS IN BUTTERFLIES.—Professor E. B. POULTON, F.R.S., said that he wished to bring before the Fellows a hypothesis which had suggested itself as the outcome of reflections upon the *Heliconinæ*, as dealt with by Mr. W. J. Kaye in a recent communication.

It had often been noticed that mimetic resemblance is apt to deceive the species concerned, so that the male of one will chase the female of the other. When model and mimic belong to very different groups, *e.g.* sub-families, it is improbable that such errors of judgment could lead to any important danger. It is very unlikely that a superficial resemblance would mislead the individuals of species belonging to different sub-families when they approached each other at all closely, and the impression made by each upon the whole of the sense-organs of the other became at all strong. But this would not apply to anything like the same extent when there was near relationship between the mimetic species—as in so many *Ithomiinæ*, *Danainæ*, and *Heliconinæ*. When close resemblance obtains within the limits of such a sub-family as one of these,—and mimetic likeness of the kind is often extraordinarily exact,—it is not a far-fetched hypothesis to suggest that some special adaptation has arisen, enabling the females easily to discriminate between their own and the males of other closely similar species, and at once to repel those advances which are something of a danger and nothing of advantage to either species. Other facts, and especially the hard, cell-like structure secreted by the male upon the body of the female in *Parnassius* and in *Acræinæ*, also support the conclusion that useless pairing and attempts to pair are an injury to the species. Colour and pattern being excluded *ex hypothesi*, some special difference in scent is the most obvious means of discrimination. May not this be the meaning of the fact that the males of the *Euplæini* may be divided into groups (which have been given generic names) distinguished, and sometimes solely distinguished, by remarkable differences in the size, number, form and position of the areas presumed to be scent-producing? These *Euplæas* are remarkable for the number of their synaposematic associations and for the closeness of the resemblance between the constituent species. So far as my experience goes,—and further inquiry in the same direction will tend to supply confirmation or refutation of the hypothesis here put forward—these associations are made up of species belonging to groups with different forms of sexual brands and not by species with males bearing the same type of brand. And now Mr. Kaye has shown that the close synaposematic pairs within the Heliconine sub-family are made up of species of which one belongs to the group with a broad the other to the group with a narrow band of glistening scales, in the male,—bands which are presumably scent-producing. It is probable that the excessively close resemblance between these pairs and between the members of the Euplœine associations has been rendered possible without injury to the species by the existence of this means of instant recognition, and I think it is possible to infer the past history with a fair degree of probability. In the African Danaine genus *Amauris* we find two very common species as closely alike as any of the Euplœine or Heliconine Müllerian groups or pairs. I refer to *Amauris echeria* and *A. albimaculata*. It was at first thought that white spots in place of buff in the fore-wing alone distinguished these forms, and the general opinion followed that one was a variety of the other. But Rothschild and Jordan have shown that they are certainly separated by minute but well-defined and constant differences. Accompanying these, the scent-patches at the anal angle of the hind-wing of the male of *albimaculata* are about twice as long as those of *echeria*. It is probable that this wide difference has been a powerful aid in rendering possible the extraordinarily close resemblance. Already both species of this pair have undergone subspecific changes in different parts of their geographical range, the southern forms being replaced respectively by *echeria jacksoni* and *albimaculata hanningtoni* in the equatorial parts of the eastern side of Africa. In the Oriental Region the even more dominant Euplœine group originated far more complex communities, probably in consequence of the development of further modifications of the male brands of one or both members of an ancestral pair, until synaposematic associations containing 3, 4 or more species arose, widened their range and spread into islands. Thus each of the component species became at first different sub-species and finally distinct species in various parts of the total area of distribution. The synaposematic Heliconine pairs, on the other hand, may in large part have reached their present condition by continuing the history begun by the two African species of *Amauris*. I say "in large part" because when Mr. Kaye very kindly arranged the Oxford *Heliconinæ* a few weeks ago we saw evidence for the *recent* abandonment of relatively ancestral patterns by certain species and the adoption of others which brought them into synaposematic relation with some more abundant Heliconine in the same locality. In giving this brief account of the hypothesis I am quite aware that the subject requires much fuller study. At the same time, I think it better not to wait for the more detailed examination which I hope to make, but to put the suggestion on record, in the hope that others may be led to further observation and reflection on the subject.

Types of Proctotrupidæ.—Mr. A. J. Chitty exhibited all the British species of the genus *Gonatopus*, except *marshalli*, Kieff., including the types of the three species described by Westwood, but entirely overlooked by subsequent authors, which had been lent him by Professor Poulton. The genus *Gonatopus*—lately dealt with by Professor Kieffer—though parasitic on Homoptera, resembles in appearance various ants.

Cordylobia anthropophaga, a Parasitic African Fly.—Mr. E. E. Austen, F.Z.S., exhibited specimens of and made remarks on larvæ, pupæ, and imagines of *Cordylobia anthropophaga*, Grünberg, an African Muscid Fly (known as the "Tumbu" or "Tumba Fly" in Sierra Leone), the larva of which is a subcutaneous parasite in man and other animals.

Cases in which the larvæ of various species of Muscidæ have been found parasitic in human beings are numerous in medical literature, so much so that the term *myiasis* (Greek, μυῖα, a fly) is employed to denote the maladies and injuries caused in this way. In most instances, however, as in that of Sarcophaginæ, which often deposit living larvæ on open sores or wounds, the parasitism is merely fortuitous, since the parent fly is attracted to the spot by the odours given off. But just as the Œstridæ (Bot- and Warble-Flies) are in the larval stage *normally parasitic* in mammals (chiefly ungulates and rodents), and develop in no other way, so does *Cordylobia anthropophaga*, Grünberg, appear to be a "pædo-parasite" of man, monkeys, dogs, and probably other mammals. The species belongs to the "Calliphorinæ" of Brauer, *i.e.* the section of the true Muscinæ, the species of which are allied to the genus *Calliphora* (which includes the common Blow-Fly, *C. erythrocephala*, Mg.), and are characterised by the presence of a row of bristles upon the hypopleura.

Cordylobia anthropophaga is very widely distributed in Africa, its range extending from Senegal to Natal, and coinciding with that of *Auchmeromyia luteola*, Fabr., the "Floor-Maggot Fly," to which in the perfect stage it presents a remarkable resemblance in coloration and general appearance. This similarity has already been productive of confusion, although the life-histories of the two species are widely different, since the maggot of *A. luteola*, which by day lies buried in the cracks in the earthen floors of native huts, has the extraordinary habit of coming out by night to fasten upon and suck the blood of the sleeping inmates.

The earliest published account of the life-history of *Cordylobia anthropophaga* is that by two surgeons in the French navy, MM. Coquerel and Mondière, who in 1862 described * cases in which soldiers had been attacked by the larvæ in Senegal. In one instance a man had two larvæ in his fore-arm, while another individual had eight in the back of his shoulder. The French authors gave a description of the maggot, but failed to breed out the fly, which they were inclined to regard as in all probability belonging to the Œstridæ, and to a new genus allied to *Hypoderma*, in which are included the well-known "Warble-Flies" of cattle.

In 1872 another French naval surgeon, M. Bérenger-Féraud, in a note presented to the French *Académie des Sciences* by Baron Larrey,† made further reference to the larva of this fly in Senegal, where, from the name of the district in which it was most common, it was said to be known as the "Ver de Cayor," or "Cayor Worm." In this paper it is stated that seventy-eight of these larvæ had been removed from all parts of the body of a spaniel, and the author mentions that he had himself counted *more than three hundred* larvæ in a puppy of the same breed; it is scarcely surprising to learn that the

* Coquerel and Mondière, "Note sur des Larves de Diptères Développées dans des Tumeurs d'Apparence Furonculeuse au Sénégal." Ann. Soc. Ent. France, 4ième série, T. II (1862), pp. 95–103, Pl. 3, figs. 1*a*–1*h*.

† Bérenger-Féraud, "Étude sur les larves de mouches qui se développent dans la peau de l'homme, au Sénégal." Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences, T. LXXXV (1872), pp. 1133–1134.

puppy died. M. Bérenger-Féraud, who succeeded in breeding out specimens of the perfect insect, states that they were "very active, and much resembled house-flies." To this communication a note by M. Émile Blanchard, to whom the paper had previously been submitted, is added. From the details supplied to him, M. Blanchard thought that the "Cayor Worm Fly" belonged to the genus *Ochromyia*, Macq., and to a new species, for which he suggested the name *Ochromyia anthropophaga*. Since, however, no description of the fly whatever was given, *Ochromyia anthropophaga*, Émile Blanchard, is a mere *nomen nudum*, and consequently invalid.

Under the name of the "Tumba" or "Tumbu" Fly, the insect, or rather its larva, is well known in Freetown, Sierra Leone, where residents often suffer from the painful boil produced by the maggot. Dogs and pet monkeys are frequently afflicted in the same way, and during a visit paid by the speaker to Sierra Leone in 1899 he fortunately succeeded in obtaining eleven larvæ and pupæ from a small Mangabey monkey (*Cercopithecus* sp.). From the pupæ that were allowed to mature there emerged five flies, which proved of much interest to local medical men, since complete ignorance as to what the "Tumba Fly" really was had previously prevailed in Freetown. Some people were even inclined to consider it to be a "Mangrove Fly" (*i. e.* Horse-Fly,—Family *Tabanidæ*), a belief that, as was subsequently found, was also entertained at Calabar, in Southern Nigeria.

On Sept. 30th, 1891, Mr. L. Péringuey, F.E.S., of the South African Museum, Cape Town, exhibited at a meeting of the South African Philosophical Society a fly, "bred from larvæ, nine in number, extracted from the arm of a child in Natal." In a note read at the same time, Mr. Péringuey said with reference to the species,—which, from the extensive series of specimens from Natal and elsewhere in the British Museum (Natural History), there can be no doubt was identical with the "Tumba Fly" of Sierra Leone and the "Cayor Worm Fly" of Senegal—that it was "perhaps allied to *Bengalia depressa* (Walk.)." * In some further notes on

* Cf. Péringuey, "Note on a Fly Which Preys on Human Beings." Transactions of the South African Philosophical Society, Vol. VIII, Part I (1893), p. 23.

the same species, published in the Minutes of Proceedings of the South African Philosophical Society at the meeting held on Sept. 30th, 1896,* Mr. Péringuey refers to his former hypothesis, which he describes as a suggestion that the fly "would, perhaps, prove to belong to the genus *Bengalia*." He adds :—"I was quite right in my surmise, the genus *Bengalia* and *Ochromyia* being partly synonymous." From this it is evident that Péringuey was thinking of the undescribed species for which the name *Ochromyia anthropophaga* had been suggested by Émile Blanchard; and indeed on the following page (p. xxiv) Mr. Péringuey states that "the species bred in Natal might prove to be identical" with the "Cayor Worm." Mr. Péringuey's remarks, although containing nothing in the shape of a statement that the parasitic fly of Natal is actually *Bengalia depressa*, Walk., appear to have been quite sufficiently definite for certain writers in South Africa as well as in this country, with the result that the species with which we are concerned is now widely known as "The Natal Maggot Fly (*Bengalia depressa*, Walker)."† *The true* Bengalia depressa, *Walk. (the type of which is in the British Museum), is, however, as shown by the specimens exhibited, albeit an allied, nevertheless a very different insect. Its life-history is as yet entirely unknown, and there is not a particle of evidence to prove that its larva is a subcutaneous parasite.*

As though to make the prevailing confusion still worse confounded, *Auchmeromyia luteola*, Fabr., the African "Floor-

* Cf. Péringuey, Transactions of the South African Philosophical Society, Vol. IX, Part II (1898), pp. xxii–xxiv (Minutes of Proceedings).

† Cf. Dr. R. M. Townsend, "Note on a Parasitic Fly—*Bengalia depressa*—which deposits its eggs or larvæ on the skin or covering of man and dogs." Proceedings of the Rhodesia Scientific Association, Vol. IV, Part I (July 20th, 1903), pp. 7–9; and *ibid.*, Vol. IV (July 1905), pp. 10–13. Cf. also F. V. Theobald, "First Report on Economic Zoology" (London: British Museum (Natural History), 1903), p. 56—"The Maggot Fly of Natal (*Auchmeroyia* [sic] (*Bengalia*) *depressa*, Walker);" F. V. Theobald, "Second Report on Economic Zoology" (London: British Museum (Natural History), 1904), p. 112—"The Natal Maggot Fly (*Bengalia depressa*);" F. V. Theobald, in "Second Report of the Wellcome Research Laboratories at the Gordon Memorial College, Khartoum" (Department of Education, Sudan Government, Khartoum, 1906), p. 83—"The Maggot Fly (*Bengalia depressa*, Walker);" Claude Fuller, F.E.S., Government Entomologist, Natal,—"Natal Department of Agriculture. Fourth Report of the Government Entomologist, 1903–4" (Pietermaritzburg: 1905), p. 15—"The Natal Maggot Fly, *Bengalia depressa*."

Maggot Fly," has, as already stated, recently been mistaken for the species with the subcutaneous larva.* The two species, however, may be distinguished by the more compact and thick-set shape of the fly with the subcutaneous larva, and by the fact that in the male of this insect the front is so narrow that the eyes almost meet together above, while in *A. luteola* the eyes are wide apart in both sexes.

For the species with the subcutaneous larva the genus *Cordylobia* (*i. e.* living in a boil) was founded in 1903 by Grünberg,† who also recharacterised and figured the species ‡ under the name suggested thirty-one years previously by Émile Blanchard. The correct designation of this highly-important and much-misunderstood African Muscid is therefore *Cordylobia anthropophaga*, Grünberg.

Papers, etc.

Dr. F. A. Dixey, M.A., M.D., and Dr. G. B. Longstaff, M.D., contributed a report of their joint entomological observations made in South Africa during the visit of the British Association in 1905, and gave a brief account of some of the points dealt with.

Dr. Dixey said that his own part in the paper was small, though Dr. Longstaff had kindly wished to associate him in the authorship. The narrative was the work of Dr. Longstaff, aided by a few suggestions from himself, and that gentleman had also undertaken most of the labour connected with the determination of species, especially in Orders other than Lepidoptera. Dr. Longstaff's contribution to the tale of specimens brought home was also far larger than his own. He had himself devoted more attention to bionomic points than to the actual work of collecting, and many of the results of the observations of himself and his colleague had been already communicated to the Society.

After shortly sketching the route of the expedition, which included visits to Cape Town, Port Elizabeth, East London,

* Cf. Fuller, *op. cit.*, p. 16, and Plate III, fig. 3, which represents a female of *Auchmeromyia lutcola*, Fabr.

† Sitzungs-Bericht der Gesellschaft naturforschender Freunde zu Berlin vom 10. November 1903 (No. 9, 1903), p. 410.

‡ *Ibid.*, p. 412, Tafel II, figs. 8–10.

Durban, Ladysmith, Johannesburg, Pretoria, Bloemfontein, Kimberley, Mafeking, Bulawayo, the Matoppos, and the Victoria Falls, he remarked that among the things that chiefly impressed him were the abundance of insect life at East London and Durban, and the extremely interesting, though in their experience somewhat scanty, fauna of the Zambesi and the Great Waterfall.

A point that seemed to him worthy of notice was the fact that although Dr. Longstaff and himself were close travelling companions, and on many days were never more than half-a-mile from each other, the captures effected by each showed remarkable differences, there being several instances of quite conspicuous forms taken by one which were never seen by the other. This was no doubt partly due to differences in their objects and methods of collecting, but it applied also to species that both collectors were desirous of taking.

Dr. G. B. LONGSTAFF stated that out of eight weeks in South Africa, two had been spent in railway trains, nevertheless they had taken some 2,500 specimens, including upwards of 50 species of various Orders not to be found in the National Collection; of these at least 15 had already been recognised as new to science. In exhibiting specimens of the new species, together with other South African insects remarkable in one way or another, Dr. LONGSTAFF gave some account of interesting points in their bionomics. For example, at Simon's Bay, a fly, *Ploas* sp., during life by its habits and mode of flight closely mimicked the bee *Halictus albifasciatus*, Smith, although the insect looked very different in the cabinet. The large Acridian, *Phymateus leprosus*, Serv., unlike most locusts, was extremely sluggish in its movements, but was defended in part by its hard integuments, but probably still better by emitting copiously when touched an ill-smelling acrid fluid. A new *Flata*, taken at Johannesburg, though found sitting in rows upon the stems of plants, could in no sense be said to resemble flowers, as was the case with some of its congeners.

Wednesday, October 2nd, 1907.

Mr. C. O. Waterhouse, President, in the Chair.

Election of Fellows.

Mr. James Allan Dyson Perrins, of Davenham, Malvern, and Mr. Frank Milburn Howlett of the Agricultural Department, Pusa, Bengal, India, were elected Fellows of the Society.

Exhibitions.

Sitaris muralis at Oxford.—Commander J. J. Walker showed living specimens of the Heteromerous beetle *Sitaris muralis,* rediscovered at Oxford in 1903 by Mr. A. H. Hamm of the Oxford University Museum, and found rather freely during September 1906 and 1907, on old stone walls in the vicinity of Oxford inhabited by the Mason Bee, *Podalirius* (*Anthophora*) *pilipes,* on which it is parasitic in its early stages.

Melanism in Yorkshire.—Mr. G. T. Porritt exhibited black specimens of both sexes of *Fidonia atomaria* from the Harden Moss Moors, Huddersfield, illustrating the melanic tendency of Lepidoptera in the district.

Rare Coleoptera, etc., from Kent and Scotland.—Mr. H. St. J. Donisthorpe exhibited (a) *Apion semivittatum* taken on *Mercurialis annua* in plenty at Deal in August and September 1907; (b) *Magdalis duplicata* from Nethy Bridge in July 1907; (c) *Formica sanguinea* from Aviemore and Nethy Bridge in July 1907; the first record for Scotland, and (d) *Piezostethus formicetorum,* taken with *Formica rufa* at Rannoch, in July, a species which has not been found in Scotland since Dr. Buchanan White first captured it at Braemar in 1874.

Butterflies from Hungary.—Mr. A. H. Jones brought for exhibition a case of butterflies taken this year from

Herculesbad, South Hungary, including specimens of *Erebia melas* from the Domogled, which bore a remarkable resemblance to *Erebia alecto* var. *nicholli*, Oberth., from Campiglio, and *Erebia lefebvrei*, Oberth., also shown for comparison by Mr. H. Rowland-Brown. Mr. Jones also exhibited examples of *Chrysophanus dispar*, var. *rutilus*, and *C. alciphron* from the neighbourhood of Buda-Pesth; both species of great size and brilliant colouring.

Forms of Lycæna bellargus.—Mr. M. Jacoby showed several fine forms of the ab. *ceronus* of *Lycæna bellargus*, taken this autumn at Folkestone, including one example of the var. *cinnides*, Stgr.

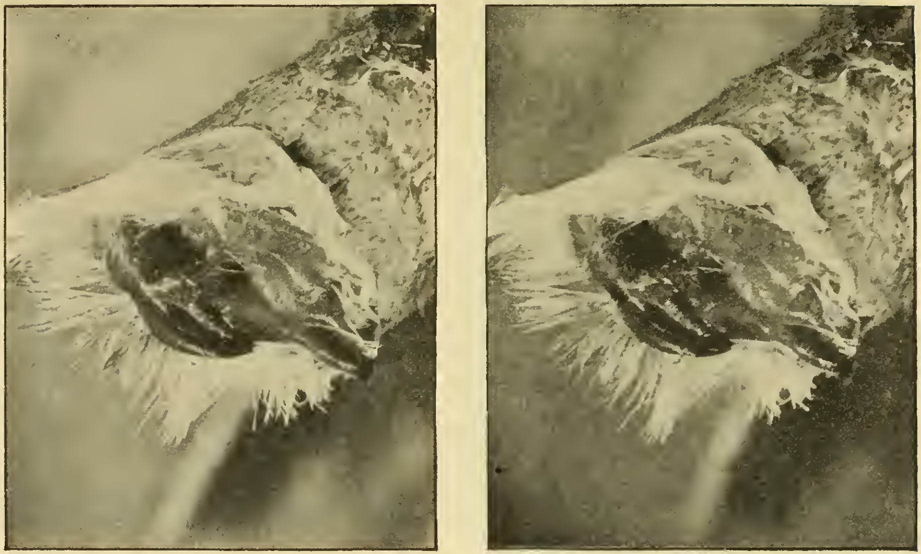
Cryptophagus subdepressus in Scotland.—Mr. Norman Joy exhibited a specimen of the rare beetle *Cryptophagus subdepressus*, Gyll., taken near Garva, Ross, on August 4th last.

Insects and their Prey.—Mr. W. J. Lucas showed on behalf of Mr. Nicholson and Mr. Summers two specimens of *Deilephila euphorbiæ* bred by them from larvæ found in Kew Gardens. He also exhibited several examples of predaceous insects and their prey *in situ*.

Oviposition of Nonagria cannæ.—Mr. H. M. Edelsten exhibited specimens of *Sesia andrenæformis*, bred from pupæ taken in Bedfordshire and Kent, and ova of *Nonagria cannæ*, *in situ*. The ♀ is provided with two pairs of anal hooks, with which it raises the cuticle of the *Typha* leaf. The egg is then thrust under the cuticle, the hooks released and the cuticle descends over the egg, and all that is visible is a slight swelling where the egg remains. The egg keeps its rounded shape, and is not flattened by the pressure of the cuticle.

The egg-laying of *N. cannæ*, as actually seen, and as deduced, from the structures, and the result in the position of the eggs, takes place by the moth resting across the leaf, taking a fulcrum on its surface by the ventral (8th abdominal segment) hooks, but not piercing the surface with them, and with the sharp knives of the dorsal processes (really ventral apophysis of 9th segment) cutting through the cuticle, and forcing the knives in, till their points must be almost close beneath the ventral hooks. The two knives are then separated and withdrawn as an egg is placed in the cavity thus formed. The

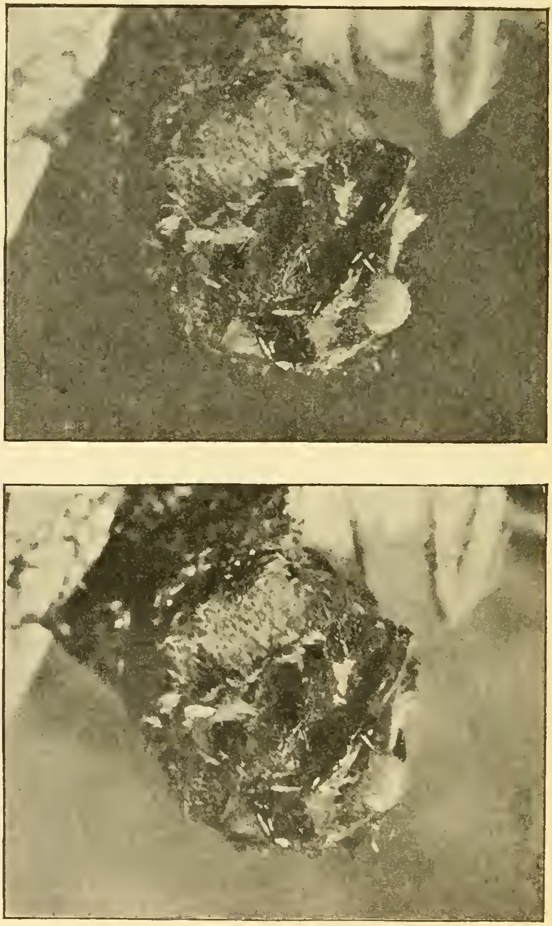
OVIPOSITION OF NONAGRIA CANNÆ (I).



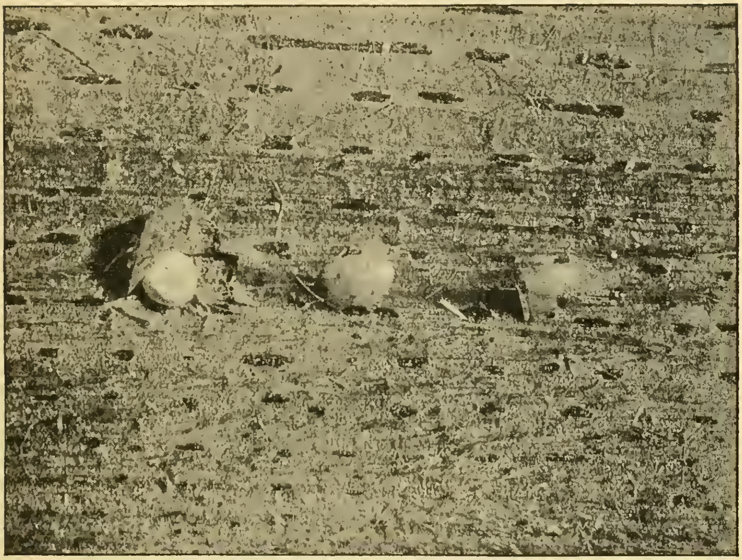
Stereoscopic view of ovipositor of *Nonagria cannæ*, from a cabinet specimen, with the hair tufts removed on the near side. The armature is so large and strong, that it is not withdrawn, but remains visible as shown, when the insect is "set" (× 10).

Stereoscopic view of another specimen, in which the parts happen to be almost in the position that must obtain just as an egg is being laid, the insect having died with an egg being extruded from the ovipositor, *i. e.* from the fleshy tubular opening between the knives of the 9th abdominal segment (× 10).

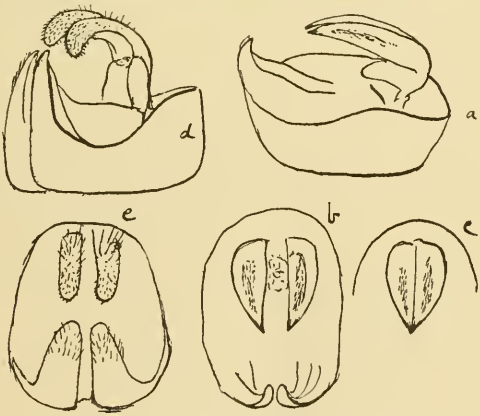
OVIPOSITION OF NONAGRIA CANNÆ (II).



OVIPOSITION OF NONAGRIA CANNÆ (III, IV).



Portion of leaf of *Typha latifolia*, in which three eggs of *Nonagria cannæ* had been laid. Two are seen with the egg, undisturbed beneath the cuticle, where it was laid by the moth ; the third egg is exposed by tearing the cuticle (× 10).



Diagrams (× 6, from Camera sketches) of ovipositors of *N. cannæ* and *N. sparganii*. *a*. *N. cannæ*, showing the opposed hooks, lateral view. *b*. End view, dorsal (9th abdominal segment) knives apart, as they usually are in dead specimens, and when an egg is being extruded. *c*. The dorsal knives in apposition, forming one sharp point, as used in piercing the cuticle of the leaf.

d. Lateral view of *N. sparganii*. *e*. End view. It is proposed to describe these organs in the *Nonagrias* generally in a future communication. *Sparganii* is presented here on account of its close resemblance in general development to that of *N. cannæ*. The modifications suit the one (*cannæ*) for piercing the cuticle and placing the egg in the plant tissue, the other (*sparganii*) for rolling over a leaf margin and placing the egg beneath it.

incision in the plant cuticle is longitudinal to the leaf and takes place rather by separating the plant cells than by cutting any through, with the result that it closes up again, and makes it impossible on close examination to be certain that one sees any trace of the opening by which the egg was inserted.

The photographs are by Mr. A. E. Tonge. The stereoscopic figures enable the structures to be seen in high relief.

Variation in Pieris napi, var. bryoniæ.—Mr. A. Harrison and Mr. H. Main exhibited four broods from females of *Pieris napi*, var. *bryoniæ*, captured on the Kleine Scheidegg Pass, Switzerland, in July 1906.

Brood A.	20 males. 16 females.
Brood B.	15 males. 24 females.
Brood C.	9 males. 11 females.
Brood D.	48 males. 59 females.

The larvæ pupated at the end of July and beginning of August 1906, and the insects emerged between May 2nd and June 14th, 1907.

There was a considerable amount of variation in the females of all the broods, but especially was this noticeable in Brood B, where some had the ground colour of a decided yellow and the black markings well defined, whilst others were uniformly grey with the markings almost absent. This grey form occurred also in Brood C, but not in Broods A or D. The males showed only slight variation, and like the females were larger than the English Spring emergence.

Lygæus equestris, Linn. — Prof. T. Hudson Beare exhibited a specimen of this rare bug, which Mrs. Hudson Beare found on a flowering umbel on the cliffs at St. Margaret's Bay on August 29th last. There are only four previous records of its capture in this country: Bath, 1837; Devizes, 1864; Dover, September 7th, 1886; Sheppey, September 22nd, 1906. Mr. Saunders is of opinion that it is a doubtful native, and is most probably only an occasional visitant.

Rare Coleoptera at St. Margaret's Bay.—Professor T. Hudson Beare also showed specimens of *Hypera tigrina*, Boh., taken in some numbers on the wild carrot at the foot of the cliffs at St. Margaret's Bay, between August 25th and September 5th last; he was unable to find a single specimen on the numerous wild carrot plants growing on the top of the cliff. This is a very local insect, and there are but few records of its occurrence; it seems to be confined to the extreme S.E. corner of England.

He also showed specimens of *Apion semivittatum*, Gyll., taken during the same period at St. Margaret's Bay off plants of *Mercurialis annua*. This species was found in abundance more than sixty years ago by Mr. Walton near the Tivoli Gardens, Margate; no further specimens were taken in this country until 1905, when Messrs. Chitty and Tomlin swept up one specimen on the Deal sandhills, and this year, in June, Mr. Bryant also swept a specimen in the same locality. *Mercurialis annua* is a garden weed which grows freely in many localities in the south-east of England; it seems to be very fond of old potato patches; the plants in such a habitat did not, as a rule, produce the beetle, which was found more freely on plants growing in uncultivated spots, hedge-sides, etc. Mr. Donisthorpe, who, during the same period, took the insect freely off its food plant, at Deal, had the same experience. He was able to confirm the statement that the larva is an internal feeder, for, on cutting open a stem of a vigorous plant showing by knots the presence of the larvæ, he discovered a pupa which was imbedded in a kind of cell; this pupa eventually hatched out.

Transition between Mylothris chloris, Fabr., and M. agathina, Cram.—Dr. F. A. Dixey exhibited typical specimens of the African Pierines *Mylothris chloris*, Fabr., and *M. agathina*, Cram.; together with a long series of forms, transitional between the two, from the neighbourhood of the Victoria Nyanza.

He remarked that he had previously called attention to the fact that the West-African *M. chloris* and the East- and South-African *M. agathina*, which had always been looked upon as distinct species, intergraded with one another in the region of

Uganda (Proc. Ent. Soc. Lond., 1904, p. xv). The present exhibit showed an uninterrupted transition, in the case of the males, from one form to the other. The females passed by almost imperceptible gradations from the brownish-orange *M. agathina*, with its marginal row of well-defined black spots, up to a form with whitish fore-wings and very pale ochreous hind-wings broadly margined in black, between which latter form and the ordinary female of *M. chloris* there was only a slight interval. It was true that his present material did not enable him to bridge over the gap; but in view of the near approach to the typical *M. chloris* exhibited by these intermediate females, and of the complete transition which he had shown to exist in the case of the males, he thought it could hardly be doubted that further investigation would supply the very few steps still lacking. A transitional female from Wadelai, of the kind he had described, had been named *clarissa* by Butler.

The greater number of the 31 specimens now shown were collected by Mr. Wiggins on the north-east and north-west shore of the Victoria Nyanza; two of his males were from Toro in Western Uganda, and one interesting female specimen, showing an early stage of departure from *M. agathina* in the direction of *M. chloris*, was captured at Mombasa. The fact that the forms referred to occurred together was established by a remarkable series of six specimens all taken on the same day by Mrs. Leaky near Mengo, on the north-west shore of Victoria Lake. This series consisted of a typical male and female *M. chloris*, and a nearly typical male *M. agathina*; together with a transitional male and two transitional females, the latter closely resembling the type of Butler's *M. clarissa*.

Mr. Neave had shown, from Uganda specimens also collected by Mr. Wiggins, that a similar transition occurred in that region between the western *Amauris niavius*, Linn., and the eastern and southern *A. dominicanus*, Trim. (Proc. Ent. Soc. Lond., 1903, p. xciv; Trans. Ent. Soc. Lond., 1906, p. 211).

Bi-centenary of Linnæus.

After the exhibitions, the President said that Mr. Morice, who had gone as a delegate from the Society to the Bicentenary

Commemorations of Linnæus's birthday at Upsala and Stockholm, was now present, and would give an account of the proceedings there.

The Rev. F. D. Morice replied, that he was very pleased to have an opportunity of informing the Society of the very kind reception he had met with as its representative. He then gave a description of the ceremonies and festivities he had attended in that capacity. "These, at Upsala, occupied the whole of Thursday and Friday (May 23, 24), visitors being entertained as guests of the University from the Wednesday to the Friday night inclusive: at Stockholm, the actual celebrations were all comprised within the Saturday (May 25), but the Prince-Regent honoured the visitors with an invitation to 'Tea and Music' at the Palace on the afternoon of the 26th ; and on that day, also, a party went by special train to Hammarby, the property on which Linné spent the last summers of his life, where he died, and where sundry relics of himself and his family are still preserved in memory of him.

"At Upsala the great ceremony of the Thursday was held in a sort of theatre in the buildings of the University. Here, after the performance by a chorus and orchestra of cantatas composed for the occasion, the Rector delivered a speech on the work of Linné, and congratulatory Addresses were handed in by the delegates, who came up in groups (nation by nation), one member of each group speaking a few words on behalf of the rest. The spokesman of our own countrymen was Sir Archibald Geikie. On the conclusion of the ceremony, the guests were conducted to a smaller hall, where they had the honour of being presented individually to the Prince-Regent and other members of the Royal Family, whom they had previously seen at the public ceremony.

"Two great dinners, to one or other of which all the guests of the University were invited, were given on that evening, one by the Rector, the other by the Archbishop of Upsala.

"Next day the company reassembled at the University, and went in procession to the cathedral, where Doctors (Honorary and Ordinary) were created in the four Faculties of Theology, Law, Medicine, and Philosophy. This ceremony, taking place as it did in the beautiful cathedral, in the presence of an assembly which included all the notables of Sweden, as well as guests from almost every European country, and even from America, and accompanied throughout by brilliant orchestral music, was not only very interesting, but extremely grand in its general effect, though it was lightened by what might almost be called a touch of the comic in certain details. Thus, as each Doctor was invested with the special hat denoting his faculty, or—in the case of a Doctor of Philosophy—with a laurel-wreath, he was saluted with the distant roar of an unseen cannon, some hundred or more of these explosions being heard before the ceremony was over. Again the music of the Marches, which were being played all the time—a different one commencing as the Doctors of each separate faculty came up for their 'promotion'—seemed to have been selected with a somewhat humorous allusion to the recipients of the honour. Thus the Theologians advanced to the strains of Mendelssohn's 'War March of the Priests,' the lawyers to those of 'See the Conquering Hero comes!' A *Dead March* (*!*) was considered appropriate to the Doctors of Medicine; while the Wedding March from 'A Midsummer Night's Dream' was performed in honour of the Philosophers.

"On the same evening all the guests and the new Doctors met at a great banquet presided over by the Prince-Regent, at which several other members of the Royal Family, the chief officials (past and present) of the University, representatives of the Swedish Government, and other eminent persons were also present.

"Besides these great functions, a number of minor festivities occurred on both days; in several of which a main feature, and a very agreeable one, was the beautiful singing of the Upsala students. The hearty yet decorous manner in which these lads took their part in the celebrations, and helped to make them a success, was quite a surprise to many of the visitors from non-Teutonic countries, and must have produced a most favourable impression as to the Swedish student character upon every one who witnessed it.

"The ceremony of Saturday at the Stockholm Academy of Sciences was conducted almost exactly as had been the opening ceremony of the Thursday at Upsala: there was music, a speech from the President, and a presentation by the delegates of congratulatory addresses. The English delegates, however, had an agreeable surprise in the middle of the President's speech—when, suddenly changing his language from Swedish to excellent English, he announced that the special medal struck by the Academy for presentation to 'the most worthy living successor of Linnæus' had been awarded to our countryman Sir Joseph Dalton Hooker, to whom the British Minister at Stockholm had undertaken to forward it. As at Upsala, the Stockholm Academy celebration was concluded by a banquet presided over by the Prince-Regent. It was held in a celebrated restaurant known as 'Hasselback,' near the park of 'Skansen'; and from it the company adjourned to the park itself, where a fête was organized by the students with national songs, informal speeches, etc., etc., making a cheerful close to a somewhat fatiguing but most interesting round of festivities.

"In connection with these celebrations, several memorial editions of works by Linné, a descriptive catalogue (with reproductions) of portraits and statues representing the great naturalist, and other similar literature, were published by the Upsala University and the Stockholm Academy. Copies of all these works were kindly given to every delegate; and even, if he so desired, were forwarded free of cost to his home address. Everything, in short, was done that could be done to make the 'Linné-Fest' agreeable at the time and a pleasant memory for the future to all who attended it."

Papers.

Col. Charles Swinhoe, M.A., F.L.S., read a paper on "The species of *Hesperiidæ* from the Indo-Malayan and African Regions, described by Herr Plotz, with some new Species."

Lieut.-Col. Neville Manders, R.A.M.C., read a paper on "The Butterflies of Mauritius and Bourbon."

Dr. T. A. Chapman, M.D., F.Z.S., read a paper on "The Hibernation of *Marasmarcha*," and exhibited specimens to illustrate his remarks.

Wednesday, October 16th, 1907.

Mr. C. O. WATERHOUSE, President, in the Chair.

Election of a Fellow

Mr. P. H. JACKSON, of 112, Balham Park Road, London, S.E., was elected a Fellow of the Society.

Exhibitions.

BRED FORMS OF PIERIS NAPI var. BRYONIÆ.—Mr. A. H. JONES exhibited a series of *Pieris napi* var. *bryoniæ*, bred from ova found last year on *Biscutella lævigata* at Arosa in Switzerland, showing a wide range of variation, and a remarkable variety or aberration of *P. napi* (*napææ*) bearing a strong resemblance on the under-side to *P. rapæ*, from Peszer, near Buda-Pesth.

RARE ORTHOPTERA IN KENT.—Mr. W. J. LUCAS showed for Mr. M. BURR examples of *Apterygida albipennis*, discovered by him near Dover this year. About 1840 Mr. J. O. Westwood took the species at Ashford in Kent. Mr. J. Edwards captured a pair near Norwich in 1889, but it was not found again until 1904 when Mr. A. J. Chitty rediscovered it at Ashford in the same locality. He also exhibited a ♂ specimen of *D. verrucivorus*—an inhabitant of Scandinavia —taken in the same locality by Mr. Burr. It is about as large as *Locusta viridissima*, but looks quite different, the characters of the elytra and head preventing it even being placed in the same genus.

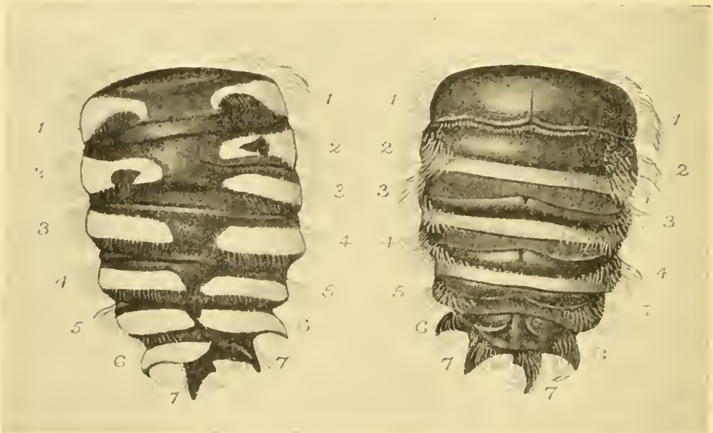
RARE NEUROPTERA.—Mr. W. J. LUCAS also showed for Mr. H. CAMPION.—*Platycleis roeselii*, Hagenb. ♀, taken September 13th, 1907, near Herne Bay. Mr. E. Saunders and Mr. H. Guermonpres have taken it at Herne Bay and Mr. Wallis Kew at Trusthorpe, Lincolnshire. There seem to be no other well authenticated British specimens. Also for Mr. E. W. CAMPION he exhibited an aberrant specimen of *S.*

sanguineum, ♂, from Epping Forest (September 15th, 1907), the form of the left hind-wing suggesting relationship with certain Orthoptera, which order is of course closely related to the Odonata. He further exhibited two *Calopteryx virgo* of his own from the New Forest showing failure in wing pigment.

Life Cycle of Callicore aurelia.—Mr. W. J. Kaye exhibited specimens of *Callicore aurelia*, Guen., together with a photograph of its larva, showing the remarkable branch-like horns rising out of the head. Mr. L. Guppy, who is rearing the species in Trinidad, and writing a detailed account of its life history, has found that the eggs hatched in four days: the larval period was eight days only, and the pupal period seven days. The whole life cycle was thus but nineteen days.

Teratological specimen of a Bee.—The Rev. F. D. Morice exhibited, side by side, a normal ♂ specimen of the bee *Anthidium manicatum*, L. (the "Hoop-shaver bee" of Gilbert White's "Natural History of Selborne"), and a monstrosity or malformation of the same insect, which was long ago given to him as a curiosity by his correspondent, M. Vachal of Argentat, Corrèze, France, but which he had only lately found opportunity to examine minutely. He also sent round a photograph of the two insects magnified, or rather of their abdomens, that being the part in which the malformation appears, and described the nature of it.

Normally in this species the ♂ abdomen viewed from above shows seven dorsal plates united only by a (concealed) "connecting membrane." The first five are nearly simple, but the sixth bears on each side at the base a remarkable hook-like process, and the seventh is armed at the apex with three large sub-triangular teeth, one on each side of the apex ando ne at its centre. In the present specimen, if we count the divisions between the dorsal plates down either side, we find that there are, as usual, on each side 5 simple dorsal half-plates, followed by a sixth with a basal lateral hook, and a seventh whose apex is armed externally with a tooth and internally with half a tooth. But when we look at the dorsum of the abdomen as a whole, we find that something has gone very strangely wrong with it. Dorsal plate 1 is normal; but the dorsal plate 2 is split on the right side only into 2 half-plates, narrow where the division commences, but dilating to their usual width at the side of the insect, so that left dorsal half-plate 2 and right dorsal half-plates 2 + 3 form together the second dorsal plate of the whole abdomen. The third and fourth dorsal plates, consisting respectively of left dorsal half-plate 3 + right 4, and left + right 5, show no visible peculiarity. But the fifth plate, which (counting down the right side) should be the *sixth*, is armed on that side with the hook which characterizes the sixth dorsal plate, while on the left side it is simple. The



next plate is most peculiar, having on the left side the basal hook of a sixth segment, and on the right the lateral apical tooth and half the central apical tooth of a seventh: and then follows (on the left side only) half of the ordinary tridentate apical plate with nothing at all to match it on the other side, the right half of the ordinary apex having appeared already in the preceding segment.

It seems very difficult to form any clear idea of a cause which could have produced the phenomenon before us. It can hardly have anything to do with gynandromorphism, for there is nothing suggestive of ♀ characters about the insect, and its genital armature (which is extracted and pinned on a card along with the specimen) appears to be that of a quite normal ♂. An injury to the creature in its larval state might have produced a false appearance of segmentation on the right side of the 2nd dorsal plate, so that what has been called half-dorsal plate 3 might be really only a part of the 2nd abdominal segment. But in that case the lateral hook which should characterize the 6th segment must be supposed to have been transferred to the 5th segment, the apical teeth of the 7th segment to have been developed on the 6th, and the 7th segment itself to have disappeared altogether on the right side, a state of things which seems quite inconceivable. The aspect of the specimen suggests rather that the whole right half of its dorsal surface after the 2nd segment has been somehow forced backwards towards its head, the right half of dorsal plate 3 having been separated from the left half and afterwards attached to and incorporated with the left half of the preceding segment, the right half of segment 4 similarly quitting its own corresponding left half and joining the left half of segment 3, and so on.

The exhibitor then invited expressions of opinion on the question whether this malformation had originated in the larval stage or in the embryo, and handed over the specimen to the President for presentation to the Teratological collection in the National Museum at South Kensington.

Dr. T. A. Chapman said this malformation had clearly no causation in any larval injury, but dated from an early period of embryonic life. It arose when the flanks of the embryo closed dorsally (venter of vertebrates) over the visceral cavity. At about the 4th abdominal segment, two segments on the right side had met one on the left, and thrown out the correct apposition of the remaining ones, the 7th right uniting dorsally with the 6th left and so on. Such an accident looked a very probable one to occur, yet it is certainly extremely rare, and he did not know whether others were on record. It was difficult to conceive any external interference occurring to produce it; and if this were not possible, it must arise by the margin of one segment failing at this early period to attain its full width. This no doubt explained the rarity of the monstrosity, as the period during which things have gone correctly at this stage was so enormous, that the heredity must have an almost impregnable position.*

ANT IN A PSEUDOBULB OF AN ORCHIS.—The PRESIDENT exhibited a living ant, a species of *Camponotus*, which had been found by Mr. Watson at Kew, in a pseudobulb of an orchis (probably a *Bulbophyllum*) from the Gold Coast. The bulb was much excavated, but it had no opening by which the ant could have entered. A second bulb was much less excavated, but was found to contain the larva of an ant.

WASP AND ITS PREY.—The PRESIDENT also exhibited a large wasp (a *Salius* allied to *dedjax*) with a spider, a *Mygale* rather larger than itself, but which it had captured and was carrying off. These were from German E. Africa.

ABERRANT TROPICAL SPECIES.—Lt.-Col. NEVILLE MANDERS exhibited a melanic variety of *Hestina nama*, captured near Darjeeling; and a monstrosity of *Papilio krishna*, in which the wings on the right side were much larger than those on the left. The specimen was taken by him at Senchal in Sikhim.

HYMENOPTEROUS PARASITE.—Mr. H. MAIN exhibited the larva of a Hymenopterous parasite of *Pygæra bucephala*, of great size comparatively to its host.

Conversazione.

The PRESIDENT announced that the Council had decided in favour of holding a Conversazione at some date next year to be fixed by a Committee of Fellows elected for the purpose of organization. He also invited Fellows to give in their names for the Guarantee Fund, and the SECRETARY gave some account of what it was hoped the Society would be able to do in the way of exhibits, etc.

* Dr. CHAPMAN sends the following note after more carefully examining the specimen at leisure: "If the explanation hazarded be correct, one would expect that, from the point where two right segments coalesce dorsally with one of the left side, the following segments would not be distinct segments, as is universal in insects, but would present a continuous spiral. It strongly supports, therefore, the explanation I advanced, when I find that this is so. Such a spiral would be very curious and very obvious in a Lepidopterous pupa. I do not know that such an one has ever been noticed. The enormous number of pupæ annually handled by Lepidopterists carelessly as regards such a point notwithstanding, gives some idea how rare this malformation must be."

Wednesday, November 6th, 1907.

Mr. E. Saunders, F.R.S., Vice-President, in the Chair.

Election of Fellows.

Mr. G. Arnold, University of Liverpool; Mr. H. Frederick D. Bartlett, of 113 Richmond Park Road, Bournemouth; Mr. John Claude Fortescue Fryer, B.A., of The Priory, Chatteris; Mr. C. W. Howard, of the Acting Government, Transvaal; Mr. Charles H. Mortimer, of Wigmore, Holmwood; Mr. R. F. H. Rosenberg, of 57 Haverstock Hill, London, N.W.; Mr. Harold Baker Sly, of Brackley Knoll Road, Sidcup, Kent; and Mr. Clement H. Pead, of Johannesburg and St. Leonards Road, Bexhill-on-Sea, were elected Fellows of the Society.

Obituary.

The decease of Mr. L. C. H. Young was announced.

Exhibitions.

Scottish Beetle in London.—Mr. A. H. Jones brought for exhibition a specimen of the Longicorn beetle *Acanthocinus ædilis*, L., a common Rannoch species, found in Grays Inn Road, London.

New Species of Pinacopteryx.—Dr. F. A. Dixey exhibited ♂ and ♀ specimens of a *Pinacopteryx*, at present undescribed, which had been discovered by Mr. S. A. Neave in North-East Rhodesia.

He remarked that the interesting genus *Pinacopteryx*, which was purely African in distribution, formed a very natural group amongst Pierine genera, somewhat isolated in affinity, but on the whole perhaps coming nearest to *Belenois*. Many members of the genus had been affected by mimicry, and one species, *P. rubrobasalis*, Lanz., was an excellent copy in both sexes of the familiar *Mylothris agathina*, Cram. This was also the case with the females of the new species, which Mr. Neave said he had often mistaken for *M. agathina* when on the wing. On the other hand, the males were quite different, showing no trace of resemblance to that species of *Mylothris*. When the speaker first looked through Mr. Neave's captures, he was inclined to conjecture that these females were the local representatives of *P. rubrobasalis*, ♀, which they closely resembled, and that their captor had failed to meet with the corresponding males. But he found that Mr. Neave had assigned them without hesitation to males of an aspect entirely different from that of *P. rubrobasalis* and *M. agathina*, and that in one instance at least this opinion had been confirmed by the capture of paired specimens. On further examination there appeared to be no doubt that the resemblance between the females of the two species was due rather to the copying of a common model than to mere affinity, and that Mr. Neave's species and *P. rubrobasalis* belonged in reality to distinct sections of the genus. Specimens of *Mylothris agathina*, the common model, were included in the exhibit; also males and females of *P. rubrobasalis* and other members of the genus, together with individuals of the new species which were actually paired at the time of capture.

Butterflies from the Aisne.—Mr. W. G. Sheldon showed a series of *Limenitis populi* and ab. *tremulæ* with intermediate forms taken this year at Laon, and a series of *Chrysophanus hippothoë* from the same region, the females of the latter displaying a wide range of variation for so restricted a locality as that in which they were captured.

Insects from Devon.—Mr. G. C. Champion exhibited a fully developed example of *Mesovelia furcata*, M. and R., from Slapton, S. Devon, and *Thamnotrizon cinereus* from Lynmouth, N. Devon.

Variations in Aplecta nebulosa.—Mr. A. Harrison and Mr. Hugh Main exhibited a case of *Aplecta nebulosa*, arranged to show the great range of variation of this species in Delamere Forest; with series from Epping Forest, North Cornwall, and the New Forest for comparison. The Cornish and New Forest insects were of the light grey colour which is the prevailing form in the West and South of England, with the exception of the neighbourhood of London, where a dark grey form is found, as shown in the series from Epping Forest. The Delamere Forest insects ranged from a rather light colour to a melanic form, with intermediates showing a complete gradation from one form to the other. The lighter insects were bred very sparingly from collected larvæ, from 10 to 11 per cent. of melanic forms agreeing more or less closely with the form *robsoni*, Collins, being obtained, the remainder, about 90 per cent., disclosing the dark grey form. In answer to a question by Mr. H. Rowland-Brown, the exhibitor said that the undergrowth in Delamere Forest was chiefly bracken, and the surface of the ground covered with the decayed remains of this plant. Beneath this is sand, which occurs over a large area of the Forest, and also gravel, gravel-pits being somewhat extensively worked. The larvæ of *A. nebulosa* seemed fairly well distributed wherever young birches, whitethorn, or bramble occurred.

A discussion followed relative to the appearance and increase of melanic forms in a restricted area like Delamere Forest within the last fifteen or twenty years, in which Dr. T. A. Chapman, Mr. G. A. K. Marshall, Mr. J. W. Tutt, Mr. A. W. Bacot, Mr. W. G. Sheldon, and other Fellows joined.

Rare Coleoptera from the Isle of Wight, etc.—Mr. R. S. Mitford exhibited two ♂ specimens of *Cryptocephalus bipunctatus*, taken by him at Niton in the Isle of Wight in July 1907, while sweeping the grass on the slopes of the Undercliff. He observed that the specimens were two forms of varieties which he understood were well known on the Continent, but that neither had ever been found in Britain before. No other specimen was met with, although the spot was well worked. The locality seemed to be a strange one for this beetle, as there were no hazel or birch trees in the neighbourhood.

Mr. Mitford also showed *Paracymus æneus*, Germ., which he had obtained from Mr. Harwood of Colchester, who had believed these specimens to be *P. nigroæneus*. The examples shown were captured on the North Essex coast in June 1898, and there could be no doubt that *P. æneus* must be regarded as a

British beetle, although Canon Fowler states in his "British Coleoptera" that we do not possess the true *P. æneus*.

He also exhibited a specimen of the very rare *Lathrobium rufipenne*, taken by him at Niton, I. W., in July 1906, a specimen of the rare *Ceuthorrhynchus viduatus*, taken by him at Brading, I. W., in July 1907, and a specimen of *Cis dentatus*, Mell., taken by him at Sandown, I. W., in July 1906, and observed that this species, although well known on the Continent, had never before been recorded in Britain.

Papers.

Mr. J. E. Collin communicated a paper "On a large series of *Nycteribiidæ* (parasitic Diptera) from Ceylon."

Dr. G. B. Longstaff, M.D., then read a paper "On some Butterflies taken in Jamaica," and a paper "On some Butterflies of Tobago," exhibiting a number of examples taken by himself in both localities to illustrate his remarks.

Wednesday, November 20th, 1907.

Mr. G. H. Verrall, Vice-President, in the Chair.

Nomination of Officers and Council for 1908.

The Secretary announced that the following Fellows were nominated to serve as Officers for 1908:—President, Mr. Charles Owen Waterhouse; Treasurer, Mr. Albert Hugh Jones; Secretaries, Mr. Henry Rowland-Brown, M.A., and Commander James J. Walker, M.A., R.N., F.L.S.; Librarian, Mr. George C. Champion; and as other members of the Council, Mr. Arthur John Chitty, M.A., Dr. Thomas Algernon Chapman, M.D., Mr. Albert Harrison, F.L.S., F.C.S., Mr. William James Kaye, Dr. George Blundell Longstaff, M.D., Mr. Hugh Main, B.Sc., Mr. Guy Anstruther Knox Marshall, Professor Raphael Meldola, F.R.S., F.C.S., Professor Louis Compton Miall, F.R.S., Professor Edward Bagnall Poulton, D.Sc., M.A., F.R.S., etc., Mr. Robert Shelford, M.A., F.L.S., C.M.Z.S., and Mr. G. H. Verrall.

Alteration of a Bye-law.

The Secretary read the following notice addressed to the President and Council of the Society.

"To the President and Council of the Entomological Society of London.—We, the undersigned, desire that the Bye-Laws of the Society be altered by substituting in Chapter XIII, Section 3, for £15 15*s*. the figures £21, and give notice under Bye-law XXI. accordingly."

Signed, GILBERT J. ARROW, R. MELDOLA, R. SHELFORD, T. H. CHAPMAN, A. H. JONES, GUY A. K. MARSHALL, G. B. LONGSTAFF, LOUIS B. PROUT.

Election of Fellows.

Mr. LEONARD WOODS NEWMAN of Bexley, Kent, and Dr. IVAR TRÄGÅRDH of Upsala University, Sweden, were elected Fellows of the Society.

Exhibitions.

RARE BEETLES FROM HANTS AND KENT.—Mr. H. St. J. DONISTHORPE showed for Mr. W. WEST of Greenwich examples of *Tropideres sepicola*, F., taken in the New Forest near Matley Bog, July 7th, 1904; *Oxylæmus variolosus*, Dufs., from Darenth Wood, March 2nd, 1903; and *Apion annulipes*, Wenck, from Darenth Wood, August 27th, 1905.

LIFE HISTORIES OF COLEOPHORIDS.—Mr. H. J. TURNER exhibited (1) The life history of *Coleophora onosmella*, including imagines from Box Hill, Reigate, Cuxton, etc., larval cases mounted on the leaves of the food plant *Echium vulgare*, showing the blotches formed by the mining larvæ, numerous cases fixed on stems and basal leaves for pupation, and photomicrographs of the ova *in situ* on the stem and leaf, and of the micropyle of the ovum, the former (× 20) and the latter (× 250). (2) The life history of *C. bicolorella*, including imagines from Chatham, Cuxton, etc., larval cases mounted to show the depredations of the larvæ on the leaves of nut, the pre-winter curved cases in which the larvæ hybernate, larval cases fixed on stems and twigs of nut for pupation, leaves showing where pieces had been cut out by the larvæ for periodic enlargements of the cases, and photomicrographs of the ova *in situ* on the under-side of the nut-leaf, and of three varieties of the micropyle of the ovum, the former (× 40), the latter (× 250). These photomicrographs were by Mr. F. N. Clark and admirably showed the surface of the ova and the structure of the micropylar area.

Mimetic Parallelism in Five Genera of African Pierines.—Dr. F. A. Dixey exhibited series of specimens belonging to five different genera of African *Pierinæ*. He remarked that the exhibit was arranged so as to show the parallelism existing between many species of these genera, a parallelism which it could hardly be doubted was in most, if not in all cases, of mimetic significance. The genera included in the exhibit were *Mylothris*, *Phrissura*, *Pinacopteryx*, *Belenois* and *Leuceronia*. The members of the same genus were arranged in vertical rows, while the species of different genera showing a similar appearance were set out side by side, horizontally. The various assemblages, each presenting a distinct pattern, with their constituent species, were as follows:—

I. White with dark marginal spots. *Mylothris agathina*, Cram., ♂; *Pinacopteryx rubrobasalis*, Lanz., ♂; *Belenois thysa*, Hopff. ♂; *Leuceronia argia*, Fabr., ♀.

II. Brownish-yellow with dark marginal spots. *M. agathina*, ♀; *Pinacopteryx vidua*, Butl., ♀; *B. thysa*, ♀ (dry season). Some specimens of *Pinacopteryx astarte*, Butl., ♀; of *Belenois theora*, Doubl., ♀; and also a form of *L. argia*, ♀, belong to this group, but were not shown.

III. White with dark apical patch and dark marginal spots. *Phrissura phaola*, Doubl., ♂; *Pinacopteryx dixeyi*, Neave, ♂; *Belenois theuszi*, Dewitz, ♂; *L. argia*, ♂.

IV. The same, with a slight brownish-yellow basal suffusion. *M. poppea*, Cram., ♂; *P. dixeyi*, ♀; *Belenois ianthe*, Doubl., ♀; *Leuceronia thalassina*, Boisd., ♀.

V. White; marginal dark spots tending to become streaks; an orange or pinkish basal flush. *M. poppea*, ♀; *Phrissura isokani*, Gr. Smith, ♀ (= *P. phœbe*, Butl.); *B. ianthe*, ♀; *Belenois sp.* (allied to *B. thysa*), ♀; *L. argia*, ♀.

VI. Fore-wings brownish-yellow with dark margins; hind-wings white or creamy with dark marginal spots. *Mylothris spica*, Mösch., ♀; *Phrissura sylvia*, Fabr., ♀; *L. thalassina*, ♀.

Specimens of *B. theuszi*, ♀; of *B. theora*, Doubl., ♀; and of *L. argia*, ♀ (form *semiflava*, Auriv.) also come into this group, but were not included in the exhibit.

VII. Bright yellow with dark marginal spots or (on fore-wings) an irregular marginal band; fore-wings with orange basal flush. *Mylothris rüppellii*, Koch, ♂ (yellow form); *L. argia*, ♀ (form *sulphurea*, Auriv.).

VIII. White with dark marginal spots; fore-wings with large basal orange-vermilion flush. *M. rüppellii*, ♂ (upper- and under-side); *L. argia*, ♀ (form *varia*, Trim.). *Phrissura nyasana*, Butl., ♂, is also a member of this group.

IX. White with dark marginal spots; a small patch of orange at base of fore-wings, and the same colour prolonged on costa of hind-wings. *M. spica*, ♂; *P. sylvia*, ♂; *P. dixeyi*, ♂; *B. theuszi*, ♂ (all under-sides).

X. White; fore-wing with dark margin broadened at apex, hind-wing with dark marginal spots. *M. spica*, ♂; *P. sylvia*, ♂; *L. argia*, ♀ (form *poppæa*, Donov.).

XI. Like IX and X, but orange of IX replaced by lemon-yellow. *Mylothris asphodelus*, Butl., ♂; *Phrissura perluceus*, Butl., ♂; *B. theuszi*, ♂ (under-side). All these specimens are from the Congo.

XII. Fore-wings whitish with a pale orange basal flush; hind-wings orange-yellow; both wings with a border of dark spots. *Mylothris clarissa*, Butl., ♀; *Pinacopteryx sp.* (allied to *P. orbona*, Hübn.), ♀; *B. thysa*, ♀ (intermediate form).

XIII. Like XII, but with the hind-wings a paler yellow, and the marginal spots tending to become streaks. *P. isokani*, ♀ (= *P. phœbe*); *Pinacopteryx sp.* (allied to *P. orbona*), ♀; *L. argia*, ♀.

XIV. Fore-wings white with brilliant orange-vermilion basal flush; hind-wings ochre-yellow; dark marginal spots. *M. agathina*, ♂; *P. isokani* (*phœbe*), ♀; *P. rubrobasalis*, ♀; *B. thysa*, ♂; *L. argia*, ♀ (all under-sides).

XV. Fore-wings white; hind-wings lemon or primrose-yellow; dark marginal spots more or less developed, and on fore-wing sometimes fused. *Mylothris trimenia*, Butl., ♂; *M. narcissus*, Butl., ♀; *M. jacksoni*, E. M. Sharpe, ♀; *Phrissura* *lasti*, Gr. Smith, ♂; *Pinacopteryx sp.* (allied to *P. vidua*, Butl.), ♀; *Belenois sp.* (allied to *B. zochalia*, Boisd.), ♀.

XVI. Like XV, but with hind-wings ochreous or brownish-yellow. *M. trimenia*, ♀; *P. lasti*, ♀; *P. pigea*, Boisd., ♀; *Belenois sp.* (allied to *B. zochalia*), ♀; *B. zochalia*, ♀; *L. thalassina*, ♀.

Dr. Dixey further remarked that though attention had already been drawn to several of these cases of resemblance by Mr. Trimen, Prof. Poulton, Mr. Neave and others, as well as by himself, they had not before been shown together in one view. In some instances the superficial resemblances between insects of very different genera belonging to this series had led to much confusion in the nomenclature, for an example of which he would refer to the facts given in Mr. Trimen's "South African Butterflies," Vol. iii, 1889, p. 35 and note. The five genera now shown, though all belonging to the *Pierinæ*, were not closely related; *Pinacopteryx* and *Belenois* probably stood nearest to one another in point of affinity, but were still abundantly distinct. *Mylothris* occupied an isolated position, while *Phrissura* was allied to the Eastern genera *Tachyris*, *Catophaga* and *Appias*. *Leuceronia* was widely removed from all the rest. Hence there was little or nothing to support the suggestion that these likenesses might be merely the consequence of affinity.

It was worthy of note that some form of the genus *Mylothris* was usually to be found at the centre, so to speak, of each of these different colour-assemblages. But this was not invariably the case, and it not infrequently happened that the species of other genera showed a closer resemblance to each other than either of them did to the *Mylothris*. This was perhaps especially the case as between the two genera *Belenois* and *Pinacopteryx*, but striking instances also occurred between *Phrissura phaola* ♂ and *Belenois theuszi* ♂, and between *Phrissura isokani* ♀ and the female of a *Belenois* allied to *B. thysa*. It was a further point of interest that the streaky character of the dark margin of the wings, well seen in *M. poppea*, ♀, appeared to have originated not in that genus, but in the genera *Phrissura* and *Belenois*. Its adoption by *Mylothris*, which was on all hands admitted to be a distasteful genus, seemed to favour the supposition of a Müllerian element in this series of resemblances, which interpretation was also suggested by the cases of "secondary mimicry" already referred to. The striking aposeme, peculiar to African butterflies, constituted by dark marginal spots on a pale ground, was a predominant feature of the whole series, and, though especially characteristic of *Mylothris*, appeared in some instances to exist independently of that genus. Another prevalent aposeme was the orange or scarlet basal flush well seen in *Mylothris rüppellii*. It was significant that both these warning marks tended to be better developed on the under-surface.

Dr. Dixey concluded by drawing attention to the fact that these colour-assemblages were by no means isolated clusters. On the contrary, they passed into one another in many directions, though this was not easily observed in an exhibit arranged like the present. As a matter of fact, the whole array of specimens shown might be regarded as forming a net-work, each individual being connected with all the rest by a larger or smaller number of gradations. It would be seen on tracing out these lines of connection that they ran to a very large extent independently of affinity. The phenomena were indeed in many respects comparable with the facts regarding mimicry in the Neotropical region, to which he had drawn attention in "Nature" for October 31, 1907, pp. 677–8.

Micromorphism in a Beetle.—Mr. Willoughby Gardner exhibited a remarkably small specimen of *Meloë proscarabæus* with an example of the normal size.

Forms of Araschnia Levana and var. Prorsa.—Mr. W. G. Sheldon showed a case containing many examples of *Araschnia levana* var. *prorsa* and intermediates, bred from larvæ found in the department of the Aisne, France, in June last. Out of 176 individuals that emerged from the pupa 109 were var. *prorsa*—65 ♂♂s and 44 ♀♀s, 4 approached nearly to ab. *porima*, 2 ♂♂s and 2 ♀♀s; 29 were intermediate between *prorsa* and *porima*—23 ♂♂s and 6 ♀♀s: all emerging in a room of average temperature at Croydon, July 20–27th. The forms *porima* and intermediates were attributable to the cold summer. The remainder of the specimens came from pupæ which as soon as formed were removed to a refrigerator and kept there for fifteen days, being afterwards subjected to the same treatment as the other lot of pupæ. These emerged August 8–15th and showed one var. *prorsa*, 16 between *porima* and *prorsa*—6 ♂♂s and 10 ♀♀s—2 ab. *porima*, both ♂♂s, 16 intermediates between *prorsa* and the type *levana*—4 ♂♂s and 12 ♀♀s, of which several approached very nearly to the typical brood—*levana*.

Dr. T. A. Chapman showed specimens of *Araschnia levana*, type, bred 1907, to give a fuller view of this form in assistance to Mr. Sheldon's report. He said the palest specimens were probably the result of leaving the pupæ at a temperature at or below 54° till the butterflies were nearly ready for emergence; but on the whole they are probably not far from normal *levana*, the darker being chiefly ♂♂, the paler ♀♀.

Mr. Sheldon also showed strings of the ova *in situ* on nettle, these being base to apex, and in position resembling those of *Polygonia c-album*.

Exotic Cockroach from Kew.—Mr. G. J. Arrow exhibited a specimen of a handsome exotic Cockroach (*Dorylæa rhombifolia*) found alive in the Natural History Museum. He remarked that he had seen this species there several years ago but had not captured it. The present specimen was found in a different part of the building by Mr. T. Sherrin, on Nov. 16th. It is an apterous species inhabiting China, India, Madagascar, S. Africa, etc. and has also been recorded from Tropical America.

Temperature Experiments on Tropical Butterflies.—Lieut.-Col. N. Manders exhibited a collection of some 200 specimens of tropical butterflies belonging to the genera *Melanitis*, *Mycalesis*, *Atella*, *Papilio* and *Catopsilia*, which had been subjected to abnormal degrees of temperature in the pupal stage. The object of the experiments was to ascertain the effect of climate on the colours of tropical butterflies. He said that with the exception of Mr. Marshall's experiments on certain S. African butterflies literally nothing had been done as far as he knew in the laboratory in relation to this question. He himself held the view tentatively, that certain cases believed to be examples of

Müllerian mimicry would be proved eventually to be cases of climatic resemblances, produced in insects of different genera or even families by climate acting on organisms similarly constituted, and so responding in a similar manner to the same stimulus.

While readily admitting that the specimens in the exhibit were too few for definite conclusions, they showed in *Melanitis* and *Mycalesis* there was good evidence for the belief that in two species—*leda* and *narcissus*—of these genera the seasonal phases are induced by cold and heat, and not by dryness and moisture.

In *Atella phalanta* there was reason for believing that the presence of the violet or purple on the under surface was due to deprivation of light during the rearing of the insect from the egg to the imago.

In *Catopsilia florella* any abnormal temperature produced an increased number of yellow females (*rhadia*), no typical white females, but an abundance of intermediates, which were absent so far as his experience went under normal conditions in Mauritius, though common enough in India and Africa. The males remained unchanged.

In *Papilio demodocus* there was an increase of red round the costal ocellus on the upper side of the hind-wing and a very distinct general ruddiness on the under surface of the hind-wing produced by cold.

Association of Allied Forms of South American Butterflies.—Dr. G. B. Longstaff exhibited a case containing 35 Ithomiine butterflies of 11 species, belonging to 6 genera, all taken in a little over an hour, on March 20th, 1907, at about 4.0 p.m. near Carácas, Venezuela, some 3600 feet above sea-level. They were disturbed in a shaded gorge and all taken on a piece of moist ground measuring perhaps 60 yards by 10 yards. They were all flying together like a cloud of gnats and many more might have been secured, but the number of distinct species was not recognized at the time. This habit of butterflies of this group thus congregating together was described by Bates.* It affords a striking exception to Darwin's principle that closely allied forms are

* Trans. Linn. Soc. 1862, pp. 539, 541.

not usually found together. When on the wing out of the sun the clear-winged species were difficult to see, only the white or yellow markings catching the eye, but in the sunshine the clear parts of the wings sometimes gave an iridescent gleam.

Convergent group of Heliconine Butterflies.—Mr. W. J. Kaye exhibited a convergent group of Heliconine butterflies, from the Potaro Road, Potaro River, British Guiana, composed of the following species: *Heliconius burneyi catharinæ*, *Heliconius xanthocles xanthocles*, *Heliconius aœde astydamia*, *Heliconius egeria egeria*. all of the second section or Opisorhyparine group. *Heliconius cybele tumatumari* of the first section or Opisogymni group, and *Eueides tales tales*. A short series of each was shown, and it was stated that except the first and last none of the species could be called common. The numbers of each secured in six years were as follows—*H. catharinæ* 31, *H. xanthocles* 6, *H. astydamia* 14, *H. egeria* 3, *H. tumatumari* 6, *Eu. tales* 50. It was significant that this group of butterflies also had a black hind-wing, a characteristic so marked in the Guiana region especially that portion known as British and Dutch territory. In the more southern area known as French Guiana the hind-wing in the representatives of these species was streaked with red. Only *H. egeria* as found on the Potaro River now shows any indication of being streaked in the hind-wing, the other four species of *Heliconius* and the *Eueides* only exhibiting a small red streak at the base, while some of the specimens present a uniform black surface. Hitherto there has not been detected any species of Danaine or Ithomiine butterfly that might serve as a model or mimic of these species, and if at any time the large *Melinæa mneme*—*Heliconius numata* group exerted any influence on these red and yellow and black species, it is unlikely that it does so now, because they have not the same flower-frequenting habit and are not found in company with them. The red colouring of the fore-wing also render these species far more distinctive on the wing than the species coloured like *H. numata*, and it is unlikely that any enemy would mistake the one for the other.

Papers.

In illustration of his paper "Mimicry in North American Butterflies of the genus *Limenitis* (*Basilarchia*)," Professor E. B. POULTON, F.R.S., showed specimens of *Adelpha* (*Heterochroa*) *bredowi*, ranging from Guatemala to Arizona, and its northern form, named *californica* by A. G. Butler, from California and Oregon. With these he exhibited specimens of *Limenitis* (*Basilarchia*) *lorquini*, Boisd., taken together with the *Adelphas*, by Mr. F. D. Godman, F.R.S., in the two last-named States. A specimen of *lorquini* from Esquimalt, Vancouver's Island, was also exhibited for the purpose of comparison with the southern individuals. Professor Poulton pointed out that *lorquini* resembles the *Adelpha* and differs from its ancestor *L.* (*B.*) *wiedemeyeri*, Edwards, in the cream colour of the band which crosses both wings and the presence of a brown apical patch on the fore-wing. The specimen from Vancouver's Island far north of the range of the *Adelpha* showed a great reduction in the size of the apical patch. The *californica* form of the *Adelpha* furthermore differed from the southern *bredowi* form and resembled the *L.* (*B.*) *lorquini* in the reduction of the brown mark at the anal angle of the hind-wing, in the more broken and irregular appearance of the cream-coloured band, and markedly in the broader, shorter shape of the wings. These mutual resemblances appeared to offer a striking example of Dr. F. A. Dixey's principle of Reciprocal Mimicry (Diaposematic Resemblance). Professor Poulton said that he was indebted to the kindness of Mr. F. D. Godman for the opportunity of showing the specimens to the Society.

Mr. H. St. J. DONISTHORPE, F.Z.S., read a paper "On the Life History of *Lomechusa strumosa*, F."

Wednesday, December 4th, 1907.

Mr. C. O. WATERHOUSE, President, in the Chair.

Nomination of Officers and Council and Auditors for 1908.

The SECRETARY again read the names of the Officers and Council nominated to serve for 1908.

The following Fellows were nominated as Auditors:—Mr. W. J. Kaye, Mr. A. J. Chitty, Mr. R. Adkin, Mr. L. B. Prout, Dr. T. A. Chapman, Mr. R. Wylie-Lloyd.

Alteration of a Bye-Law.

The Secretary again read the notice relative to a change of Chapter XIII, Section 3, announced at the previous meeting.

Election of Fellows.

Mr. Walter Feather, of 10 Station Grove, Cross Hills, Keighley, Yorkshire, and the British Somaliland Fibre and Development Company, Berbera, Somaliland, British East Africa, and Mr. Rupert Wellstood Jack, Assistant Entomologist in the Department of Agriculture of the Cape of Good Hope, Cape Town, South Africa, were elected Fellows of the Society.

Obituary.

The decease of Mr. Henry Hague was announced.

Exhibitions.

Variations in Anthrocera trifolii.—Dr. G. C. Hodgson, introduced by Dr. T. A. Chapman, exhibited a case containing a number of examples of *Anthrocera trifolii*, collected on the same ground in Sussex, and showing a wide range of variation, including three fine melanic forms, and several showing six spots on the upper-wings. He remarked that these latter were bred by him from cocoons found on the ground, and not as in the case of the others from those taken on ling, etc.

Enemies of South American Butterflies.—Mr. W. J. Kaye showed a specimen of *Papilio thoas thoas* with the central portions of both tails removed apparently by a narrow-billed bird. The injury appeared so symmetrical that it was thought likely that the specimen was an abnormality. But a careful microscopical examination showed that the overlapping scales on the sides of the injury were not shaped like the cilia scales but were in the position of broken rows of scales, showing that there had been uniformity. It was mentioned that by experiment with a butterfly and a pair of forceps a piece of the wing could be removed and the resulting injury appear scaled. If however a wedge of the wing be cut out with a pair of sharp scissors, the resulting edge of the wing showed hardly a trace of any overlapping scales, the scales themselves being actually sheared.

Several species of butterflies from British Guiana were also shown with injuries to the wings in the region of the abdomen. These included *Heliconius burneyi catharinæ*, *Stalachtis phædusa*, *Bia actorion* and *Methona confusa*, the last-named being a most conspicuous injury just above where the abdomen is held when at rest. Such injuries to Danaine butterflies were quite rare.

Locusts and their Food.—The President exhibited photographs of a large locust (*Catacanthacris rubella*) from the Congo Free State, which was captured holding a small mouse (*Leggada* ?) with its front and middle legs, and was apparently devouring it. He read the following note from the Rev. M. H. Reid, who found it. "I never knew that a grasshopper would eat flesh, but seeing was to believe. I went to see several of the chiefs . . . during that time great swarms of locusts devoured every green thing. While looking at the locusts crawling over the native huts I observed the one I gave you. It held a mouse firmly, and had actually fastened its legs about the mouse so that there was no way of escape. . . . Some of the locusts had great spiders and others great roaches (cockroaches), and in fact anything which would make food." The specimen is now in the Natural History Museum.

A discussion followed on the carnivorous habit of the *Acridiidæ*, it being considered a very unusual phenomenon.

The Rev. F. D. Morice mentioned an occasion on which he had found wearing apparel devoured by grasshoppers in Switzerland, and other Fellows followed.

Reciprocal Convergence in Limenitis.—Professor Poulton exhibited 7 males and 4 females of *Limenitis* (*Basilarchia*) *lorquini* from Vancouver's Island; 11 males and 1 female from British Columbia; 4 males from California; also 4 examples of the Californian form of *Adelpha bredowi*, together with 5 specimens of the same species from Mexico and 1 from Guatemala. He also exhibited 2 males of the species which probably represents the ancestor of *lorquini*, viz. *Limenitis*

(*Basilarchia*) *wiedemeyeri*, from Colorado. This much larger series supported the conclusions suggested by the smaller exhibit shown by Professor Poulton at the previous meeting:—viz. that the superficial appearance of *A. bredowi* and of *L.* (*B.*) *lorquini* undergoes reciprocal convergence in the areas where these two species fly together, but that where each of them exists alone, *lorquini* to the W. and *bredowi* to the S., the resemblance to the other is much reduced.

Hybrids and Varieties of British Heterocera.—Mr. L. W. Newman exhibited (*a*) a long and varied series of *Ennomos autumnaria* (*alniaria*), including examples in-bred several years of a very pale washed-out colour, the usual in-bred Kent form; specimens bred by Mr. Tugwell 1882–3, a very rich dark speckled form; specimens including two pairs melanic (rich dark brown with canary-yellow thorax), the parent ♀ captured in East Kent in 1905 and quite typical, but the brood of 1906 produced two melanic specimens, while this year several melanic specimens were bred and a quantity of the types, which latter were very rich in colour and heavily speckled, some almost approaching Mr. Tugwell's race: (*b*) a series of *Polia xanthomista* (*nigrocincta*) bred from ova and fed on carrot, the specimens unusually large (N. Cornwall), and one Isle of Man specimen also bred from ova, and one specimen bred from wild collected larvæ—a much smaller specimen: (*c*) three pairs of hybrid *Notodonta ziczac* ♂ × *N. dromedarius* ♀, = *newmani*, Tutt, and one specimen each of *ziczac* and *dromedarius*: (*d*) three very fine *Xylina conformis* bred by Evan John, S. Wales: (*e*) three cocoons (*in situ*) of *Dicranura bicuspis* collected wild in Tilgate Forest: and (*f*) fine melanic ♂ *Oporabia dilutata*, taken wild in Bexley Woods 1907, this being the first melanic specimen of the species reported from Kent.

New Species of Belenois.—Dr. F. A. Dixey exhibited male and female specimens of a new *Belenois* allied to *B. zochalia*, Boisd., but quite distinct from the *zochalia* group. These were captured by Mr. Wiggins in the Tiriki Hills, north-east of the Victoria Nyanza.

Rare Coleoptera, Thysanoptera, and Aptera.—Mr. R. S. Bagnall read the following notes on the several examples exhibited by him.

COLEOPTERA :—

Triplax bicolor, Gyll. Specimens reared from larvæ found hibernating in moss at Gibside, Co. Durham, and showing change in coloration after emergence from pupæ.

Agathidium badium, Er., from beneath bark of beech trunks and logs, Gibside, Co. Durham.

Cryptamorpha desjardinsi, Latr. A probably cosmopolitan species from cellars, Winlaton, Co. Durham.

Enicmus fungicola, Th., taken by Mr. Gardner in Teesdale, Co. Durham.

Henoticus serratus, Gyll., from refuse lying on the banks of Loch Long at Arnochar.

Epuræa angustula, Er., and *Acrulia inflata*, Gyll., found (parasitic) in the runs of a wood-boring beetle, *Trypodendron domesticum.*

Euplectus minutissimus, Aubé., taken at Winlaton Mill, Co. Durham, with other rare creatures, amongst sand and shingle actually submerged by the river Derwent.

Scydmænus exilis, Er., not uncommon in the Derwent Valley (Durham) beneath bark of various trees.

Ptilium myrmecophilum, All., common with *F. rufa* in Northumberland, Durham and the Kyles of Bute.

THYSANOPTERA :—

Having paid a little attention this year to the British species of Thrips I have pleasure this evening in drawing your notice to twelve rare species, ten of which (marked " * ") are new to the fauna of Great Britain.

* *Megalothrips lativentris*, Heeger. Both sexes found by Dr. Randell Jackson in Delamere Forest. One of the largest European species.

Liothrips setinodis, Reuter. Described by Reuter from Scotland. A fine ♀ from Elm Gibside, Co. Durham.

* *Trichothrips cæspitis*, Uzel. A minute species, apterous, without ocelli, and having the proboscis abbreviated. Described from Bohemia. A single example from Gibside in moss.

* *Heliothrips femoralis*, Reuter. A hothouse species taken at Acton by Mr. C. O. Waterhouse and in Northumberland by

myself. It is recorded from Finland and North America, and I have recently found it in numbers in Belgium.

* *Parthenothrips dracænæ*, Heeger. Another hothouse species taken by Mr. Waterhouse at Acton. It is widely distributed, and I have taken it in large numbers in Belgium, in which country it was previously unknown.

Aptinothrips nitidula, Hal. On the sea aster (*Aster tripolium*) and sea milkwort (*Glaux maritima*), Arran. Described by Haliday more than seventy years ago and only rediscovered this year.

* *Uzeliella lubbocki*, new genus and species. A single female found amongst seaweed, Whitley Bay.

* *Euthrips robusta*, Uzel. From the field scabious (*Scabiosa arvensis*), Co. Durham. Rare. Bohemia (Uzel).

* *Oxyothrips parviceps*, Uzel. From heather (*Calluna* and *Erica*), Scotland, Clyde and Solway districts; Northumberland, Co. Durham. Bohemia (Uzel).

* *Oxyothrips ajugæ*, Uzel. From the flowers of bugle (*Ajuga reptans*), Co. Durham. Bohemia (Uzel).

* *Thrips major*, Uzel, and

* *Thrips communis*, Uzel, from the flowers and leaves of the bittersweet (*Solanum dulcamara*) and the potato plant (*S. tuberosum*), Co. Durham. Bohemia (Uzel).

APTERA :—

The following species of Collembola, another neglected group, are additions to the fauna of Great Britain, whilst many species yet await identification and most probably description. Prof. Carpenter has helped me greatly in this group.

* *Orchesella rufescens*, Lubbock, and * *Isotoma hibernica*, Carpenter, the latter a recently described species. Delamere Forest, where they were taken by Dr. Randell Jackson.

* *Isotoma minuta*, Tlb. Whitley Bay, Northumberland.

* *Isotoma bidenticulata*, Tlb. An arctic and alpine species. Amongst shingle of mountain streams, in numbers, Northumberland and Scotland.

* *Isotoma quadrioculata*, Tlb. A solitary example from the Derwent Valley, Durham.

* *Xenylla brevicauda*, Tlb. Several from beneath bark, Derwent Valley, Durham.

* *Anurida tullbergi*, Schött. Taken in large numbers amongst sand and shingle submerged by the river Derwent, Durham.

* *Sminthurus cinctus*, Tlb. In numbers, Derwent Valley, Durham.

THYSANURA :—

Præmachilis hibernica, Carp., this year described by Prof. Carpenter, and another species probably *P. brevicornis*, Ridley, the description of which has been overlooked by modern authorities, both from the Derwent Valley.

Papers, etc.

Professor E. B. POULTON, F.R.S., communicated the following observations on the

INSECT AND OTHER FOODS OF BLACKGAME

contained in a letter received from Dr. F. Menteith Ogilvie. His correspondent stated that the larvæ of *Bombyx rubi* had been unusually abundant on the Argyllshire moors during October (Dr. Ogilvie's visit had been from the 16th to the 28th of the month). The following extract from the letter indicates both the excessive abundance and the special protection of these larvæ :—"Had I set about seriously collecting them, I dare say I could have gathered over 1,000 of these caterpillars in a day. We shot a number of blackgame, grouse, and ptarmigan, and I examined the crops of a good many of these, more especially of the blackgame. The latter species we found out on the open moor—very few were in the woods and birch patches at this season—they therefore had ample opportunities of feeding on these hairy caterpillars had they been so minded. But in the examination of the contents of the crops of a considerable number of birds of this species I never found one hairy caterpillar, though I often found one or two smooth-skinned caterpillars of different kinds. From this I came to the conclusion that these hairy caterpillars are noxious to birds—at any rate to the game birds I was dealing with—and that they are severely left alone."

A later communication from Dr. Menteith Ogilvie contained the following interesting details :—"I enclose a rough note on the contents of the crops of five blackgame. I could send others, but the general result was the same in all the birds shot."

Blackgame, *Tetrao tetrix*, L. Contents of crop (5 specimens).
Barcaldine, Argyllshire.

1. ♀ Shot 17th October, 1907 (3 p.m.); crop fairly distended. "An immense number" of galls from oak trees, vulgarly "spangle galls" (*Neuroterus lenticularis*), probably not less than 500 of these.
   Also "an immense number" of small dark-brown beetles, *Lochmæa* (*Adimonia*) *suturalis* of Thomson, one of the plant-feeding section of the Coleoptera.
   A quantity of plantain leaves, others that appeared to belong to some kind of mint, and only one small flowering head of heather.
2. ♂ Shot 19th October, 1907 (4 p.m.); crop full.
   Plantain leaves, fully $\frac{1}{3}$ of the contents.
   Heather shoots, about another $\frac{1}{3}$.
   A few blaeberry tops (*Vaccinium myrtillus*).
   Marsh Trifolium (2 or 3 leaves); a fern leaf (? *Polypodium alpestre*).
   Many dark-brown beetles, as in ♀ of 17th October, 1907, but less numerous.
   One large smooth-skinned caterpillar, $1\frac{1}{4}$ in. long, 3 longitudinal yellow stripes on a dark olive-brown ground.
3. ♂ young. Shot 19th October, 1907 (10 a.m.); crop nearly empty.
   Seven berries of the mountain ash (Rowan), and
   A few crinkly leaves, somewhat like parsley. (Sp. ?)
4. ♂ adult. Shot 18th October, 1907 (4 p.m.); crop very distended.
   Large quantities of heather shoots.
   Willow leaves. (Sp. ?)
   [This is a dwarf willow which grows plentifully on the moors. I don't know the species—it is locally known as the "saugh" willow.]

Flowering heads of a scabious.

Numerous fronds of a fern (? *Polypodium alpestre*), Tormentilla (*T. officinalis*), and two or three Trifolium leaves.

" Vast number " of spangle galls.

300 or more dark-brown beetles (*L. suturalis*).

One earwig, and

One large ($1\frac{1}{2}$ in. long) smooth-skinned green caterpillar.

5. ♀ Shot 18th October, 1907 (3 p.m.); crop half full.

Mainly heather shoots, with a good sprinkling of blaeberry (*V. myrtillus*).

Fern fronds (*P. alpestre*), a few.

"Immense number" of the usual small dark-brown beetle, and quantity of "spangle galls."

"The two outstanding features are the spangle galls and the small beetle. Almost all the birds were crowded with these, and, judging by my specimens, the blackgame must have been destroying enormous numbers of both. I don't think, as regards the beetles, it is any exaggeration to allow 300 beetles per day per bird. Ours is not a very good black-game ground now, and perhaps we have 300 head in all; that would equal 90,000 beetles per day! I was surprised to find, too, how little heather was eaten in most cases, despite the fact that the birds were in almost every case found on the moor and not in the woods.

"The beetles were kindly identified for me by Commander Walker, and the oak spangles by the authorities at Kew."

Professor POULTON said that Dr. Menteith Ogilvie had kindly obtained specimens of the abundant hairy larvæ untouched by the birds, and that they were undoubtedly *Bombyx rubi*. He remarked upon the interesting fact that the beetle *Lochmæa suturalis*, so plentifully devoured by the blackgame, belonged to the *Galerucidæ*, a family generally believed to be distasteful, and certainly providing many models for mimicry. These particular Galerucids, however (examples of which were exhibited), were rather inconspicuous dark brown insects.

REST ATTITUDE OF HYRIA AURORARIA.—Mr. J. C. MOULTON read the following note :—" During the past summer I had the opportunity of studying the habits of this species in the field near Glastonbury, Somersetshire. I first met with it on July 2nd, and after a rainy interval saw it again on July 10th, 11th, and 12th. The moth frequented a small patch of ground about 80 yards square, covered with heath and ling, intermingled with bog-myrtle, alder bushes, and birch trees. The insect was on the wing in bright sunlight from 10.30 a.m. to 1.30 p.m. The rest attitude was first observed on July 10th; when following a moth that was flying about four or five feet from the ground, I saw it settle upon the ling a little ahead of me when it became invisible. However, on closer inspection I found it had alighted on a thin stem of ling, with the underside of its outspread wings uppermost. When disturbed it again took a short flight of a few yards, and settled in exactly the same manner. This happened during four successive flights of this one insect; and for the rest of that morning and the following days I was interested to notice that all the others, which I saw settle, invariably did so in this attitude. The interpretation is not far to seek when a comparison is made between the colouring of the upper- and under-sides. In the former the bright purple and rich golden markings at once attract the eye and render this little Geometer a conspicuous object. The under-surface, on the other hand, possesses a perfect cryptic colouring of dark dull purple, combined with shades of tawny yellow. It should be noted that on no occasion was the flower itself selected as a resting-place, but always the leaf or stem, the dull colour of which, combined with the dark shadows in the interior of the plant, formed a background harmonising in a remarkable manner with the exposed surface of the insect. In conclusion, I should like to record my sincere gratitude to Professor Poulton for very kindly looking over this note."

Mr. A. H. Swinton communicated a paper on "The Family Tree of Moths and Butterflies, traced in their Organs of Sense."

Mr. E. Meyrick, B.A., F.R.S., F.Z.S., communicated a paper on "Notes and Descriptions of *Pterophoridæ* and *Orneodidæ*."

Mr. R. Shelford, M.A., C.M.Z.S., F.L.S., read a paper entitled "Studies on the *Blattidæ*."

The Rev. K. St. A. Rogers, introduced by Professor E. B. Poulton, F.R.S., read a paper entitled "Notes on the Bionomics of British East African Butterflies," and exhibited many examples collected by him, and from the Hope Museum, Oxford, to illustrate his remarks.

ANNUAL MEETING.

Wednesday, January 15th, 1908.

Mr. C. O. WATERHOUSE, President, in the Chair.

Mr. R. WYLIE LLOYD, one of the Auditors, read the Treasurer's Balance Sheet, showing a balance of £6 7*s.* 11*d.* in the Society's favour.

Mr. H. ROWLAND-BROWN, one of the Secretaries, then read the following

Report of the Council.

During the Session 1907–1908 eight Fellows have died, seven Fellows have resigned, thirty-six new Fellows have been elected, the name of one Fellow has been restored to the list, and those of fourteen Fellows removed therefrom.

It is a pleasure to report that the elections for the year constitute a record in the annals of the Society, and that the tendency toward a lower annual average, of which mention was made two years ago, has not been maintained. The interest taken in the work of the Society, apart from the gratifying additions to our ranks in the past twelve months, is demonstrated by the number of those attending the Ordinary Meetings, these, as a rule, being almost double compared with the attendances of some previous years. In this connection it is also agreeable to note that the number of foreign Fellows is increasing steadily, our ranks during the year having received accessions from France, Germany, and Sweden, while the British Colonies continue to be well represented on the nomination papers.

At present the Society consists of eleven Honorary Fellows, and five hundred and nine Life and Subscribing Fellows, this being the first year that the roll of Ordinary Fellows has exceeded five hundred.

It is much to be regretted that the finances of the Society have not developed proportionately to the increase of Fellows. On several occasions during the year the Council has been compelled to withhold valuable papers contributed by Fellows, simply for want of funds, and were it not for the continued generosity of one or two Fellows we should have been unable to bring our Transactions even to the modest number of pages and plates of the current issue. Much time has been devoted by the Treasurer and the Council to the matter : the question of raising the annual subscription has been considered at length, but abandoned as undesirable; a majority of the Council, however, recommend that the Life Composition be somewhat increased, and for this purpose have taken steps to consult the wishes of the Society upon the necessary alteration of the Bye-Law. The increased expenses of printing, and of the preparation of the plates; the advance in the cost of paper, and the falling off in the amount of voluntary subscriptions to the publication fund, have demanded stricter economy on the part of the Council, and a consequent reduction of the scientific material published by the Society.

The Transactions for the year, however, form a volume of five hundred and fifteen pages, containing twenty-seven Memoirs by the following authors : Mr. Malcolm Burr, B.A., F.Z.S., Lieut.-Colonel C. T. Bingham, F.Z.S., Mr. M. Cameron, M.B., R.N., and Signor A. Caruana Gatto, LL.D., the Rev. G. A. Crawshay, M.A., Dr. T. A. Chapman, M.D. (two), Dr. T. A. Chapman and Mr. G. C. Champion, F.Z.S., Mr. Hamilton H. Druce, F.Z.S., Dr. F. A. Dixey, M.A., M.D., Mr. H. St. J. Donisthorpe and Dr. G. B. Longstaff, M.D., Mr. E. A. Elliott, F.Z.S., and Mr. C. Morley, F.E.S., Mr. L. Guppy, junior, Mr. J. L. Hancock, M.D., Mr. E. Dukinfield Jones, F.Z.S., Mr. J. C. Kershaw, F.Z.S. (three; two of them with Mr. F. Muir, F.E.S.), Mr. P. I. Lathy, F.Z.S, Mr. A. M. Lea, F.E.S., Lieut.-Colonel N. Manders and Mr. E. Meyrick, B.A., F.R.S., F.Z.S., Professor L. C. Miall, F.R.S., and Mr. T. H. Taylor, Mr. K. J. Morton, F.E.S., Mr. R. Shelford, M.A., C.M.Z.S. (two), Mr. E. E. Unwin, M.Sc., and Mr. H. Scott.

Of these papers, nine relate to Lepidoptera, six to Coleoptera, three to Diptera, one to Rhynchota, three to Orthoptera, one to Hymenoptera, one to Neuroptera; one, by Dr. Chapman and Mr. G. C. Champion, to Lepidoptera and Coleoptera; one by Dr. Dixey and Dr. Longstaff to South

African Entomology, and one by Dr. Chapman to the subject of Teratology in insects.

The Memoirs referred to are illustrated by twenty-nine plates, of which nine are coloured. Half the cost of Plate I has been defrayed by Mr. Lathy. Mr. M. Burr has given the drawings for Plate IV. Dr. T. A. Chapman has given the whole cost of Plate V, the blocks for Plates VI–XII, and the photograph for Plate XXVII. Mr. Crawshay has given the photographs for Plates XIV–XX, and Mr. J. C. Kershaw the drawings for Plates XXII–XXIII. The entire cost of Plate XXV has been defrayed by Dr. G. B. Longstaff, the drawings of Plates XXVI–XXVII have been presented by Mr. L. Guppy, junior, and Lieut.-Colonel Manders has given £5 towards the expenses of Plate XXIX. The quality and length of the Proceedings has also been well maintained, and many short papers are now included in this part of our publications.

We regret to announce that the amount offered in grant for a Travel Fund, so liberally volunteered by Mr. F. Merrifield, was not applied for. Mr. Merrifield has, however, most kindly announced his willingness to repeat his offer in the forthcoming year.

The Society was invited to send a delegate to the Bicentenary Celebrations of the Birth of Linnæus at the University of Upsala, and the Academy of Science, Stockholm, and was represented by the Rev. F. D. Morice, M.A., one of our Fellows, who has published in our Proceedings an account of the very gratifying way in which he was received on both occasions. Another of our Fellows, Professor E. B. Poulton, F.R.S., represented the University of Oxford, and was decorated by the late King of Sweden with the Order of the Polar Star in recognition of his services to Entomological Science.

The Treasurer reports that the Balance Sheet of the Society shows that the subscriptions for the year 1907 are about £17 in excess of the previous year. The admission fees are far in excess of any previous year, amounting to £50 8*s*. The sum total received is, however, about £20 less than last year, owing to the falling off of donations, and in the sale returns of the Transactions.

The printing bill—£321 1*s.* 2*d.*—is abnormally high, being £100 in advance of that of the preceding year. The cost of plates shows a reduction—£113 2*s.* 5*d.*—as against £199 4*s.* 7*d.* in 1906; the other items of the Balance Sheet being normal. But although the balance is small, as a matter of fact we are in as good, if not better, a financial position than last year. The volume of Transactions and Proceedings for 1906 was very bulky, and Parts III and IV were paid for last March, the expenses for the same amounting to £106; £60 will probably cover the whole cost of these two Parts in the current issue.

The Librarian reports that the number of volumes issued to Fellows for home-reading amounted during the year to a total of 287. The Library has also been very well patronised for purposes of reference and study. The additions to the Library consist of five volumes, 102 pamphlets, and the usual periodicals.

Entomological Society of London,
11, Chandos Street, Cavendish Square, W.
January 15*th*, 1908.

The Secretaries not having received any notice proposing to substitute other names for those contained in the list prepared by the Council, the following Fellows constitute the Council for 1908–9:—George C. Champion, F.Z.S.; Dr. Thomas Algernon Chapman, M.D.; Arthur John Chitty, M.A. (since deceased); Albert Harrison, F.L.S., F.C.S.; Albert Hugh Jones; William James Kaye, F.L.S.; Dr. George Blundell Longstaff, M.D.; Hugh Main, B.Sc.; Guy A. K. Marshall; Professor Raphael Meldola, F.R.S., F.C.S.; Professor Louis Compton Miall, F.R.S.; Professor Edward B. Poulton, D.Sc., M.A., F.R.S.; Henry Rowland-Brown, M.A.; Robert Shelford, M.A., F.L.S.; George Henry Verrall; Commander James J. Walker, M.A., R.N., F.L.S.; Charles Owen Waterhouse.

The following are also elected as officers:—President, Charles Owen Waterhouse; Treasurer, Albert Hugh Jones; Secretaries, Henry Rowland-Brown, M.A., and Commander

James J. Walker, M.A., R.N., F.L.S. ; Librarian, George C. Champion, F.Z.S.

The Balance Sheet and Report having been adopted, Mr. C. O. Waterhouse, the President, delivered an Address. A vote of thanks to the President for his Address, and for his services as President during the past year, was proposed by Mr. Frederic Merrifield, and carried unanimously. Professor Raphael Meldola, F.R.S., then proposed a vote of thanks to the other officers of the Society, which also was carried unanimously. The President, Mr. A. H. Jones, Mr. H. Rowland-Brown, and Commander J. J. Walker replied.

ENTOMOLOGICAL SOCIETY OF LONDON.

Balance Sheet for the Year 1907.

Receipts.

	£	s.	d.
Balance in hand, 1st Jan., 1907, and at Bankers' ...	53	18	2
Subscriptions for 1907 ...	412	2	6
Arrears	15	15	0
Admission Fees	50	8	0
Donations	21	12	8
Sales of Transactions ...	76	13	5
Interest on Investments:—			
Consols £21 8 5			
Westwood Bequest 6 16 6	28	4	11
Subscriptions in Advance	14	14	0
Life Compositions	31	10	0
	£704	18	8

Payments.

	£	s.	d.
Printing Transactions, etc.	321	1	2
Plates, etc.	113	2	5
Rent and Office Expenses	180	10	5
Books and Binding	37	12	9
Investment in Consols ...	31	10	0
Subscriptions in Advance, per contra carried to 1908	14	14	0
Balance in hand and at Bankers'	6	7	11
	£704	18	8

Assets.

	£	s.	d.
Subscriptions in arrear considered good	50	0	0
Cost of £929 16*s.* 5*d.* Consols. Present price 1st Jan. 1908, @ 83⅞ £779 17*s.* 9*d.*	902	8	0
Cost of £239 12*s.* 4*d.* Birmingham 3 per cent. Present price 1st Jan. 1908, @ 86. £206 1*s.* 5*d.*	250	0	0
Balance in hand	6	7	11

No Ascertained Liabilities.

Additional Assets.

Contents of Library and unsold Publications.

Audited, compared with vouchers and found correct.

R. W. Lloyd.
Horace St. J. Donisthorpe
(for Arthur J. Chitty deceased).
Robert Adkin.

A. Hugh Jones,
Treasurer.
10th January, 1908.

THE PRESIDENT'S ADDRESS.

Ladies and Gentlemen,

My first words must be to congratulate the Society on its continued prosperity. In my young days, when the Members met in an uncarpeted room and sat on wooden benches, the Society produced good results; and the Turkey carpet and leather-covered chairs have not in the least impaired our powers, for we still do plenty of hard work, and that of a progressive character, in the interest of Entomological Science. The papers in our Transactions are varied and most useful, and I am glad that some of them are contributed by friends living abroad who are able to furnish us with notes on the life-histories of species of which we only know the dried imagines.

The notes and short papers in the Proceedings are of more than ordinary interest, and embrace many various subjects. I need not go into details.

I regret to have to put on record the decease of several Fellows:—

John Emmerson Robson died on February 28th last at the age of 74. He resided at Hartlepool, and was known in the North of England as a zealous Lepidopterist. He was perhaps best known as the editor from 1879 to 1893 of the "Young Naturalist," or as it was afterwards called the "British Naturalist." Besides editing this periodical, he was a frequent contributor to its pages. His most important work was the "Catalogue of the Lepidoptera of Northumberland, Durham and Newcastle-on-Tyne." This is a great deal more than a mere list of names, as there are observations of interest on most of the species. Unfortunately he only completed the work to the end of the *Tortrices.* The remaining families were in hand at the time of his death. He also published in 1886–87, in conjunction with Mr. John Gardner, a "List of the British Lepidoptera and their Named Varieties." Part I. contained the Macrolepidoptera. The Microlepidoptera were never published.

He was elected a Fellow of this Society in 1890. Those who knew him personally describe him as a genial companion, and he was a charming correspondent. He took much interest in public affairs, especially in educational work, and at the time of his death he was a member of the Hartlepool Borough Council.

Dr. Frederic Moore, D.Sc., A.L.S., died on May 10th, aged 77. He was elected to this Society in 1853, and had therefore been a Fellow for fifty-four years. At the time of his death I was asked if I knew how he came to take up the study of Entomology. I cannot answer that question definitely, but it is not difficult to make a guess. In his boyhood he resided in the Zoological Society's house. My father as Curator of that Society's Museum was also resident in the same house. Hope, Vigors, Kirby and other entomologists were at this time publishing entomological papers in the Zoological Society's Proceedings and Transactions. Dr. J. E. Gray was frequently at the Society and employed young Moore to make drawings for him. This brought him under the notice of Dr. Horsfield, who was interested in Entomology. When these facts are known it is not surprising that Frederic Moore took to Entomology. He was attached to the Museum of the East India Company and remained a member of that Museum's staff until it was given up in 1879. He was a regular attendant at our meetings and he contributed many papers to our Transactions. His chief works were the "Lepidoptera of Ceylon" (1881–7) and the still more important work the "Lepidoptera of India." This last he had not completed, the *Lycænids* and *Hesperids* still remained to be done. He formed a large collection of Indian Lepidoptera, the greater part of which is already the property of the British Museum. The remaining portions will, I have no doubt, follow.

Charles James Watkins died on May 27th. He was born at Lightpill, near Nailsworth, in July 1846. For many years he resided at Painswick, but quite recently he removed to Watledge, Nailsworth, and it was here that he underwent an operation which culminated in his death. He was a pin manufacturer, and his father was one of the earliest to supply entomological pins. His business did not leave him a great deal of spare time, but what he had he devoted to Natural History, and he was always ready to help any one who applied to him for information. The Gloucestershire portion of the Victoria County Histories owes much to him, as he collected and supplied many details for that work. He was a good all-round naturalist, including geology and botany in his studies, and as regards insects he was noted for his knowledge of Hymenoptera, Lepidoptera, Coleoptera and Hemiptera. He became a Fellow of this Society in 1900.

William Christopher Boyd died on September 18th. He was well known as a Lepidopterist, and although he was the head of the firm of Messrs. J. & C. Boyd, Manchester Warehousemen, of Friday Street, E.C., which must have left him little leisure, he nevertheless was a frequent contributor to the Entomological Monthly Magazine, making a study of the Microlepidoptera as well as the larger species. *Coleophora potentillæ* was new to science when he discovered it, and he added other species to our British list. He was a Fellow of this Society from 1867 to 1893.

John Harrison died on July 11th, aged 73. He resided at Barnsley, and was well known in the North of England as a Lepidopterist, and was an enthusiastic collector, but chiefly in his native county. He was one of the founders of the Barnsley Naturalists' Society in 1867, and lived to see it become one of the most flourishing societies in South Yorkshire. He was elected a Fellow of our Society in 1889.

Martin Jacoby died on December 24th. He was born at Altona, near Hamburg, in 1842, and came to Manchester at the age of twenty, and had since made England his home. At first he was in Hallé's band, then in London at the Royal Italian Opera, but from his earliest days he took an interest in Natural History. He joined this Society in 1886, and was a regular attendant at our meetings. For many years past he had confined his studies to the Phytophagous Coleoptera, and he contributed many papers to our Transactions and to the Proceedings of the Zoological Society. His chief works were the Phytophaga in the "Biologia Centrali Americana," and quite lately the volume on Phytophaga for the "Fauna of India." This work he had just completed, and it was all in print, but unfortunately he did not live to see it published. He formed a large collection of these insects, which passed into the hands of Herr van de Poll. Since parting with this he had been forming a second collection, but I do not know anything of its extent. We shall all miss his presence amongst us.

Arthur John Chitty, M.A., died on January 6th of this year, at the age of 48. He was a barrister-at-law and had not much leisure, but much of what he had he devoted to Entomology. He joined this Society in 1891, and since 1906 had been a most useful member of our Council. He was a keen collector of British Coleoptera, but did not confine himself to this Order. Lately he had taken up the *Proctotrupidæ*. That he was cut off from pursuing the study of these insects is greatly to be regretted, as this family has been much neglected. His loss will be deeply felt by all who knew him.

Before proceeding to the subject of my address I must not omit to mention an important event that happened during the year. I allude to the bicentenary of the birth of Linnæus, which was celebrated at Upsala and Stockholm, to which this Society was invited to send a representative. The Rev. F. D. Morice kindly undertook to present an address on our behalf, and he has given us a report on what occurred. I do not propose to inquire what views Linnæus held as regards the relationship existing between animals. When we say that one animal is related to another, we mean that these have a common origin, and that implies evolution. But whatever views Linnæus held, he certainly saw in a way that none of his predecessors had, that plants and animals fell naturally into groups, and he arranged them systematically in Classes, Orders and Genera in a manner that had never been done before.

Of insects he knew at the time the twelfth edition of his

Systema Naturæ was published only 2,724 species. These he divided into seven Orders: Coleoptera, Hemiptera, Lepidoptera, Neuroptera, Hymenoptera, Diptera and Aptera. His Order Hemiptera embraced the Orthoptera as well as the Rhynchota, otherwise the Orders remain now as they were then. These Orders he divided into 77 genera, the names of all of which are in use except, perhaps, *Phalæna*. Some of the larger genera he broke up into sections or phalanges, "To facilitate reference," as he says. These sections he indicated by asterisks accompanied by a few words of description, such as "Corpore ovato" or "Corpore cylindrico." Each of the descriptions of species which follow begins with "ovatus" or "cylindricus" as the case may be. When suitable Greek or Latin names of insects such as Bombyx, Locusta and others were available, he used these as the first word of his sectional diagnosis, "Bombyces elingues Alis reversis," "Noctuæ elingues," etc., then each description which follows begins with "Noctua elinguis."

In the five divisions of *Gryllus* alone are these words or popular names used in the singular, with full stops after them, followed by a short diagnosis. They are Acrida, Bulla, Acheta, Tettigonia and Locusta. *Cicada* is divided into five groups: Foliaceæ, Cruciatæ, Manniferæ, Ranatræ and Deflexæ; *Cimex* is divided into nine groups: Apteri, Scutellati, Coleoptrati, Spinosi, Rotundati, Seticornes, Oblongi, Spinipedes and Lineares. *Papilio* is divided into five groups: Equites, Heliconii, Danai, Nymphales and Plebeji; *Phalæna* is divided into eight groups: Attaci, Bombyces, Noctuæ, Geometræ, Tortrices, Pyralides, Tineæ and Alucitæ.

Those which have a generic sound about them, such as Bombycæ, Noctuæ, Heliconii, are given in his list of "Termini artis" with antenna, larva, pupa, etc. This list, however, includes the names of Orders, Coleoptera, Hymenoptera, etc.

Most of these terms have been taken up, in the singular number, by subsequent writers as genera.

It should be noted that the genus *Tettigonia* of Fabricius has no reference to the term Tettigonia of Linnæus; nor has the genus *Ranatra* of Fabricius any connection with Ranatræ, one of the Linnæan divisions of *Cicada*.

These facts are well known, and much has been written about them. I mention them now because they have a slight bearing on what I wish to say later on.

Many years ago the President's Address generally gave a summary of the works published on entomological subjects during the year. This is no longer possible nor desirable. Lately the Address has usually taken the form of a treatise on some entomological topic.

I propose saying a few words on the subject of accurate nomenclature.

The fact that insects are small and have thus escaped destruction is probably one reason why we have such complete series of closely allied species with all the connecting links in gradation still before our eyes.

The number of described species increases at a rapid rate; insects which our fathers would have unhesitatingly regarded as belonging to one species are now considered quite distinct. Slight differences which were formerly thought to be of no importance are now known to have specific value. A hair or two more or less on the thorax of a beetle or a fly may be of generic importance, or at least specific.

The descriptions of species written fifty years ago are often almost useless in the present day. I remember one Fellow of this Society saying that when a species has been properly described, the specimen from which the description was made might be destroyed. His own descriptions I must say are very perfect, but even *he* cannot say how a species differs from one he has never seen, and specific characters are frequently found in the most unexpected places.

How are we then to secure accuracy in the names of our insects? And unless our specimens are correctly named, how are we to understand one another? Take two or three cases of incorrect determination which have been very misleading.

Meigen briefly characterized a genus of Diptera under the name of *Corethra,* and he quotes *Tipula culiciformis* of De Geer as the type; it is evident, however, from his subsequent work that the insect he had before him at the time was not *culiciformis*, but *plumicornis*, Fabr., and in his later work when he had discovered his error he gives *plumicornis* as his type, and states that he had never seen *culiciformis*. *Mochlonyx* was at a much later date proposed for the true *culiciformis*; but *culiciformis* was originally named as the type of the genus *Corethra*, and it has therefore been suggested that *Mochlonyx* should sink as a synonym of *Corethra*, and one of our commonest and best known British insects, *Corethra plumicornis*, should have a new generic name. I believe this has never been given and it is certainly not necessary when the case is understood. This is one instance of the confusion arising from an incorrectly named specimen.

Take another case. In North America, a Longicorn beetle, *Cyllene pictus*, was said to be injurious to two trees, *Robinia* and Hickory. Afterwards Dr. Horn noticed that the specimens from *Robinia* were not identical with those from Hickory, although the difference was very slight, and he gave the name *robiniæ* to the species found on *Robinia*. Unfortunately not having seen the type of *pictus*, he named the wrong one. The true *pictus* of Drury is the species found on *Robinia*. The species found on Hickory is still without a name, unless my colleague Mr. Gahan has by this time named it.

I will only mention one other case. Many years ago the Cinchona plantations in Java were suffering greatly from attacks of a Hemipterous insect, *Helopeltis*. These were said to have been imported with tea plants from Ceylon. With the kind help of friends I obtained specimens from the Cinchona and also from the tea plants of both Java and Ceylon, and found them to be three distinct species, so that the introduction of the pest with tea plants was shown to be a myth.

It would be easy to multiply instances of this kind, but these three are sufficient for my purpose. Two of those I have mentioned are not only of scientific interest but also of great practical importance.

Before proceeding to suggest a plan by which we might secure the accurate determination of our insects, I must say a few words about types.

The word "type" is used in various ways by zoologists.

Some take a very wide view of what is a type. One entomologist, in giving a list of the types in his collection, says that he considers as a type any specimen sent to him by the describer of a species. Others regard all the specimens which they had before them when describing a new species as types, and distribute them as such. Some thirty-five years ago I saw the danger arising from this loose way of using the word, and applied the word "type" to the actual specimen described when that could be determined, and called the other examples mentioned by an author "co-types." Some years afterwards my colleague Mr. Oldfield Thomas proposed (P.Z.S., 1893, p. 242) the terms para-type, topo-type and meta-type; and all these are useful in their way. But we are both agreed that the word type should be restricted to the actual specimen upon which the species is founded.

I think describers should make their descriptions from a specimen which is to be the standard specimen for all future reference, and should mark it as such. Other specimens associated with it may have the same value, but very often they have not. A case lately came under my notice where a series of specimens, all named by the describer as one species, were found when examined carefully by a specialist to consist of five distinct species. In this case there was no special difficulty in saying for which species the name should be retained, but sometimes it is very difficult. When an author has confused two species and his description is applicable to both, any one who subsequently discovers the error is at liberty to say to which of the two the name should be applied, and may describe the second as a new species, the division of the species following the same course as the division of a genus where no type has been specially indicated. The type specimen therefore, according to the view I take, is the STANDARD SPECIMEN for all future reference; it should be as carefully preserved as are our standards of weights and measures, for we must frequently refer to them if we are to have accurately named specimens.

I know from experience that it is quite possible to compare a specimen with a type and to be satisfied that your specimen belongs to the same species, and afterwards to find that there are two very closely allied species which make it desirable to re-examine the type. If I am not much mistaken this reference to original types will become increasingly necessary. It is therefore of the greatest importance that these Standard Specimens should be carefully preserved, and that their whereabouts should be known. Partly with this view the Trustees of the British Museum have recently published the *History of the Collections in the Natural History Departments.*

This, of course, does not give a list of the types in the Museum, which is impossible, but it gives a list of the principal collections of insects which contained types when acquired by the Museum. This is not very much, but it is a step in the right direction. It is impossible to say how many type specimens of insects our National Collection possesses, but the number must be very large, and we are continually adding to them. Collections are broken up and sold; the type specimens pass from one collection to another and are lost sight of; fortunately they occasionally find their way into the Museum, as did some of Westwood's (described more than fifty years ago) only a short time since.

Complaints have sometimes been made that type specimens are not allowed to go out of our National Museum; the rule has been even stigmatized as selfish. Now although I sympathize with any entomologist who wishes to borrow a type, I think the rule is a sound one, as the Museum is the guardian of these types not for any private individual but in the interest of science for all time.

But although the actual types must not leave the Museum, there are duplicate specimens of a large number of them, identical with the types, and often part of the series received with the types. Duplicates are allowed by the Trustees to be sent out (under strict regulations) to specialists who are naming specimens for the Museum. I should like to go further than that. Whenever there are duplicates identical with the type, I should like to put a specimen of each species aside for the special purpose of being sent out. I should in fact like to do more. I should like to see established what, for want of a better name, might be called a Circulating Collection, somewhat on the lines of a circulating library.

Some years ago, when I first learned that the late Mr. Alexander Fry had bequeathed his collection to the Museum, it struck me that in it there must be an enormous number of specimens which would be duplicates, and that these would (so far as Coleoptera are concerned) form an excellent nucleus for a collection such as I have indicated.

I think such a scheme is feasible. At any rate I do not see any insurmountable difficulty in the establishment of such a collection.

It might be connected with some public museum; but on the whole I think it would be better if it were quite an independent collection, the property of some society or under the care of trustees appointed by our chief entomological societies, or by the directors of the great national museums. This would facilitate financial and other arrangements, which would be difficult if it were a Government museum.

The space required would not be large, as it would consist generally of a single specimen of each species.

The curator need not be a person requiring a large salary, as his chief duties would be to see that the collection was kept in a proper state of preservation; to send out to persons (authorized to borrow them) the specimens that they required, and to see that they were returned in accordance with regulations. The annual expenditure on boxes and other necessaries would not be large.

Most of you are doubtless aware that the Trustees of the British Museum give away annually to other museums large numbers of duplicates, and I venture to think that if the collection I have suggested were well organized as a museum (perhaps as an International Museum) with men of standing responsible for it, the Trustees would probably place it on their list of institutions to which duplicates may be given. Other museums and private individuals would I feel sure be willing to contribute specimens.

Perhaps I might make my plan clearer if I give an example. In the course of my work on the Coleopterous family Buprestidæ I have had to go through the genus *Stigmodera*. Of this genus there are in the Museum types of 181 species. Out of this number there are duplicates of 104 species, to which may be added specimens of 36 species which have been compared with types, making a total of 140 species in this genus which might be passed round to every museum in Europe that cared to see them. This would be a good foundation for any one interested in the genus to work upon; for even if he had a species which was not in the series, it would be a help to know what it was *not*. Of course there are in the Museum a great many more species of this genus, which I have no doubt are correctly named, and these might be included in the series, provided it was understood that they had not the same name-value. This would give each specimen the chance of having its name confirmed if it came into the hands of the person who possessed the type of that species.

If each author who possessed (say) three specimens of a new species which he had described would send one to the central depot, and these (when there was a sufficient number of them to make it worth while) were sent round to all the museums in turn, the curators would gain a far greater knowledge of the fresh discoveries than they would by reading any amount of literature.

I can imagine that if this scheme were successful, it would also strike at the root of many of our difficulties as to nomenclature. Every worker at Systematic Entomology feels the great inconvenience of the constant changes in the names of species, and perhaps the practical economic entomologist feels it even more so.

Some maintain that the only remedy lies in the strict observance of the law of priority, and spend much time and trouble in hunting up old names, because they feel that there can never be a settled nomenclature until these old names are unearthed; but just when you think you have really the oldest name for a species, some book comes to light that was never thought of, and the name has to be altered again. For the last fifty years names have been constantly changed, and there does not seem to be any immediate prospect of a settlement. One of our commonest British insects, which is found all over Europe, is in every catalogue under a certain name, and has borne that name for a hundred years or more, but has a much older name. What would science gain, what would any one gain by altering it now?

If indeed we admit the law of priority, there is still much left to the individual in the application of it. I have already mentioned the groups into which Linnæus divided his large genera. Some entomologists treat these as sub-genera, others consider that they ought not to be so regarded—so that priority does not by itself secure a permanent name.

The law is a good one generally speaking, but that we should be bound hand and foot by it seems to me unreasonable. This law has force only by a mutual agreement among zoologists, but I see no reason why—(also by mutual agreement, brought about by an entomological congress, or in some other way)—we might not have some modification of it which would give us greater fixity.

I remember one of our Fellows saying in this room that he took Staudinger's Catalogue of Lepidoptera as his standard. It is to my mind conceivable that a collection such as I have suggested *might* become a court of final appeal. It would not be a question whether *brassicæ* is or is not the oldest name for a species, but,—What name does it bear in the International Collection?

Then we need not go beyond that.

At first there would be just one little difficulty remaining with regard to priority. I might put into the collection a specimen of a species of which I had the type. Afterwards some one might place in it another specimen of the same species under a different name, compared with a type in his possession. Which of these names should be adopted should be left for the trustees of the collection to decide, but both specimens should remain in the collection. If a specimen had been passed round the principal museums in Europe, and its name had not been challenged, I should not alter it even if an older name were afterwards discovered. For consider, What is the object of the name? Is it not that we may be able to speak of the insect and record facts about it? For this reason it is of the greatest importance that we should have an *unchanging name.* Whether it is the oldest one or not is of very minor importance.

In what I have been saying I have had the public museums chiefly in my mind. I feel, however, that arrangements could be made to assist our country museums and local Natural History societies, and with regard to British insects I think it would be useful to have a single specimen of each species, arranged in families, so that they could be borrowed by country entomologists, who find it so difficult to name their specimens from books, and who have few opportunities of coming to London to consult our collections.

I have taken this opportunity of suggesting my scheme. I may not have hit upon the best plan; but I feel sure of this, that in the future we shall have recourse to some other means of determining our insects besides descriptions. A *good* figure backed up by a *good* description will as a rule enable you to determine a species with a fair degree of certainty, especially if it is a Lepidopterous insect. But the number of species figured bears a small proportion to the number described, and good figures of insects other than Lepidoptera are very scarce indeed.

When you consider the time spent in searching the ever-increasing literature, the weariness of reading long descriptions, the disappointment (to say the least of it) resulting from short ones, and the uncertainty attending the whole process, any plan that may help us to obtain a more rapid and more certain determination of our species is worth considering, and if what I have suggested would at the same time (as I believe it might) give us greater fixity in our nomenclature, the sooner such a collection is begun the better.

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SPECIAL INDEX.

The Arabic figures refer to the pages of the 'Transactions'; the Roman numerals to the pages of the 'Proceedings.'

April 14, 1908.

TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

For the Year 1907.

I. *Notes on the Indo-Australian Papilionidæ.* By Percy I. Lathy, F.Z.S., F.E.S.

[Read February 6th, 1907.]

Plate I.

I have recently been obliged to re-arrange the collection of Indo-Australian *Papilionidæ* belonging to Mr. Herbert J. Adams, F.E.S., owing to the acquisition of a very large amount of material from the Van de Poll collections. In the course of this work I came across many interesting facts hitherto not known, in spite of the attention that has been paid to this group; the results are these notes.

Only two forms are described as new, viz. the Andaman race of *P. agamemnon*, Linn., and a form of *P. stratocles*, Feld., from Mindoro.

I am enabled to establish the claim of *T. brookiana*, Wall., from Sumatra to be considered as a distinct geographical form, while *P. cacharensis*, Butl., must sink as a synonym of *P. doubledayi*, Wall. I also describe nine hitherto unknown females and one male.

Troides cleanor, Walk.

The three females of this form of *Troides* from Sumatra are all devoid of subapical white markings and correspond to the form recorded by Rothschild (Nov. Zool. vol. ii, p. 199) as ab. *eleanor*, Walk.; the locality of this aberration is unknown, but I think there is little doubt that this is the usual Sumatran form, therefore Walker's name must be applied to the sub-species. It is curious that Malacca specimens = *albescens*, Rothsch., should be much whiter than the Bornean examples and that the Sumatran females which one would have expected to be intermediate are so different.

Troides darsius, Gray.

An aberration of the male which has a black spot in each of discal yellow markings of hind-wing excepting post-cellular one.

Troides papuensis, Wall.

A remarkable aberration of the male which has a dirty white marginal border to fore-wing below.

One example from Stephansort, German New Guinea.

Troides dohertyi, Ripp.

A specimen of the male from Talaut which has distinct golden scaling on disc of hind-wing above; the discal yellow markings below rather more extended than usual.

Troides neomiranda, Fruhs.

♀. Ground-colour darker than in the female of *T. miranda*, Butl.; the upper adnervular whitish markings extending to cell and yellow markings of hind-wing larger; these differences apply to both upper and under surfaces of wings and on the under-side the marginal cream-coloured lunules are larger than in Butler's species.

2 ♀♀ from Sumatra.

Troides vistara, Fruhs.

♂. Differs from the other forms of *T. amphrysus* in having the adnervular markings of fore-wing greyish-white instead of yellow; the marginal black border of hind-wing is as in *T. niasicus*, Fruhs.

2 ♂♂ from Tanah Massa and Poelo Tello, Batu Isles.

Troides sumatranus, Hagen.

♀. The single female differs from the other forms of *amphrysus* females in having the ray-like markings of the fore-wing yellow instead of dirty-white ; the base of hind-wing is black, somewhat as in *T. vandepolli*, Snell.

Papilio palembanganus, Rothsch.

Mr. Adams has one male and three females; the male has one spot at apex of cell of hind-wing and has the upper submarginal spot; of the females one has one spot at apex of cell of hind-wing, the other two have no spot; they vary considerably in extent of white markings, in one of which they are greatly reduced; the submarginal spots are rather smaller and not so white as in Javan examples.

Papilio doubledayi, Wall.

A good series of specimens from Cachar, Malacca and Siam. I think *cacharensis*, Butl., must be treated merely as a synonym of this species. Two examples from Cachar sent in the same parcel as typical specimens are not to be distinguished from Malaccan forms; they have an even greater extent of white and none of the characteristics given by Rothschild to separate the two forms.

Papilio fehri, Honr.

An aberration of the male from Orahili, Nias, in which the red spots of hind-wing have almost entirely disappeared, being represented by a few reddish scales.

Papilio saturnus, Guér.

A curious aberration from Sumatra resembles *P. tellonus*, Fruhs., from the Batu Isles, in having an additional patch on hind-wing, in other respects however it agrees with the usual Sumatran form.

Papilio memnon, Linn.

A remarkable aberration of the male from Mt. Marapok, British North Borneo, in which the basal red spot of hind-wings below is much enlarged and suffused; the discal row of black spots strongly suffused with reddish scales; the submarginal row of black spots reduced.

Papilio memnon, Linn.

Among some of the more noticeable forms of females are ab. *achates*, Cram., with basal patch of fore-wing white, and another with basal patch orange; specimens from Banka with anal angle of fore-wing white and outer-margin also to near apex; an example from Nias with basal white patch of fore-wing suffused with reddish scales.

Papilio rumanzovius, Esch.

I am able to record a single female of the form *semperinus*, Haase, from Talaut. The band parallel to abdominal margin of hind-wing is pinkish-white, not scarlet.

Papilio acheron, Gr. Sm. (Plate I, fig. 2.)

A female from Mt. Kinabalus, British North Borneo, which appears to differ from the female described by Rothschild, Nov. Zool, vol. iii, p 65, 1896, in having a subapical white band on fore-wing above and below.

Papilio alphcios, Fruhs.

Fruhstorfer, in Iris, 1901, p. 343, gives this name to a female of the polytes group from Menado; Mr. Adams also has a female from the same locality. I think these ♀♀ belong to the tailless ♂♂ and are the Celebes form of polytes, Linn., and that *alcindor*, Oberthur, should be kept as a distinct species.

Papilio hewitsoni, Westw.

♀. Does not differ in any respect from the male. Four examples from Mt. Kinabalu, British North Borneo.

Papilio telesicles, Feld.

Among a long series of females of this variable species I find two interesting forms, one which agrees with ab. *leucothoides*, Honr., but has a strong purple gloss on anterior of fore-wings, this specimen unfortunately is without locality; the other is brown as in ab. *nepticula*, Rothsch., but fore-wings entirely without white markings and having a submarginal row of yellowish-brown spots; this form was obtained on Mt. Marapok, British North Borneo. From Sumatra Mr. Adams has two forms of female, one belonging to ab. *daja*, Rothsch., and the other to ab. *nepticula*, Rothsch.

Papilio ægialus, Dist. (Plate I, fig. 1.)

♀. Upper-side. Fore-wing olive-brown darker on outer-margin; the following white markings, a large patch at apex of cell extending beyond cell nearly to costa, three small discal patches, fascia on inner-margin, and a row of nine submarginal spots. Hind-wing dark brown, a large white patch almost filling cell and seven patches around cell of which the middle ones are short, a series of seven submarginal lunules, white spots, and a similar number of marginal white spots between nervules.

Under-side similar but paler and white markings more extended.

A single example from the Batu Islands; it may easily be distinguished from the same sex of *P. mendax*, Rothsch., by greater extent of white markings and absence of purple gloss.

Papilio brunei, Fruhs.

♀. Differs from the male in the same way as *evan*, Doubld., differs. The black markings of hind-wing are less than in the mainland form and the silvery markings of the hind-wing below are most distinct.

Six examples from Mt. Marapok, British North Borneo.

Papilio insularis, Stgr.

♀. Similar to male but slightly larger. A single specimen from Sumatra.

Papilio celebensis, Fick.

A single female from Talaut which apparently belongs to this form.

Papilio sarpedon, Linn.

A single specimen of the remarkable melanistic form figured by de Niceville, Journ. Bombay N. H. Soc., p. 54; n. 14, t. 4, p. 11. This was also obtained in Sumatra.

An aberration of the male from Java has a green spot at apex of cell of fore-wing.

Papilio milon, Feld.

An aberration of the male from Tondano, Celebes, with a submarginal row of indistinct green lunules on fore-wing above.

Papilio andamana, sub-sp. nov.

Differs from *P. agamemnon*, Linn., in the markings being bluish-green instead of yellowish-green; from the allied *P. decoratus*, Rothsch., from Nicobars, it may be separated by less amount of red markings on hind-wings below.

Seven males from the Andaman Isles.

Papilio macaristus, Gr. Sm.

♀. Similar to the male, but larger and the outer margin of fore-wing more rounded.

A single example from Mt. Kinabalu, British North Borneo.

Papilio xanthosoma, Stgr.

♀. Similar to the male but larger and the outer margin of fore-wing more rounded.

Two specimens from Sumatra.

Papilio stratoclides, sub-sp. nov. (Plate I, fig. 3.)

Similar to *P. stratocles*, Feld., but whitish markings of both wings above and below very much more extended, this being especially so in the discal markings of the hind-wings.

Hab. Mindoro.

I find that the firm of Staudinger and Bang-Haas have been sending out this sub-species as typical *stratocles*, Feld., and the true *stratocles*, Feld., as *stratoclides*, therefore the two forms are probably confused in many collections; the description of *stratoclides* was never published, this being the case in many of the names in Staudinger's list.

Explanation of Plate I.

[*See Explanation facing the* Plate.]

II. *On the Hymenopterous Parasites of Coleoptera.*[1] By ERNEST A. ELLIOTT, F.Z.S., and CLAUDE MORLEY, F.E.S.

[Read February 6th, 1907.]

THE subject of parasitism on Coleoptera does not appear to have been especially taken up by any Entomologist. Prof. Ratzeburg and a few of his contemporaries collected a large amount of information on the parasites of Forest insects in general, and the former studied a few Coleoptera —*Curculio notatus* and some of the bark borers—more particularly. The results are found in the "Ichneumonen der Forstinsekten," to which work (so little known in England) we are indebted for a great number of the records in the following paper. Marshall's records are all taken from other authors, but are useful in so far as they refer to the original records. Another valuable work is Giraud's posthumous "Liste des éclosions d'Insectes," in which, however, there occur manuscript names. Otherwise the records are mostly scattered through numerous British and Continental magazines, and are only to be discovered by laborious research. While not claiming to include every published record on the subject, or any great amount of original work, we trust that the following list will be found of sufficient interest to encourage others to carry on the work, both by means of personal observation and by bringing to our notice records we may have overlooked.

1. *Calosoma sycophanta*, Linn.

"Once I caught a large, fat larva of *Calosoma*, and put it in spirits of wine. Soon afterwards it burst, and little larvæ of *Microgaster* thronged out; over a hundred lay closely piled up together, with the anal extremity turned towards the abdominal end of the larva." (Ratz., Ichn. d. Forst. i, 23, footnote; host specified at *lib. cit.* ii, 212.)

[1] The Coleoptera bearing an asterisk are extra-British. The numbers in small type after the parasites' names refer to those *prefixed* to the "Classified List of Parasites," *post.*

2. *Carabus violaceus*, Linn.

Dr. Ratzeburg says of his *Phygadeuon campoplegoides*[9] (*l.c.* ii, 124): This remarkable little pair came from Herr Drewsen, who writes as follows: "Out of *Tachina pacta*, which, as is well known, lives in *Carabus violaceus*." The synonymy of this Cryptid is still doubtful (cf. Morley, Ichn. Brit. ii, 88).

3. *Nebria brevicollis*, Fab.

Van Vollenhoven (Pinac. fol. xxxi) says: "Curtis bred *Proctotrypes* (?) *viator* from the larves of *Nebria brevicollis*." This refers to the latter's statement (Farm Insects, 198) "that on opening the cells of the specimens of this beetle sent to me by Mr. Graham, I found one partly consumed, and the other had produced six specimens of *Proctotrupes viator* (?): thus showing that this parasite keeps in check . . . the larvæ of ground beetles."

4. *Nebria gyllenhali*, Sch.

5. *Patrobus assimilis*, Chaud.

In describing *Oresbius castaneus* from the top of Garbhavel, near Loch Rannoch, the Rev. T. A. Marshall (E. M. M. iii. [1867], p. 194) writes: "This species may be suspected of being a parasite of *Nebria*, *Patrobus*," etc. *N. gyllenhali* would be the only British species of the genus at that altitude—3,500 feet.

6. *Pterostichus vulgaris*, Linn.

Curtis says the larvæ of *Omaseus melanarius*, Ill., are "frequently infested by a parasite called *Proctotrupes viator*" (Farm Insects, 131).

7. *Gyrinus natator*, Scop.

Mr. F. Bouskell tells us that, in 1894, he bred two or three different sorts of parasites from pupæ of this beetle found by him on reeds at the Cropstone reservoir in Leicestershire. "Mr. Parfitt first bred ♂♂ of his *Hemiteles gyrini*,"[16] says Morley (Ichn. Brit. ii, 163), "from spring pupa-cases, and Bignell also raised it, from pupæ of *Gyrinus natator* found by the Rev. J. Hellins upon rushes on the banks of the Exeter Canal, of which the latter has allowed me to examine both sexes; it is later recorded as bred from the same host, together with *Pezomachus* (?) *viduus*,[24] Först. One is led to wonder whether the latter could have been a dimorphic ♀ of the same species." Of *H. persector*, he says (*lib. cit.* 160), "bred from some pupæ of *Gyrinus natator*, collected by the Rev. J. Hellins, from rushes on the banks of the Exeter canal. It did not, however, emerge till later than *H. gyrini* (*argentatus*, Grav.), with which it appears to be associated."

8. *Phlœopora reptans*, Grav.

Morley (Ichn. Brit. ii, 134) took *Hemiteles areator* in February 1899, associating, though perhaps accidentally, with this beetle beneath pine bark, near Ipswich.

9. *Myrmedonia collaris*, Payk.

A ♀ of *Microcryptus nigrocinctus* was taken in Wicken Fen in Cambs., by Donisthorpe, associating with this beetle, which it much resembles, in a nest of *Myrmica lævinodis* (*cf.* Morley, Ichn. Brit. ii, 42).

10. *Creophilus maxillosus*, Linn.

Marshall writing of the common Braconid, *Alysia manducator* (Bracon. d'Europ. ii, 377) says: "On a vérifié leur parasitisme dans les larves de *Lucilia* . . . et ce, qui semble plus remarquable, dans les larves formidables du coléoptère *Creophilus maxillosus*, L., qui habitent constamment les cadavres." We have repeatedly captured this parasite on carrion.

11. *Ocypus olens*, Müll.

A beetle-larva, twenty-two millimetres in length, was dug up from beneath the surface of the ground in Mr. Morley's garden (Monks Soham House, Suffolk) on 9th Sept. 1905. This, there can be no doubt, is that of *Ocypus olens*—as figured by Westwood (Mod. Class. i, 166, fig. xvi, 1), since *Creophilus* feeds in carrion, etc. This larva was placed in a chip box and, the following day, had become moribund with seventeen hymenopterous larvæ protruding from its ventral surface. The latter lived till October and all assumed the pupal state, the first three on 28th Sept., of which two (in the fifth segment) alone assumed the blackness of maturity. Unfortunately they all died—probably through lack of moisture—in the position and situation indicated below.[1]

Third segment (between the intermediate and hind-legs) three protruded ; two from the centre and one a little to the right side ; two with head and half thorax discovered, and one—the hinder central—with only half its head showing.

Fourth segment (well behind the hind-legs) three ; two from the centre and one a little to the left side ; all with head and thorax, and the hindmost slightly more, protruded.

Fifth segment, four ; two from the centre, a third slightly before and to the right of the first central one, and the fourth level with and to the left of the second central ; the foremost central is the furthest protruded and most fully developed of all, being held *in situ* only by its fifth abdominal segment and anus, the right-hand one is next fully developed with its fourth segment and anus still encased, the hinder central has little more than its basal segment protruded and the left-hand one has exserted only its head and fore part of thorax.

Six to tenth segments all bear one equally developed parasite, exposed to about the base of the mesothorax.

Eleventh segment, two ; the basal considerably to the right and the apical exactly in the centre and so close to the anus as to have nearly severed the host's conical anal proleg, which is thrust obliquely aside.

Even the most advanced specimen is much too immature to guess specifically. The only reliable feature discernible is a distinct central longitudinal carina throughout the metathorax; this at once precludes the parasites from the Ichneumonidæ and, combined with their general facies, lends strong probability to their appertaining to the Braconid genus *Apanteles*, many of whose species (*A. salebrosus*, Marsh., etc.) possess such a central carina. But they did not evacuate their host, nor spin the least trace of cocoons—simply protruded in their larval, subsequently pupal, skins.[2]

[1] The body of the host from the fifth segment to the anus is so distorted by the parasites that it is only the manner in which they themselves are grouped which enables the distinction of the segments to be surmised.

[2] "Many years ago, I found under a stone a shrunken beetle larva, which undoubtedly belonged to the *Staphylinæ*, dead. In it were several parasites in naked pupal state : these proved to be *Codrus pallipes*,[428A] Jur." (Kawall, Stett. Ent. Zeit. 1855, p. 260).

12. *Cafius xantholoma*, Grav.

12*a*. *Micralymma brevipenne*, Gyll.

Mr. E. A. Newbery has found *Platymischus dilatatus*, Westw., to be parasitic upon this *Cafius* at Plymouth, in May 1895. And at Berl. Ent. Zeit. 1859, p. 98, we find that "Mr. George Wailer undoubtedly observed, at Newcastle, that *Platymischus* was parasitic on *Micralymma brevipenne*, Gyll."; attention is also there drawn to the occurrence of such a parasite on an at times submarine host.

13. *Teretrius picipes*, Fab.

Westwood (Mod. Class. i, 182) writes: "*Paromalus picipes*, according to Dalman, is parasitically attacked by *Pteromalus micans*"[288] and refers to the Swed. Trans. 1822. At *lib. cit.* ii, 159, he adds: "*Perilampus micans* was always observed upon posts perforated by . . . *Hister picipes* by Dalman."

14. *Anatis ocellata*, Linn.

On 10th August, Ratzeburg (Ichn. d. Forst. i, 211) boxed a larva of *Coccinella ocellata*, which he thought unusually large and sluggish, and probably parasited. It devoured a larva of *Lophyrus*, but would subsequently eat nothing. Soon it affixed its anus to a leaf and became motionless, but without pupating. In the following spring he found his *Eupelmus Eytelwcinii*[283] dead in the box and a small hole in the side of the larva's back; it may have emerged the preceding autumn. The larva had retained its natural form, and had only lost its red and white spots. Five years later (*lib. cit.* ii, 145) he discovered two more specimens of the same parasite in the box, in which the larva had been left; a second hole was then found in the larva's skin. He thought these later specimens could have but recently emerged, since he had often examined the box in which they had been kept.

15. *Coccinella quinquepunctata*, Linn.

Marshall (Bracon. d'Europ. ii, 45), writing of *Perilitus terminatus*, says: "Audouin, dans son mémoire 'Sur le Parasitisme des Insectes,' nous a laissé une indication des habitudes de cette espèce. Il s'est assuré qu'un individu était sorti d'un coléoptère du genre *Coccinella*, soit *septempunctata* soit *quinquepunctata*, L. Des expériences ultérieures faites par Ratzeburg ont démonstré l'exactitude de l'observation d'Audouin." Bignell (Trans. Devon. Assoc. 1901, p. 662) adds that when full-fed the larva of the *Perilitus* issues from the sutures of the perfect ladybird's ventral segments and that the latter afterwards coalesce, leaving no visible aperture. On emerging the parasitic larva spins a pyriform cocoon, interlacing the dead beetle's legs and so holding its body as an additional rampart against possible enemies.

16. *Coccinella septempunctata*, Linn.

"M. V. Audouin . . . has informed me that he had observed that *C. 7-punctata* is subject to the parasitic attacks of *Microctonus terminalis*,[213] Wesm., and *Encyrtus flaminius*, Dalm." (Westw. i, 397 et ii, 159). "Audouin has obtained *M. terminalis* from the perfect *Coccinella 7-punctata*, the larva of the former bursting forth and spinning its cocoon beneath the body of the latter" (*lib. cit.* ii, 142). Also referred to by Kirby and Spence [misprinted *C. 17-punctata* in 7th Ed. 1859, p. 155]; Marshall (Bracon. d'Europ. ii, 45) and Ratzeburg (Ichn. d. Forst. iii, 61), who tells us that Bouché (*lib. cit.* i, 122) several times bred *Bassus exultans*,[94] Grav., from this host. Morley (Ichn. Brit. ii. 235) also bred a couple of ♀♀ *Pezomachus fasciatus* from a single pupa of this beetle at Ipswich in 1894.

17. *Megilla maculata*, DeG.*

"Il est maintenant bien constaté que la *M. maculata* des Etats-Unis . . . est infesté par des parasites du genre *Perilitus*" (Marsh., Bracon. d'Europ. ii, 45). Cf. also *Centistes americana*, Riley, Insect Life, 1888, p. 101.

18. *Endomychus coccineus*, Linn.

Referring to Curtis' discovery of this species' larvæ, Westwood (Mod. Class. i, 394) says, "some were attacked by a Chalcidideous parasite." Cf. also *lib. cit.* ii, 159, *et* Ratz., Ichn. d. Forst. ii, 187. Of these larvæ, Curtis (B. E pl. 570) simply says, "some of the largest seemed as if they were either dead or in a torpid state, but these proved to have been punctured by a little parasite allied to *Gnatho dispar* (*Colax*, pl. 166), a great number of which afterwards hatched." From Curtis' MS., Walker described this parasite (Ent. Mag. 1836, p. 496) as *Pteromalus Endomychi*, "reared by Mr. Curtis, from the larva of *Endomychus coccineus*."

19. *Triplax russica*, Linn.

Under *Meteorus obfuscatus*, Marshall (Bracon. d'Europ, ii, 92) tells us, on the authority of Dr. Reinhard, that in the Sichel collection, in Paris, ten of these parasites are preserved, which were bred by Lespès from this beetle; he expressly says that they emerged from the larvæ and not from the imago, "An den Nadeln sind noch die Käferlarven mit dem Cocon der Parasiten befestigt."

20. *Meligethes æneus*, Fab.

C. G. A. Brischke gives (Schr. Nat. Ges. Danz. 1880, p. 193) *Thersilochus morionellus*, Holmgr., a small Ophionid, as parasitic upon *Meligethes ænea*.

21. *Meligethes viridescens*, Fab.

Dr. Alexandre Laboulbène, in his "Liste des éclosions d'Insectes," observed by Giraud (Ann. Soc. France, 1877, p. 424), instances the emergence of *Callimome difficilis*,[289] Nees, which is usually parasitic upon the Bedeguar gall-flies, from this beetle.

22. *Synchita juglandis*, Fab.

A single ♂ of *Brachistes destitutus* [237] was bred by Herr Nördlinger from *S. Juglandis* in hornbeam in Germany (Ichn. d. Forst. ii. 28).

23. *Læmophlœus ferrugineus*, Steph.

24. *Typhæa fumata*, Linn.

Morley (Ichn. Brit. ii, 141) says he has found *Hemiteles subzonatus*, Grav., beneath the bark of a felled log full of these two species of beetles in May, at Wherstead, in Suffolk.

25. *Dermestes.*

26. *Anthrenus.*

Westwood (Mod. Class. ii, 143) writes, "other species" of Ichneumonidæ and Braconidæ "(*Hemiteles areator*, etc.) also frequent our dwellings, to deposit their eggs in the larvæ of *Dermestidæ, Anthreni, Tineæ*, and other domestic insects." These vague and general statements are dangerous, since the above is undoubtedly the foundation of Taschenberg's apparently established fact (Zeits. Ges. Nat. 1865, p. 130) under *H. areator*, Panz.: "Wurde erzogen . . . aus *Dermestes—Anthrenus*—und *Tineen*—Larven"; and Ratzeburg (Ichn. d. Forst. i, 151) takes the same view. Cf., however, Morley, Ichn. Brit. ii, 133.

27. *Sinodendron cylindricum*, Linn.

Keys first took localised British specimens of *Histeromerus mystacinus*, Wesm., on 14th August, 1901, from the burrows of this beetle; and ten days later Bignell and he discovered three of these coleopterous larvæ each surrounded by about a dozen apparently full-fed larvæ of this parasite, which had evidently just emerged from the bodies of the former (cf. Trans. Devon. Assoc. 1901, p. 666). Nördlinger bred *Eupelmus inermis* [280] from an ailing beech in the Swabian Alps, in Würtemburg, in which this beetle, among others, was boring (Ichn. d. Forst. ii, 152).

28. *Oryctes nasicornis*, Linn.*

In his Wirths-system, Ratzeburg simply gives (Ichn. d. Forst. ii, 215) *Pimpla instigator*, Fab., as parasitic upon *Scarabæus nasicornis*; no mention of it seems to appear in the text.[1]

29. *Buprestidæ*.

Most of the unspecified *Buprestes* given by Ratzeburg (*lib. cit.* i, 23; ii, 212; iii, 249) are either subsequently

[1] This record must, I think, be based upon Passerini's "Osservazioni sulle Larve, Ninfe, etc." (Pise, 1840; cf. also Guérin-Méneville in Revue Zoolog. 1841, p 240). He found that *Scolia flavifrons* places its eggs on the larva of *Oryctes nasicornis*, and the larvæ when hatched feed by introducing the three capital segments into the belly of the beetle-caterpillar, always between the sixth and seventh segments (*cf.* Kirby and Spence, Introd. 7th Ed. 1859, p. 195). This parasitic Fosser is not British; "the genus *Tiphia* is the only representative of the family *Scoliadæ*, being closely allied to the genus *Scolia*. . . . . *Tiphia femorata*, I have every reason to believe, to be the parasite of a species of *Aphodius*; I have several times found it beneath the droppings of cows and horses" (Smith, Ent. Ann. 1862, p. 77). Gravenhorst, of course, mentions no Aculeata, but gives *Ichneumon flavifrons*, Schr., with a note that Schäffer's figure of it resembles *Pimpla instigator*, Fab. Ratzeburg, it is highly probable, draws his erroneous inference from this association.—C. M.

named or their parasites again bred from recognised hosts of the same genus (*sensu lato*). *Lissonota catenator*,[73] however, one ♀ of which was bred by Bachmann, "from an unknown beetle larva, in rotten lime wood" (iii. 107); *Spathius curvicaudis*, of which Nördlinger bred a single ♀, from a beetle larva, boring in the manner of *Buprestis* (i. 50), and *Pteromalus guttatus*, were not so assigned.

30. *Chalcophora mariana*, Linn.*

Dr. Leop. Kirchner, in his 1867 Cat. Hym. Europæ, p. 107, under *Ephialtes manifestator*, Linn., writes, "Schmarotzer von *Buprestis Mariana*," probably basing his statement upon Ratzeburg's record (Ichn. d. Forst. i. 119) that a fine and large pupa of this Pimplid cut its way out of an old fir stump, in which, judging solely by the borings, larvæ of *B. Mariana* had lived. This record must, however, be regarded with doubt since no one nowadays quite knows what the Linnean parasite was![1]

31. *Dicerca berolinensis*, Herbst.*

We are also indebted to Kirchner (Cat. 115) for the record of *Doryctes imperator* as parasitic upon this beetle; it is copied by Marshall (Brac. d'Europ. i. 229).

32. *Anthaxia quadripunctata*, Linn.

From fir wood, in which larvæ of *Buprestis 4-punctata* were living, Ratzeburg (Ichn. d. Forst. iii, 44) bred a single ♀ of his *Exothecus lignarius*[183], which is extremely like *Spathius brevicaudis*, but with the petiole broader and parallel nervure different; the latter parasite was bred plentifully from the same beetle and locality. *Pimpla*

[1] That *Ephialtes rex*, Kriech., rather than *E. imperator*, Kriech. (as indicated by Schmiedeknecht, Opusc. Ichn. xiv, 1120), was described under the name *E. manifestator* by Gravenhorst (Ichn. Europ. iii, 232) was recognised by Marshall (Brit. Cat. 1872, p. 85), and I certainly think the description of the abdominal segments as bearing "tuberculo laterali obsoleto" is sufficient to establish the fact, especially it *excl. indiv. stigmate nigro* be added; cf. also Thoms. Opusc. Ent. xii, 1249. The *Ichneumon manifestator*, whose economy is so interestingly recounted by Thomas Marsham (Trans. Linn. Soc. iii [1794], pp. 23-29 et pl. iv.) must doubtless be referred to the common *Ephialtes carbonarius*, Christ.—the *Musca tripilis secunda* of old Mouffet, 1634, p. 64—on account of the lack of abdominal tubercles and its length not exceeding eight lines.—C. M.

linearis (iii, 99) and the rare *Eusandulum abbreviatum* (iii, 200) probably preyed upon the same host, emerging late in the season, the latter from fir billets. *E. lignarius*[183] is indicated as a parasite of this species, with no query, by Kirchner (Cat. 112); but Marshall (i, 265) simply gives *Clinocentrus lignarius* as a "parasite supposé" and insufficiently described.

33. *Agrilus biguttatus*, Fab.

Ratzeburg says that his *Exochus compressiventris* (Ichn. d. Forst. ii, 121, queried as a true parasite at ii, 212) was probably bred from *Buprestis biguttata*: "The present ♀ was in the thick bark of a strong oak, in which I was seeking for Buprestidæ." It is associated with no query by Kirchner (Cat. 82). *Spathius radzayanus* is another doubtful parasite upon this beetle: Herr Radzay (Ichn. d. Forst. ii, 43) bred it from an oak in which *Curculio depressirostris*, *Buprestis biguttata* and several species of *Clytus* were all burrowing and to which they were doing considerable injury.

34. *Agrilus viridis*, Linn.

From this beetle, Kirchner (Cat. 114), says that *Corystes aciculatus*,[156] Reinh., has been bred. Ten ♀♀ and one ♂ of *Eulophus agrilorum*[396] were bred by Ratzeburg (Ichn. d. Forst. i, 169) in June from a beech knot, in which was *Agrilus nocivus*, Ratz.; and Reissig (*l. c.* iii, 242) also bred *Pteromalus æmulus* from the same variety of *A. viridis*.

35. *Throscus dermestoides*, Linn.

The anomalous *Pachylomma buccata* is given by Ratzeburg (*lib. cit.* ii, 53) as having been taken by Hartig flying round *Throscus adstrictor*, with the supposed intention of ovipositing therein. Marshall, however, who treats this parasite as an aberrant member of the Braconidæ, quotes (Bracon. d'Europ. ii, 625) his own and Giraud's observations upon the association of *Pachylomma* with ants; and adds: "après les observations faites sur *P. cremieri*, constatant les rapports qui existent entre les *Pachylomma* et les fourmis, on est autorisé à rejecter tout opinion contraire."

36. *Agriotes*.

There appears to have been no record of parasitism in the Elateridæ since Kirby said (Introd. Ent. 7th Ed. 1859,

p. 154): "Mr. Paul has shown me the destroyer of the wire-worm, which belongs to Latreille's genus *Proctotrupes*."

37. *Malachius æneus*, Linn.

We have a very uncertain record concerning this beetle: Herr Reissig (Ichn. d. Forst. iii, 109) bred *Ephialtes glabratus* from spruce cones, together with *Tortrix strobilana*, *Anobium* and *Malachius æneus*. Which it had preyed upon remained uncertain.

38. *Dasytes.*

Under *Mesostenus ater*, Kirchner writes (Cat. 57): "Nördlinger erzog ihn aus einem alten Buchenstocke, worin *Melandrya*, *Sphex* und *Dasytes* gehauset." A single ♂ of this parasite was bred by Nördlinger from an old beech stump, in which *Melandrya*, [? *Sphex* and *Dasytes*] were boring (Ichn. d. Forst. iii, 143). *Ephialtes gracilis* [40] has also been several times bred from oak (*l. c.* iii, 109); sometimes a *Dasytes* appeared with it, at others a *Raphidia* or *Crabro*.

39. *Dasytes niger*, Linn.

Campoplex pusillus [104] and *Ephialtes gracilis* [40] are indicated by Ratzeburg (*lib. cit.* iii, 249) as preying upon this species.

40. *Dasytes cœruleus*, Fab.

At Schr. Nat. Ges. Danz. 1880, p. 110, Brischke describes his *Ephialtes discolor*, and adds: "Aus Lindenstöcken mit *Dasytes cœrulea* und *Exenterus balteatus* erzogen." This may be Ratzeburg's *Pimpla lignicola* [67] (Ichn. d. Forst. iii, 98), which he found in worm-eaten oaks tenanted by *Dasytes cœrulæus*.

41. *Thanasimus formicarius*, Linn.[1]

Ratzeburg (*lib. cit.* iii, 249) records *Hemiteles melanarius* and, with doubt, *H. modestus* [18] and *Bracon palpebrator* as parasitic upon *Clerus formicarius*. [Cf. also *Mesostenus brachycentrus*, under *Hylesinus crenatus*, *post.*] Marshall (Bracon. d'Europ. i, 167) does not note this doubtful

[1] Stephens (Illust. Suppl. 8) says of *Perilampus micans*, Dalm., "found in company with *Lyctus oblongus* and *Tillus unifasciatus*," on new oak palings at Camberwell.

association of the Braconid, but expresses his opinion that it is closely allied to, if not actually identical with, *Clinocentrus exsertor*, Nees.

42. *Hylecœtus dermestoides*, Linn.

From this species, Wissmann bred in Germany (Ichn. d. Forst. ii, 69) several specimens of *Aspigonus diversicornis* [255] and perhaps also a species of *Helcon*.

43. *Ptinidæ*.

Another of Westwood's general statements (Mod. Class. ii, 143) is: "A small, pretty, spotted-winged *Cryptus* enters our houses to prey upon the larvæ of the *Ptinidæ*; as do also *Spathius clavatus* [147] and *Hecabolus sulcatus*"; the first-named is certainly *Hemiteles areator*, Panz. (cf. Morley, Ichn. Brit. ii, 133). *Ptinus fur* and *Niptus hololeucus* are, however, the only common domestic *Ptinidæ*, and there is no record of hymenopterous attacks upon these species.

44. *Hedobia imperialis*, Linn.

Westwood may, however, be correct in the above statement, since the parasitism of *Hemiteles areator* upon *Ptinus imperialis*—by no means a domestic species, at least in Britain—is recorded by Ratzeburg, who says (Ichn. d. Forst. iii, 153) that Nördlinger bred this parasite at Hohenheim from old acacia posts together with *P. imperialis*. The latter also bred (*l. c.* ii, 152) *Eupelmus inermis* [280] from an ailing beech in which this beetle, among others, was dwelling.

45. *Dryophilus pusillus*, Gyll.

Brachistes interstitialis [236] (*l. c.* i, 54) and *Bothriothorax fumipennis* (iii, 194) were bred by Nördlinger at Stuttgart from, respectively, dry spruce twigs and a larch branch, in which *Anobium pusillum* was boring.

46. *Anobium*.

Westwood says (Mod. Class. ii, 159), "I have observed *Perilampus angustus* [287] on palings perforated by *Anobia*." Ratzeburg quotes this, and adds *Entedon confinis* from France (Ichn. d. Forst. i, 66), a ♂ *E. longiventris* in a German fir twig, *Xorides cryptiformis* (iii, 115) and *Hemiteles palpator* [27] of which Wissmann cut several out of oak bark in which *Anobii* had probably lived (ii, 130); *Lissonota arvicola* [71] was bred by the same observer (ii, 98 et iii, 98) from beech logs inhabited by *Anobii* and *Ptilini*; and numerous *Taphæus fuscipes* [262] were found on old worm-eaten wooden bathing-houses (*l. c.* iii, 60) whence they were conjectured to have emerged from *Anobii* by Brischke, who once took *Diospilus capito* in abundance on old wood, probably from the same host (Schr. Nat. Ges. Danz. 1880, p. 123). Marshall gives *Calyptus tibialis* (Bracon. d'Europ. ii, 149) as another "parasite supposé" of this genus.

47. *Anobium domesticum*, Fourc.

Bracon spathiiformis [173] was certainly bred from *Anobium striatum* in hazel, by Nördlinger in France (Ichn. d. Forst. ii, 37). It is possible that this parasite—which is Haliday's *Doryctes obliteratus*, Ent. Mag. iv, p. 44 (*nec* Nees et Wesm.)—was really *Spathius clavatus*,[147] Panz., mentioned by Brischke (Schr. Nat. Ges. Danz. 1880, p. 137), "aus Larven von *Anobium striatum* erzogen." Bouché certainly bred the latter from this host, and Mr. A. J. Chitty has recently bred several *Doryctes spathiiformis* at Huntingfield in Kent from dead whitethorn sticks containing *A. domesticum* and *Priobium castaneum*. Rev. W. F. Johnson has recorded (E. M. M. 1901, p. 15) *Spathius exarator*, Linn., on Morley's authority, as commonly parasitic on *A. domesticum* in the central pillar of a large rosewood table, in Ireland; and Marshall also indicates the same host. Wissmann bred *Hemiteles modestus* [18] from *A. striatum* in old woodwork (Ichn. d. Forst. ii, 129 et iii, 154), as well as *Rogas collaris* [252] (*l. c.* ii, 66); and the association of *Hemiteles bicolorinus*, Grav., is suggested by Morley (Ichn. Brit. ii, 131). Donisthorpe bred a Chalcid at Rye in August 1902, from the burrows of this beetle. Mr. A. Sich took a ♀ of *Spathius exarator*, Linn., investigating the burrows of *A. domesticum* at Chiswick on 14th August, 1906.

48. *Anobium* (*Ernobius*) *angusticolle*, Ratz.*

Marshall simply says of *Aspidogonus abietis*, Ratz. (Bracon. d'Europ. ii, 253), "Il habité les pommes de pin, en société avec les *Anobium abietis*, Fab., et *angusticolle*, Ratz.," which, however, certainly points to parasitism; especially since Wissmann (Ichn. d. Forst. ii, 69), who actually bred it, expresses no doubt upon the subject.

49. *Anobium paniceum*, Linn.

At Hohenheim Nördlinger bred a ♀ *Eulophus pilicornis*, probably from this host, upon which are also said to prey (Ichn. d. Forst. ii, 154 et 211) *Entedon longiventris* and perhaps *Pteromalus brevicornis.*

50. *Anobium denticolle*, Panz.

Morley states (Ichn. Brit. ii, 133) that Mr. Donisthorpe has found *Hemiteles areator*, Panz., in the burrows of *A. denticolle* in England, in March; it may, however, have been no more than hibernating therein.

51. *Anobium consimile*, Muls. (? *Ernobius mollis*, Linn.)

52. *Anobium* (*Ernobius*) *longicorne*, Sturm.*

In Dr. Giraud's paper on Eclosions d'Insectes (Ann. Soc. Fr. 1877, p. 419), Laboulbène tells us that M. Perris bred *Eusandulum inerme*, Ratz., from both *Anobium consimilis* and *A. longicorne*, and earlier (p. 415) that *Spathius anobii*,[148] Gir., was also raised from the latter host, together with (p. 411) *Eubadizon brevicaudis*, Gir.

53. *Anobium rufipes*, Fab.*

Sigalphus aciculatus[188] is said by Ratzeburg (Ichn. d. Forst. iii, 249) to prey upon this species.

54. *Anobium pertinax*, Linn.*

Marshall (Bracon. d'Europ. i, 194) gives this species as an alternative host of *Spathius exarator*, Linn.

55. *Trypopitys carpini*, Herbst.*

From this host, Ratzeburg (Ichn. d. Forst. ii, 211) says that he raised his *Microgaster rufilabris.*

56. *Ernobius abietis*, Fab.

The following species are indicated as having been bred from *Anobium abietis* (Ichn. d. Forst. ii, 211 et iii, 249): *Pimpla strobilorum*,[42] *Aspigonus abietis*,[256] *Brachistes punctatus*,[238] *Bracon scutellaris*, *Pteromalus Hohenheimensis*, *P. strobilobius* and, doubtfully, *Ephialtes glabratus.* Of these Nördlinger bred in Würtemburg both sexes of *Asp. abietis* from fir cones infested especially by this beetle and, in a lesser degree, by *Tortrix strobilana*; Saxesen bred it in the

Hartz; and Wissmann expressly states that he "bred it from *A. abietis* and *angusticolle*"; Reissig, however, who has bred it most frequently, asserts it to prey upon the above *Tortrix*; Ratzeburg believed it was parasitic upon both the Lepidopteron and Coleoptera (*lib. cit.* i, 56 et ii, 69). Nördlinger also bred the *B. punctatus* twice singly at Hohenheim (ii, 28 et iii, 244) from spruce cones along with *Anobium abietis.* Giraud, too (Ann. Soc. Fr. 1877, p. 412), bred *Aspigonus abietis,* Ratz., from "*Anobium abietis*, dans cônes du sapin," as well as (p. 427) *Anogmus abietis,* Gir.

57. *Ptilinus pectinicornis,* Linn.

Curtis first (B. E. pl. dvii) bred his *Hecabolus sulcatus* from this beetle. Ratzeburg found (Ichn. d. Forst. ii, 215) it was preyed upon by his *Hemiteles completus* which Reissig (*l. c.* 130) bred from this beetle in poplar in the middle of May, *Eupelmus inermis*[280] and, perhaps, *Lissonota arvicula,*[71] *Polysphincta elegans, P. soror,* with *Xorides cryptiformis.* None of these were raised from it by Giraud (Ann. Soc. Fr. 1877, pp. 415 et 419), who says *Spathius clavatus,*[147] Panz., and *Halticella rufipes,* Oliv., attack it. The original parasite, *H. sulcatus,* Curt., was again bred from it by Brischke (Schr. Nat. Ges. Danz. 1880, p. 136); and Wissmann (Ichn. d. Forst. ii, 35) bred a great number of ♂ ♂ only, which were even more like Curtis's illustration than those from *Ptilinus costatus.* Haliday (Ent. Mag. iv, p. 49) bred it from the same host.

58. *Ptilinus costatus,* Gyll.*

A male and two females of *Bracon* (*Hecabolus*) *sulcatus* were taken by Hartig on willows in the act of investigating the borings of this beetle (*l. c.* ii, 34); and Reissig bred a single specimen of *Pteromalus distinguendus,* Först., from the same host (iii, 233) in poplar wood.

59. *Ochina hederæ,* Müll.

Writing of this species (Mod. Class. i, 272), Westwood tells us: "A. Cooper, Esq., R.A., has informed me . . . that it is preyed upon in the larva state by *Cleonymus depressus.*" Wissmann repeatedly bred *Spathius erythrocephalus* from *Anobium Hederæ* (Ichn. d. Forst. ii, 43); Nördlinger bred both sexes of *Sigalphus aciculatus*[188] from this beetle at Grand Jouan, in France (ii, 27); together with *Sigalphus facialis*, from old ivy stems (iii, 27), and quantities of *Bracon sulcatus* [157] (iii, 32); *Pteromalus elongatus* was also bred by him at Ludwigsberg from ivy stems along with the same host (iii, 244). *Spathius clavigcr* is recorded (Ann. Soc. F. 1877, p. 415) upon Perris' authority from *Blastophagus hederæ* by Giraud; and *Ochina ptinoides* is given by Marshall (Bracon. d'Europ. i, 207) as a host of *Hecabolus sulcatus*, Curt.

60. *Mesocœlopus niger*, Müll.

The host of *Pteromalus Opisthotonus* [358] has not been bred anywhere else, says Ratzeburg (Ichn. d. Forst. ii, 194); according to Reissig it is *Xyletinus murinus*; and the parasite emerged on 11th June, from an old woody fungus on oak.

61. *Dorcatoma dresdensis*, Herbst.*

Nees says of *Bracon ephippium* [259]: "E larvis Dorcatomæ Dresdensis, Boleto igniario nutritis, *Sickershusi*, mense Maio *mares* et *feminæ* exclusi sunt" (Hym. Ichn. aff. Mon. i, 65). This is quoted by Kirchner (Cat. 132) and Marshall (Bracon. d'Europ.).

62. *Dorcatoma setosella*, Muls.

From *Dorcatoma setosella*, Laboulbène records (Ann. Soc. Fr. 1877, p. 435) the curious *Cephalonomyia formiciformis*, Westw.

63. *Sinoxylon sexdentatum*, Oliv.*

Upon the authority of Perris, Giraud (*lib. cit.* p. 435) gives *Cephalonomyia formiciformis*, Westw., as parasitic upon this beetle.

64. *Bostrychus capucinus*, Linn.

Perris tells us vaguely (Ann. Soc. Fr. 1850, t. viii, p. 565) that *Apate capucina* is attacked by some Braconid, which he was unable to determine.

65. *Xylopertha sinuata*, Fab.*

Apate sinuata and *Eccoptogaster intricatus* were both thought by Ratzeburg (Ichn. d. Forst. ii, 187) to be parasitised by *Pteromalus bimaculatus*; a large specimen of which emerged from an oak stick containing larvæ of the above beetles. He also queries (ii, 211) *Helcon carinator* as preying upon *Bostrychus sinuatus*.

66. *Lyctus canaliculatus*, Fab.

Dalman, according to Westwood (Mod. Class. ii, 159), always observed *Perilampus micans* upon posts which had been perforated by this species; but no direct association appears to be established, although Ratzeburg (Ichn. d. Forst. i, 23 et ii, 215) and Stephens (Illust. Suppl. 8, on *L. oblongus*) refer to the same subject. Giraud, however (Ann. Soc. Fr. 1877, p. 419), says he has bred *Eusandulum inerme*, Ratz., from this beetle. Mr. E. A. Newbery sent me in July (18, vii, '01) two ♀♀ *Eubadizon pallidipes*, Nees, "taken in Middlesex, while intruding their long spiculæ into the burrows of *L. canaliculatus* in an oak fence" [C. M.]. Bignell also records this parasite (Trans. Devon. Assoc. 1901, p. 682) "busy depositing eggs in a wood-boring beetle, infesting oak fencing," in London; this probably also applies to the present Coleopteron, since Mr. Newbery informs us he sent the latter some of these parasites. We have received from Mr. E. C. Bedwell two ♀♀ *Eubadizon pallidipes*, Nees, which "with others were running about on an old park paling fence at Ashstead in Surrey, which was riddled with borings of *Lyctus canaliculatus*; they seemed to run from hole to hole, some of which they partly entered. The *Lyctus* was abundant at the time"; 24th June, 1905.

67. *Lyctus brunneus*, Steph.

Eubadizon pallidipes, Nees, has also been captured by Mr. Donisthorpe, in the act of ovipositing in the burrows of this beetle, at Southfields, in 1904.

68. *Cis boleti*, Scop.

P. F. Bouché describes, in his Naturgeschichte der Insecten (1834, p. 149), a parasite of this species under the name *Bracon cis*—referred to by Westwood (Mod. Class. ii, 143). This Nees synonymised with *Meteorus atrator*, Curt.; but Marshall (Bracon. d'Europ. ii, pp. 96 et 119) thinks it certainly referable to *M. profligator*, Hal., of which Bignell (Trans. Devon. Assoc., 1901, p. 682) bred nine examples from the larvæ of this Coleopteron, in *Polyporus versicolor*, early in August 1885. *M. filator*, Hal., is also sometimes found abundantly in the same kind of fungus, though no association with *C. boleti* has yet been suggested.

69. *Cis laminatus*, Mel.*

The only parasite upon this species is *Cephalonomyia formiciformis*, recorded by Dr. Giraud (Ann. Soc. Fr. 1877, p. 435).

70. *Cis glabratus*, Mel.*

71. *Ennearthron affine*, Gyll.

From both these small species, Dr. Laboulbène records (*l. c.* p. 431) the Chalcid fly, *Astichus arithmeticus*, Först., upon the authority of M. Perris, in France.

72. *Prionus coriarius*, Linn.

MM. Dr. Jacobs and Dr. Tosquinet, in their Catalogue des Ichneumonides de la Belgique appartenant au Groupe des Pimplides, indicate (p. 320) *Xorides albitarsus* as having been observed to be parasitic upon this fine Coleopteron by Dr. Fromont.

73. *Cerambyx.*

From unspecied individuals of this genus, *sensu lato*, Ratzeburg records *Ephialtes populneus*, of which Herr Zebe bred a ♂ from poplar and probably from the *Cerambyx* larvæ therein (Ichn. d. Forst. ii, 100); Nördlinger bred *Ephialtes tuberculatus* from a Longicorn in oak at Nozay (*l. c.*); *Polysphincta lignicola* is also thought to be bred from some *Cerambyx* (iii, 110) and *Xorides appendiculatus*[86] from the larger *Cerambycidæ* (ii, 108). *Bracon bicellularis* was bred by Nördlinger from elm-wood in which small Longicorns were living (iii, 33), and *B. flavator* "also lives on *Cerambyces* in dry wood" (i, 46). *Mesoleptus teredo*,[1] whose cocoon was found in a beetle's boring together with the remains of a dead *Cerambyx* larva (ii, 119), and *Xorides crassipes*, also prey on these beetles; the other kinds, indicated by Ratzeburg at Ichn. d. Forst. i, 23, are specified at ii, 212.

74. *Cerambyx heros*, Fab.

Ephialtes carbonarius, Christ., is said by Ratzeburg (Ichn. d. Forst. iii, 109 et 249) to prey upon this large species.

[1] An entirely neglected species; described by Hartig, Bericht d. naturw. Verein der Harz. 1846–7, p. 16.

75. *Aromia moschata*, Linn.

The larvæ of the Musk Beetle are said by Brischke (Schr. Nat. Ges. Danz. 1880, p. 129) to be destroyed by *Ischnoceros rusticus*, Grav., which he considers synonymous with *Odontomerus cornutus*, Ratz. Thomson says that his *Ephialtes heteropus* (Opusc. Ent. 1249) was bred from this longicorn at Lund.

76. *Hylotrypes bajulus*, Linn.

From fir-wood in which *Cerambyx bajulus* had bored, Ratzeburg (Ichn. d. Forst. iii, 140) bred *Cryptus minator*. Bouché also found *Ephialtes manifestator* in this beetle (i, 119 et ii, 119); but *Bracon leucogaster*[172] is said to be by far its commonest parasite, and has been found—in Germany—in and upon dry wood, especially in beams of houses, about its borings (*l. c.* iii, 35 et Marsh., Bracon. d'Europ. i, 234).

77. *Callidium.*

Herr Wissmann bred several *Aspigonus diversicornis*[255] in Germany from very different insects, but all in dead wood—*Lymexylon dermestoides*, *Mycetochara linearis* and unspecified *Callidia* (Ichn. d. Forst. ii, 69). Marshall says that this Braconid (Bracon. d'Europ. ii, 252) has been bred "d'un longicorne non determiné."

78. *Callidium alni*, Linn.

There is a ♀ specimen of *Pimpla instigator* in Morley's collection taken by Mr. E. C. Bedwell at "Westerham, 4. 6. 1900, sitting on a post, which was full of *Callidium alni*." No parasitism is, however, suggested, for which indeed the Ichneumonid appears much too large.

79. *Callidium sanguineum*, Linn.

Ratzeburg tells us (Ichn. d. Forst. i, 123) that he found *Cerambyx sanguineus* upon several occasions preyed upon by *Xorides præcatorius*[77] in hornbeam logs; and this is confirmed by Prof. Thompson (Opusc. Ent. viii, 775), who says of the latter, "Utkläckt ur *Callidium* i Lund." Giraud (Ann. Soc. Fr. 1877, p. 411) gives *Opius* ? *caudatus*, Wesm., as parasitic on this Longicorn, upon Perris' authority. Marshall (Bracon. d'Europ. i, 228) has no doubt that it is further attacked by *Doryctes gallicus*, Reinh., and adds, "Il est très probable aussi que le *Bracon truncorum*, Goureau, élevé du même *Callidium*, est identique avec le *D. gallicus*."

80. *Callidium variabile*, Linn.

Of *Xylonomus præcatorius*, Fab., Brischke writes (Schr. Nat. Ges. Danz. 1880, p. 128): "Aus *Callidium variabile* erzogen." Goureau gives his insufficiently described *Spathius ferrugatus* as preying upon the same beetle; and Marshall says of *Helcon carinator*: "Elevé par Ratzeburg d'une larve du longicorne *Callidium variabile*, L., trouvée dans une ramuscule de chêne."

81. *Callidium violaceum*, Linn.

From the larvæ of various *Cerambyces*, but especially of this common species, Ratzeburg says (Ichn. d. Forst. ii, 68) that Wissmann bred both sexes of *Helcon carinator*, Nees, and also, probably, *H. tardator*, Nees; and adds (*l. c.* ii, 70) that he has bred *Aspigonus contractus*,[254] with *Helcon æquator*, out of spruce-wood infested by this Longicorn. Mr. Horace Donisthorpe possesses a ♀ *Ephialtes carbonarius*, which he took in the act of ovipositing in the burrows of *C. violaceum* at Lyndhurst, in 1902.

82. *Clytus*.

Herr Reissig bred *Exothecus lævigatus*[119] from an unspecified larva of this genus (Ichn. Forst. iii, 43); eight of this parasite's larvæ were found to be externally sucking that of the Longicorn and they subsequently spun light cocoons. Radzay also bred *Spathius Radzayanus* (*l. c.* ii, 44) from oaks in which several species of *Clytus*, together with other beetles, had been boring.

83. *Clytus arcuatus*, Linn.

M. Perris has raised the very rare Pimplid, *Arotes albicinctus*, Grav., from this species (cf. Laboulbène, Ann. Soc. Fr. 1877, p. 406); and Ratzeburg gives (Ichn. d. Forst. iii, 249) *Exothecus lævigatus*[119] as parasitic upon *Cerambyx arcuatus*. [Cf. also *Agrilus biguttatus*, ante.]

84. *Molorchus umbellatarum*, Linn.

The only parasite which has been indicated in connection with this species is *Ephialtes pusillus*, Ratz. (Ichn. d. Forst. iii, 110), of which one specimen was bred by Nördlinger out of *M. umbellatarum* in apple-wood.

85. *Rhagium bifasciatum*, Fab.

There are, curiously enough, no records of hymenopterous parasites of this common species. In April 1900 Mr. F. H. Day sent from the Carlisle district (Orton and Durdar) to Mr. Morley both sexes of *Mitroboris cornuta*,[76] Ratz., with the following note: "They were bred from fir logs, in which *Rhagium bifasciatum* was feeding; I have just bred another pair from cocoons—the cocoons from which *Mitroboris* emerged were their own and not those of *Rhagium*; taken 18th March, 1900. I fancy it is not uncommon here, having during the last few years repeatedly noticed similar cocoons in the *Rhagium* burrows."

86. *Rhagium indagator*, Fab.

Ratzeburg (Ichn. d. Forst. ii, 212) says this northern species is preyed upon in the Hartz Mountains by *Xorides irrigator*[78] (ii, 105)—copied by Taschenberg (Zeits. Ges. Nat. 1863, p. 300) and Tosquinet (Ann. Soc. Belg. 1897, p. 322)—*Spathius Radzayanus* whose cocoons were found in its burrows (ii, 43) and *Bracon leucogaster*[172] which was bred from it by Bouché (i, 45); this last is probably synonymous with *Cœloides initiator*, Fab., which Marshall records (Bracon. d'Europ. i, 222) from the same host, whence Bouché also bred *Bracon initiator*.

87. *Rhagium inquisitor*, Fab.

This common species is preyed upon by another kind of *Xorides, filiformis*,[79] according to Wissmann (Ichn. d. Forst. ii, 105—copied like the last species), who notes that the parasite constructs a disproportionately elongate cocoon and is not confined to the present host.

88. *Rhagium mordax*, Fab.*

Brischke writes (Schr. Nat. Ges. Danz. 1880, p. 129), under *Ischnoceros rusticus*, Grav., "Aus Larven von *Rhagium mordax* . . . . erzogen."

89. *Leptura scutellata*, Fab.

Both sexes of *Histeromerus mystacinus* have been bred by Mr. Horace Donisthorpe, from a mass of their own cocoons, which emerged from a cocoon of *L. scutellata*, found in Epping Forest in May 1906.

90. *Strangalia quadrifasciata*, Linn.

Marshall's record (Bracon. d'Europ. ii, 219) of *Helcon ruspator*, Linn., "Parasite du longicorne *Strangalia quadrifasciata*, L.," is the only one known.

91. *Grammoptera ruficornis*, Fab.

Morley, confirming *Helcon annulicornis*, Nees, as British (E. M. M. 1900, p. 175), writes: "I should suspect it, from the state of its environment when found in the present instance," to prey upon "*Grammoptera ruficornis*, F., . . . If, however, it be parasitic upon so ubiquitous a host, it appears curious that it should for so long have been overlooked." And, moreover, the relative size of host and parasite render such an association highly improbable.

92. *Acanthocinus ædilis*, Linn.

Xorides filiformis [79] under fir bark (Ichn. d. Forst. i, 123), *X. irrigator* [78] of which the almost black and boat-shaped cocoon was found side by side with that of its host in dry wood (iii, 105), and *Bracon initiator* [162] (i, 46 et ii, 39) are instanced as parasites of this interesting Longicorn by Ratzeburg (ii, 212), to which is somewhat doubtfully added (iii, 36) *Bracon præcisus*,[169] upon the authority of Brischke, who saw on 23rd May six of these parasites emerge from a hole of *Cerambyx ædilis* in a fence post.

93. *Leiopus.*

Giraud indicates an unspecified individual of this genus to have been the host of *Orthocentrus fulvipes*, Grav. (Ann. Soc. Fr. 1877, p. 408); it was bred in France by M. Edouard Perris.

94. *Leiopus nebulosus*, Linn.

From this species has been bred by Dr. Fromont, according to Tosquinet (Ann. Soc. Belg. 1897, p. 322), *Mitroboris cornuta*,[76] Ratz.; and Laboulbène also says (Ann. Soc. Fr. 1877, p. 411) that *Meteorus tabidus*, Wesm., was raised from it by Perris.

95. *Hoplosia fennica*, Payk.*

From *Cerambyx fennicus*, Ratzeburg records (Ichn. d. Forst. ii, 212) *Ephialtes tuberculatus*, *Xorides filiformis* [79] bred by Reissig from its own brown, papyraceous cocoons of nearly an inch in length from this beetle in dead wood (ii, 105), *Helcon carinator* and, doubtfully, *Helcon tardator*. Of *H. carinator* he says (ii, 68): "I bred 6 ♂♂ and 2 ♀♀ from an oak bough in which the otherwise rare *Apate sinuata*, with *Eccoptogaster intricatus* and *C. fennicus* had bored extensively; of *C. fennicus* only one beetle emerged; either the *Helcon* attacked this species only, or at the same time the somewhat large *Apate*." Marshall, however, has not noticed this parasitism under either species of *Helcon*.

96. *Exocentrus lusitanus*, Linn.*

Brischke appears to have paid considerable attention to the parasites of this species, for, in his "Die Ichneumoniden der Provinzen West- und Ost-Preussen," he records *Cœnocryptus tener*, *Ephialtes discolor*, *Spathius brevicaudis* and *Trigonoderus dactilis*, as preying upon it.

97. *Exocentrus punctipennis*, Muls.*

A Braconid, under the name *Blacus exocentri*, Gir., is recorded by Laboulbène (Ann. Soc. Fr. 1877, p. 411) as having been bred from this species by Perris in France.

98. *Exocentrus adspersus*, Muls.*

Laboulbène (*lib. cit.* p. 419) instances the Chalcid, *Eusandulum inerme*, Ratz., as parasitic on this Longicorn.

99. *Pogonochærus fasciculatus*, DeG.

Bracon flavulator, one ♂ from fir billets (Ichn. d. Forst. i. 46), *Ephialtes carbonarius*, *Pimpla terebrans*, *Pteromalus Dahlbomii*, two ♂♂ taken out of this host upon different occasions (i, 202) and a single pair of *P. Pogonochoeri*, from fir billets in which this beetle had lived (i, 200), are recorded from *Cerambyx fascicularis*, Panz., by Ratzeburg (ii, 212); and to these are added (iii, 249) *Bracon igneus*,[170] several bred from fir boughs in which were these beetles, *B. undulatus*[174] and *B. palpebrator*, from the same host; the last-named parasite was several times bred in great numbers by Reissig from *P. hispidus*, Linn. (iii, 38). Reinhard obtained four ♂♂ and twelve ♀♀ of his *Doryctes pomarius* from the borings of *Pogonochærus fascicularis*, Panz., *Scolytus rugulosus* and *S. pruni* in fruit trees, as recorded by Marshall and Kirchner.

100. *Pogonochærus bidentatus*, Thoms.

From *P. hispidus*, Laich., Perris bred in France (cf. Ann. Soc. Fr. 1877, pp. 410–11) *Odontomerus spinipes*, Grav., *Opius rubriceps*,[264] Ratz., and, doubtfully, *O. caudatus*, Wesm. Nördlinger also bred, in Germany, one ♀ of *Bracon undulatus*,[174] from apparently this species, out of *Euonymus* (Ichn. d. Forst. iii, 35).

101. *Pogonochærus dentatus*, Fourc.

Ratzeburg says (*l. c.* ii, 212) that *Cerambyx pilosus*, Fab., is attacked by *Ephialtes carbonarius* (i. 119), and perhaps also by *Pimpla terebrans*, which he bred from fir billets probably containing this beetle (i, 114), and from some six-to-eight-year old dead firs containing a quantity of *Pogonocherus* larvæ (ii, 89).

102. *Monochammus sutor*, Linn.

Bracon impostor is given by Ratzeburg (*l. c.* iii, 249) as parasitic upon *Cerambyx sutor*.

103. *Dorcadion pedestre*, Poda.*

The same author instances *Cerambyx rufipes* as the host of *Xorides* (*Echthrus*) *crassipes*, which Jacobi bred at Nordhausen, in April, from this species, feeding in dry plum-tree branches (*l. c.* iii, 115 et 249).

104. *Saperda carcharias*, Linn.

Xorides (*Mitroboris*) *cornutus*,[76] Ratz., is the only known parasite of this species as instanced by its author, Taschenberg and Tosquinet. Kielmann took at Haasenfelde (Ichn. d. Forst. ii, 108) three ♀♀ as they crept in and out of the holes bored by *Cerambyx carcharias* in aspen stems.

105. *Saperda populnea*, Linn.

This Longicorn is much subject to Hymenopterous parasites: *Ephialtes continuus*, twice bred by Brischke from swellings on aspen twigs caused by the larvæ of this beetle (Ichn. d. Forst. iii, 25 et 109), *E. manifestator* and *E. populneus*, one ♂ of which was bred by Lebe from poplar but uncertain host (ii, 100); *Bracon multiarticulatus*, *Chelonus lævigator*[194] from the same swellings as *E. continuus* (iii, 25), *Alysia Gedanensis*,[270] bred by both

Reissig and Brischke from swollen aspen twigs containing these larvæ in May, June and July (iii, 70); *Pteromalus æneicornis*, several raised by Brischke out of aspen swellings whence the *A. Gedanensis* had already emerged (iii, 228); with, doubtfully, a single *Entedon chalybæus* from a similar larval swelling in poplar by Reissig, and *Torymus macrocentrus* by Nördlinger at Stuttgart out of similar knots in a weak aspen (iii, 224);—were all noted from *Cerambyx populneus* by Ratzeburg (*lib. cit.* ii, 212 et iii, 249); as also was said by Brischke to have been *Ichneumon suspicax*[2] (iii, 166), but Morley regards this (Ichn. Brit. i, 248) as "almost certainly in error," and adds (*l. c.* 292), "a great deal more proof is needed before any reliance can be placed upon the records of any Ichneumoninæ preying upon Coleoptera." Tischbein once saw *Glypta teres*,[70] Ratz. [*nec* Grav.: cf. Thoms., Opusc. Ent. xiii, 1340] swarming round an aspen and several times bred the same species from the present Longicorn. Brischke, in his Prussian Ichneumons, also gives *Ephialtes continuus*, *Ascogaster lævigator*[194] and *Entedon chalybæus*, adding *Diadromus subtilicornis* with a query. Giraud records (Ann. Soc. Fr. 1877, p. 397 *et seqq.*) *Cryptus analis*,[31] *Ephialtes tuberculatus*, *Pimpla alternans*, *Echthrus nubeculatus*, *E. populneus*, Gir., and *Bracon denigrator*,[167] Fab., as preying upon it. Kirchner (Cat. 119) adds *Chelonus nigrinus* and Tosquinet (Ann. Soc. Belg. 1897, p. 280) *Ephialtes carbonarius*, upon Taschenberg's authority. Bridgman says (Trans. Norf. Soc. 1893, p. 629) that Mr. H. J. Thouless has bred both *Ephialtes imperator* and *E. tuberculatus* from this Longicorn in Norfolk.

106. *Saperda scalaris*, Linn.

According to Dr. Laboulbène (Ann. Soc. Fr. 1877, p. 405), Perris bred *Campoplex transfuga*,[103] Gir., *Orthocentrus fulvipes*, Grav., and *Meteorus tabidus*, Wesm., from this species; from which has also been raised (Ann. Soc. Belg. 1897, p. 322) by Dr. Fromont *Xylonomus filiformis*, Grav., in Belgium. Nördlinger also bred both sexes of *X. præcatorius* (Ichn. d. Forst. iii, 115) from a *Cerambyx*[1] in maple.

[1] Ratzeburg (*loc. cit.*) calls this beetle *Cerambyx luridus*; I fancy, however, it is really *Saperda scalaris*, as *Tetropium luridum* lives in *Coniferæ*.—E. A. E.

107. *Tetrops præusta*, Linn.

From this small species, Ratzeburg (Ichn. d. Forst. ii, 212) records *Elachestes leucogramma*, *Pteromalus nodulosus*, of which Brischke bred a single ♂ (ii, 197) and, doubtfully, *Eurytoma Eccoptogastri*. Nördlinger also bred several specimens of *Eurytoma ischioxanthus* from ash and some others from a dry ash point, ringed by hornets, in which were *Cerambyx præusta*. Under the genus *Acrocormus*, Först., Kirchner (Cat. 166) writes: "Dr. Förster entdeckte 2 Arten aus dürren Appelzweigen, worin die Larven von *Saperda præusta* von einer *Thamnophilus*—und *Scolytus*—Art lebten."

108. *Oberea oculata*, Linn.

Taschenberg and Tosquinet both give *Ephialtes carbonarius*, Christ., as preying upon this handsome species. They copy Ratzeburg, who says (Ichn. d. Forst. ii, 99): "Among others, I bred a 5½ lines long ♂ with stramineous under-side of scape, rust-red clypeus, beautifully silky face and remarkably short legs out of *Salix caprea*, in which *Saperda oculata* had been boring." The parasitism, however, is not established, and the short legs render the identification doubtful.

109. *Tetropium luridum*, Linn.

This species is said to be much infested with *Xorides ater* [80] in Silesian spruce-fir trees, *X. collaris*, a ♂ of which were bred by Wissmann in the Hartz, *Aspigonus contractus*,[254] *Bracon initiator*,[162] *B. obliteratus*,[175] a few untypical ♀♀ of *Helcon æquator* and both sexes in fir in the Hartz, and, doubtfully, *Mesoleptus teredo*, by Ratzeburg (*lib. cit.* ii, 39, 67 et 212). *Xylonomus caligatus* [35] is also instanced as parasitic upon it by Kirchner (Cat. 109) in Prussia.

110. *Tetropium castaneum*, Linn.

Morley writes (Ichn. Brit. ii, 21) of *Cubocephalus nigriventris*, Thoms.: "In July 1904, Donisthorpe gave me a female of this species, which he had 'dug at Market Bosworth, Leicestershire, from a burrow of *Tetropium castaneum*, in a spruce tree'; there was, however, no direct evidence of this species' parasitism upon the Longicorn coleopteron (cf. E. M. M. 1906, p. 41)." Mr. Pool has bred from *Tetropium gabrieli*, at Enfield in 1906, a ♂ *Lissonota*, which appears to be the undescribed sex of *L. palpalis*, Thoms., and, if so, is new to the British Fauna.

111. *Bruchus affinis*, Fröh.

Curtis tells us (Farm Insects, 365) that *Sigalphus thoracicus* is parasitic upon *Bruchus flavimanus.*

112. *Bruchus atomarius*, Linn.

The same author (*lib. cit.* 364) instances *Sigalphus pallidipes* as preying upon *Bruchus granarius.* Kirchner (Cat. 115) and Marshall (Bracon. d'Europ. i, 254) say *Chremylus rubiginosus*, Nees, is a parasite of *B. granarius*, Schh.; from the larvæ of which in the pods of vetch M. Perris has also bred *Sigalphus striatulus.*

113. *Bruchus lentis*, Boh.

Marshall (*lib. cit.* i, 312) indicates *Sigalphus thoracicus*, Curt., as preying upon *Bruchus lentis*, Schk.

114. *Bruchus rufimanus*, Boh.

This species is also given by Marshall (*l. c.* i, 254) as an alternative host of *Chremylus rubiginosus*, Nees.

115. *Bruchus biguttatus*, Oliv.*

Bracon rufator, Giraud, was raised by its author (Ann. Soc. Fr. 1877, p. 414) from *B. biguttatus*, in France.

116. *Bruchus seminarius*, Linn.*

Both *Chremylus rubiginosus*, Nees, and *Sigalphus thoracicus*, Curtis, are given as parasitic upon this species by Marshall (Bracon d'Europ. i, 254 et 312).

117. *Bruchus viciæ*, Oliv.*

Edouard Perris, according to Laboulbène (Ann. Soc. Fr. 1877, pp. 414 et 429), bred *Bracon præcox*, Wesm., and *Pteromalus leucopezus*, Ratz., from this species in France.

118. *Bruchus villosus*, Fab.

Three Chalcids are instanced by Ratzeburg as preying upon *B. spartii*, Er. These are *Tridymus undatus* [309] and *T. punctatus* [311] (Ichn. d. Forst. iii, 227), the latter of which Reissig bred from the seeds of *Spartium scoparium*, together with *Curculio Spartii*, and two ♀♀ of *Entedon seminarius* [383] (iii, 213). The latter was also bred by Brischke from the same host; from which Kirchner further says (Cat. 111) that *Bracon colpophorus* and *Pteromalus leguminum* have been bred. Reissig, however, was uncertain (Ichn. d. Forst. iii, 234) whether the host of *P. leguminum* were a *Bruchus* or an *Apion*.

119. *Bruchus rufipes*, Herbst.*

120. *Bruchus signaticornis*, Schh.

121. *Bruchus pallidicornis*, Schh.

M. Perris has indicated *Sigalphus striatulus* as parasitic upon the above three species of *Bruchus* in pods of vetch.

122. *Crioceris asparagi*, Linn.

Our evidence of this species' parasitism is of the slenderest: a single cocoon of some kind of *Apanteles* (which unfortunately failed to emerge) was found in June 1906, upon an asparagus leaf in the garden of Monks' Soham House, Suffolk, amongst numerous larvæ of this beetle [C. M.].

123. *Crioceris duodecimpunctata*, Linn.

Kirchner states (Cat. 98), concerning the Ophionid, *Porizon microcephalus*, Grav., "Von Dr. Amerling aus *Crioceris duodecimpunctata* erzogen."

124. *Cryptocephalus bipunctatus*, Linn.

M. Tappes has figured the male of *Pygostolus falcatus*, Nees, which he says (Ann. Soc. Fr., 1869) emerged from this beetle.

125. *Cryptocephalus fulvus*, Goez.

The Braconid, "*Pezomachus*" *Rosenhaueri*, [161] Ratz. (Ichn. d. Forst. ii, 247), has been bred in Germany by Herr Rosenhauer from larvæ of *Cryptocephalus minutus*, Fab.

126. *Cryptocephalus quinquepunctatus*, Har.*

Nees von Esenbeck reared two individuals of *Eupelmus annulatus* from the pupa of this beetle (Hym. Mon. ii, 76—quoted by Westwood, Mod. Class. ii, 159). This is copied by Ratzeburg (Ichn. d. Forst. iii, 249), who adds that *Pezomachus pedestris*,[13] a species of *Tryphon*, *Entedon cassidarum* and *Pteromalus cryptocephali*, which was bred by Rosenhauer, also prey upon this species; though all his details appear somewhat inconclusive.

127. *Timarcha tenebricosa*, Fab.

DeGeer first noticed this species to be attacked by hymenopterous parasites. Bignell bred (Trans. Devon. Assoc., 1901, p. 680) a specimen of *Perilitus falciger*, Ruthe, from a perfect beetle of this species in South Devon, on 7th May, 1891, and remarks upon the rarity of the emergence of parasites from imagines. For a similar record cf. Bull. Soc. Fr. 1854, p. 57.[1]

128. *Timarcha violaceonigra*, DeG.

Writing of *Perilitus falciger*, Ruthe, Marshall (Bracon. d'Europ. ii, 42) tells us that "Un examplaire conservé au Museé Britannique est étiqueté comme provenu d'un coléoptère adulte et vivant, *Timarcha coriaria*, Fab."

129. *Chrysomela*.

Boyer de Fonscolombe bred (Ann. Scien. Nat., 1832, pp. 273 *et seqq.*) his *Pteromalus gallarum*[385] from the pupa of some species of this genus, as is quoted by Westwood and Ratzeburg.

130. *Chrysomela varians*, Schal.

Kawell is said by Kirchner (Cat. 97) to have bred from this beetle *Mesochorus thoracicus*, Grav., in Kurland.

131. *Melasoma populi*, Linn.

Chrysomela populi is said by Ratzeburg (Ichn. d. Forst. iii, 230 et 249) to be attacked by *Pteromalus Sieboldi*, which Reissig and von Siebold both bred from this beetle,

[1] "Several instances of the emergence of the larvæ from the bodies of perfect Coleopterous insects are recorded, and I possess a specimen of *Timarcha lævigata*, from which the larvæ of a small species of *Bracon* escaped from the posterior extremity of the abdomen in such numbers, as to cover the whole bottom of a pill-box an inch in diameter with their little cocoons. There could hardly have been fewer than a hundred of them, and the beetle did not long survive such an unpleasant operation" (Dallas' Elements of Entomology, p. 242).

probably from the pupa or full-grown larva. Cf. also J. Giraud, Bull. Soc. Fr. 1869, p. 147.

132. *Melasoma tremulæ*, Fab.

Referring to the earlier records of *Apanteles hoplites*, Ratz., Marshall (Bracon. d'Europ i, 443) writes: "Reissig a supposé, par erreur, qu'il était parasite des coléoptères . . . *Lina tremulæ*, Fab., obtenus des feuilles roulées du tremble." Marshall's scepticism is based upon the belief that no member of the genus preyed upon Coleoptera; but cf. Morley, Entom. 1906, p. 100.

133. *Gastroidea viridula*, DeG.

134. *Plagiodera versicolora*, Laich.

Kirchner says of *Pteromalus mandibularis*, Först. (Cat. 172): "Von mir erzogen aus *Plagiodera armoraciæ*, Fabr., und *Gastrophysa raphani*." Brischke records *Bracon fuscipennis*, Wesm., ♂ "Aus Larven von *Gastrophysa raphani* erzogen" (Schr. Nat. Ges. Danz., 1880, p. 135).

135. *Prasocuris phellandrii*, Linn.

In his splendid "Wirths-Tabelle," Brischke (*lib. cit.*, p. 176) gives "*Phitonomus phellandrii*" as the coleopterous host of *Canidia quinqueangularis*, Ratz. No such species appears to occur in the genus *Phytonomus* (*Hypera*), nor is such a one called to mind in any but *Prasocuris*; but cf. Thoms Opusc. Ent. xi, 112.

136. *Galerucella calmariensis*, Linn.

Westwood says (Mod. Class. ii, 159) that Fonscolombe reared *Pteromalus galerucæ* from the eggs of *Galeruca calmariensis*; but we have not seen the latter's account of the circumstance.[1]

137. *Adimonia pomonæ*, Scop.*

The ubiquitous *Bassus lætatorius* has been bred by Tischbein from the larva of *A. rustica* (cf. Voll. Pinac. iii, pl. 1, et Morley, Trans. Ent. Soc., 1905, p. 432).

[1] Cf. also P. Marchal's Observations biologiques sur un Parasite de la Gateruque de l'Orme, le *Tetrastichus xanthomelænæ*, Rond. [Bul. Soc. Fr. 1905, pp. 64–68.]

138. *Phyllotreta nigra*, ? MS.*

Under *Aphidius Halticæ*, Rond., Marshall (Bracon. d'Europ. ii, 616) writes : " Provenu, selon l'auteur, de la larve d'un coléoptère, qu'il nomme *Phyllotreta nigra*, Ent. Heft. Outre qu'il n'y a pas de *Phyllotreta nigra* parmi les Halticidæ, un rapport de parasitisme entre *Aphidius* et un coléoptère est peu vraisemblable.—Italie."

139. *Psylliodes dulcamaræ*, Koch.

Dr. Giraud, in a footnote (Ann. Soc. Fr. 1877, p. 248), says : " M. Edouard Perris a trouvé le *Pteromalus excrescentium* de Ratzeburg, parasite de la *Psylliodes dulcamaræ*."

140. *Cassida*.

Under *Entedon cassidarum*, Ratz., Kirchner (Cat. 184) gives : " Gezogen aus *Cassida*-Arten." It was bred by both von Siebold and Rosenhauer from members of this genus (Ichn. d. Forst. iii, 248).

141. *Cassida seladonia*, Gyll.

Laboulbène gives (Ann. Soc. Fr. 1877, p. 418) *Chalcis parvula*, Laporte, as having been bred by Perris from *C. filaginis*, Perr.

142. *Heledona agaricola*, Latr.

Of his ♀ *Orthocentrus testaceipes*, Brischke says (Schr. Nat. Ges. Danz. 1878, n. 6, p. 110) : "Aus Larven der *Heledona agaricola* in einem *Boletus* erzogen. Neustadt." A dozen specimens, including both sexes, of a green *Pteromalus*, together with their hosts, were bred from this beetle by Donisthorpe in a fungus found at Virginia Water, 21st September, 1901.

143. *Diaperis boleti*, Linn.

Giraud found *Diospilus ephippium* associating with this beetle and other fungivorous Coleoptera in *Boletus ignarius* about Vienna (Bracon. d'Europ. ii, 263 et Kirch. Cat. 132). Laboulbène records *Microdus calculator*, Nees (Ann. Soc. Fr. 1877, p. 412) : " Bolet, avec *Diaperis boleti* et *Tinea parasitella*" ; Marshall, however, thinks the *Microdus* more probably parasitic on the Lepidoptera, *Scardia boleti*, Fab., etc.

144. *Mycetochares axillaris*, Payk.*

This species was thought by Ratzeburg (Ichn. d. Forst. ii, 69 et 215) to be preyed upon by *Aspigonus diversicornis*,[255] since the latter was bred in Germany by Herr Wissmann from dead wood containing *M. linearis* and other Coleoptera. Marshall (Bracon. d'Europ. ii, 252) quotes this, but synonymises the host with *Mycetochares barbata*, Latr.

145. *Orchesia minor*, Walk.

From the pupa of this species, which is probably synonymous with the next, Marshall says *Euphorus pallidipes*, Curt., has once been bred in England.

146. *Orchesia micans*, Panz.

The pink larvæ of this beetle, so abundant in dry *Boleti*, are very extensively parasitised, though it is difficult to understand how their foes come at them when so embedded in their pabulum. Westwood (Mod. Class. i, 309 et ii, 143) says M. V. Adouin has ascertained that it was attacked by *Perilitus similator*,[218] which he himself had also reared from it. Curtis instances *Euphorus orchesiæ*[210] and *Meteorus orchesiæ*.[217] Ratzeburg (Ichn. d. Forst. ii, 215) gives *Microdus abcissus*[207] (p. 46), *Porizon moderator*,[106] of which Tischbein bred both sexes (p. 86), *Perilitus obfuscatus*,[217] bred by Reissig, Tischbein and Wissmann, and *P. longicaudis*, also bred by Wissmann along with the last species, as its parasites; and *Meteorus longicaudis* is also referred to in this connection by Brischke. Giraud bred *Meteorus obfuscatus*, Ratz., from "*Orchestes micans*, dans *Boletus igniarius*" (Ann. Soc. Fr. 1877, p. 411). Marshall records (Ent. Ann. 1874, p. 126) *Perilitus obfuscatus*, Nees, bred from this beetle and (Bracon. d'Europ. ii, 91) says of *M. obfuscatus*: "Ce *Meteorus* est bien connu comme parasite solitaire et commun des coléoptères fungicoles, *Orchesia micans*, Panz., etc. On ignore si la femelle confie son œuf à la larve de *l'Orchesia* ou à l'insecte adulte; quoi qu'il en soit, j'ai vu plusieurs fois des *Orchesia* à l'état parfaits, trouvés mort, et ayant leurs membres enchevêtrés dans le lainage de la coque blanchâtre du parasite, qui s'était attaché à leur ventre." Bignell (Trans. Devon. Assoc. 1901, p. 681) also notices the attachment of the parasites' thin and whitish cocoon to their host in Bolt Head specimens of the same species; he bred it at the end of June 1898. Sometimes only ♂♂ will emerge from a whole fungus-full of *Orchesia*, as was the experience of Mr. E. G. Bayford, about Barnsley in 1898, who bred it from the pupæ of the beetle. It has been suggested that this species may have been the host of *Hemiteles niger*, which has been bred from a ligneous fungus (cf. Morley, Ichn. Brit. ii. 146).

Morley has invariably bred *Meteorus obfuscatus*, wherever *O. micans* occurs (from *Boletus* on old elm-trees about Ipswich); a fungus taken on Oct. 17th, 1897, produced 5 ♂ and 2 ♀ *Thersilochus moderator* on April 1st, 1898; and 1 ♂ with 3 ♀♀ of the same species, 8 ♂ and 13 ♀ *Meteorus obfuscatus*, and 19 *O. micans*, had also emerged from it by Jan. 12th, 1901. A second fungus, taken Dec. 30th, 1899, yielded only 2 ♀ *M. obfuscatus* and 2 *O. micans* by June 22nd, 1900. From a third fungus obtained in 1902 were bred by June 17th, 1903, 26 *O. micans*, 50 (17 ♀♀) *M. obfuscatus*, 10 (5 ♀♀) *T. moderator*, 5 (1 ♀) *Proctotrypes parvulus*, Hal., 2 red-bodied *Cecidomyia* and 1 *Phalacrus corruscus*; there can be but little doubt, in lack of direct evidence, that the *Thersilochus* is hyperparasitic, through the *Meteorus*, upon the *Orchesia*; the appearance of the *Proctotrypes* is more difficult to explain, though several times before bred from fungi; the Dipteron doubtless subsisted upon the fungus itself, in which the Phalacrid Coleopteron was probably no more than hibernating.

147. *Hallomenus.*

Prof. C. G. Thomson (Opusc. Ent. xiii, 1360) says of *Porizon*: "Hvad angår lefnadssättet känner man föga derom; ett par arter hafva kläckts ur Coleoptera—*Orchesia* och *Hallomenus*—; några andra lefva parasitiskt hos *Cynips*." And adds of *Diaparsus gilvipes*, Grav. (*lib. cit.* 1378), "utläckt ur *Hallomenus*."

148. *Hallomenus humeralis*, Panz.

A Braconid, *Diospilus filator*, Nees, is said by Giraud (Ann. Soc. Fr. 1877, p. 411) to have been bred by Perris from this beetle.

149. *Carida affinis*, Payk.

Gravenhorst (Ichn. Europ. iii. 777) writes of *Porizon boops*: ". . . alter Neeseo ab Esenbeck prorepit e larva

Hallomeni affinis, in *Boleto fomentario* habitante, mense Junii." This is quoted by Kirchner; and Ratzeburg (Ichn. d. Forst. ii, 86) says under *Porizon moderator* that Herr Wissmann has bred it from *Hallomenus affinis* in a fungus on beech at Münden, in Hanover.

150. *Melandrya caraboides*, Linn.

Laboulbène gives (Ann. Soc. Fr. 1877, p. 412) *Aspigonus diversicornis*,[255] Gir., as having been bred by Perris from this species; and Ratzeburg (Ichn. d. Forst. iii, 69) says Nördlinger found *Helcon claviventris* in the trunk of an ancient beech tree in company with it, adding *Mesostenus ater* as an alternative parasite; the latter, however, emerged from wood containing unspecified *Melandrya*, *Sphex* and *Dasytes* (*q. v. ante*).

151. *Mordellistena episternalis*, Muls.*

From this beetle, Giraud tells us (Ann. Soc. Fr. 1877, p. 426) that M. Perris bred the Chalcid, *Eurytoma histrioniea*, Först.

152. *Metæcus paradoxus*, Linn.

It may be well to indicate that the Tryphonid, *Sphecophaga vesparum*, Curt., though often found in the same nests of *Vespa vulgaris* as this anomalous beetle (cf. Morley, E. M. M. 1900, p. 123), is now considered to prey exclusively upon the larvæ of their common host, in spite of Hope's assumption that *S. vesparum* was parasitic upon *M. paradoxus* (Proc. Ent. Soc. 1838, iii, p. 177). It is not yet, however, known upon what the nondescript *Chalcid* and *Braconid*, which are also sometimes found in the same nests (cf. Kirby, Bridgwater Treatise, 1835, ii. 335), are parasitic.

153. *Rhynchophora.*

Westwood (Mod. Class. ii, 142) refers to an unspecified *Curculio*, which was discovered to be attacked by hymenopterous parasites by Rev. William Kirby, F.R.S.; and Ratzeburg (Ichn. d. Forst. ii, 213) says that *Encyrtus flaminius* has also been bred from some species of the same broad genus; further, Reissig (*lib. cit.* iii, 39) raised a ♂ of *Bracon scutellaris* from weevils in the leaves of sallow.

154. *Apoderus.*

At *lib. cit.* ii, 213, Ratzeburg tells us that an unspecified *Apoderus* has been found to be attacked by *Encyrtus flavomaculatus* and also (*l.c.* iii, 249) by *Ophioneurus simplex.*[426]

155. *Apoderus coryli*, Linn.

Ratzeburg says (*l. c.* ii, 94) that his single ♂ of *Pimpla longiventris* was found in an immature condition in a hazel leaf rolled by this beetle and thought consequently that it had undoubtedly been bred there. Reissig also bred (*l. c.* iii, 97) *Pimpla favipes*[51] and (iii, 217) *Elachestus leucobatus* from the same host.

156. *Attelabus curculionoides*, Linn.

Two specimens of *Ophioneurus simplex*[426] were bred by Herr Reissig (Ichn. d. Forst. iii, 197) out of the little larvæ of *Apoderus curculionoides* in rolled oak leaves at Darmstadt.

157. *Byctiscus betuleti*, Fab.

Rev. T. A. Marshall (Bracon. d'Europ. ii, 149) records *Calyptus tibialis*, Hal., which he thinks synonymous with *Brachistes politus*, Ratz., from this species, upon the latter's authority—Nördlinger found *B. politus* in a pear leaf rolled by this weevil early in June at Winnenden (Ichn. d. Forst. iii, 27);—he is however sceptical of the record from it of *Apanteles hoplites* (cf. *Melasoma tremulæ*, ante). Ratzeburg also mentions (*l.* c. ii, 214) *Bracon discoideus*, frequently bred from aspen leaves rolled by this beetle (p. 38); *Microgaster lævigatus*, one ♂ bred by Reissig (p. 50); *Pimpla flavipes*,[51] obtained in masses from *Curculio betuleti* in rolled aspen leaves in the middle of July (p. 91); and *Elachestus carinatus*, of which four specimens were bred from rolled aspen leaves—probably tenanted by this weevil—by Reissig (p. 173); as well as (iii, 249) *Ophioneurus simplex.*[426]

158. *Byctiscus populi*, Linn.

Herr Reissig bred *Bracon discoideus* from *Rhynchites populi* in rolled poplar leaves (Ichn. d. Forst. iii, 37).

159. *Deporaus betulæ*, Linn.

Ophioneurus signatus[427] is instanced by Reissig (*lib. cit.* iii, 249) as bred from leaves rolled by *Rhynchites betulæ.*

160. *Apion.*

Kirby and Spence (Introd. 7th Ed. 1859, 154) say they have received hymenopterous parasites from "The clover-weevil"—probably *Apion apricans.* Ratzeburg (Ichn. d. Forst iii, 249) instances *Pteromalus leguminum* and *Tridymus punctatus,*[311] bred from unspecified *Apiones.* Kirchner records (Cat. 179) *Cirrospilus nerio* "Aus *Apion* in *Spartium*-Hülsen erzogen." And Giraud tells us (Ann. Soc. Fr. 1877, pp. 428–30) that *Pteromalus fasciatus,* Först., and *P. regius,* Först., have been bred from uninstanced members of this rich genus.

161. *Apion apricans,* Herbst.

Perhaps Kirby and Spence's above record refers to *Callimone parallelinus,* Boh., which Reinhard once bred from this species.

162. *Apion bohemani,* Thoms.

Perris, according to Laboulbène (Ann. Soc. Fr. 1877, p. 428), bred *Pteromalus erichsoni,* Ratz., and perhaps also *P. albitarsus,* Walk., from *Apion ononidis,* in France.

163. *Apion craccæ,* Linn.

164. *Apion difficile,* Herbst.*

According to Marshall (Bracon. d'Europ. i, 144), Bach has raised *Bracon colpophorus,* Wesm., from the siliquæ of *Ervum hirsutum,* which were occupied by both these *Apiones*; the parasitism, however, appears open to doubt. Bach is also instanced (Ichn. d. Forst. iii, 234) as having bred *Pteromalus leguminum* in quantities from both *A. craccæ* and *A. difficile.*

165. *Apion loti,* Kirby.

166. *Apion rufirostre,* Fab.

Giraud tells us (Ann. Soc. Fr. 1877, p. 412) that *Sigalphus floricola,* Wesm., has been bred from both *Apion atritarse* and *A. loti* by Edouard Perris.

167. *Apion trifolii,* Linn.

This species is said by Laboulbène (*loc. cit.* p. 429) to have been parasitically attacked, according to Perris, by *Pteromalus leguminum,* Ratz.

168. *Apion urticarium*, Herbst.

Perris has also raised *Pteromalus muscarum*, Htg., according to Laboulbène (*l. c.*), from *Apion vernale.*

169. *Apion violaceum*, Kirby.

Entedon curculionum, Giraud, is said by its author (Ann. Soc. Fr. 1877, p. 432), upon the authority of Perris, to prey, among other weevils, upon this species.

170. *Apion brevirostre*, Herbst.*

M. Edouard Perris, who has done such good work in this genus, is also said (*loc. cit.*) to have bred *Eulophus atrocæruleus*, Nees, and *Tetrastichus rosarum*, För st., from this *Apion* in France.

171. *Apion sulcifrons*, Herbst.*

Giraud records (Ann. Soc. Fr. 1877, pp. 425 et 432) his *Eurytoma apionum* and *Entedon nitens* from *Apion sulcifrons*, in the latter case upon *Artemisia campestris*, Linn.

172. *Apion Perrisi*, Wenck.*

From a species thus named, Laboulbène (*loc. cit.* p. 414) says M. Perris bred *Bracon rufator*, Gir., in France.

173. *Apion consimile*, ? MS.*

Laboulbène also records (*l. c.* p. 432) *Entedon longiventris*, Ratz., bred from *Apion consimile* by Dr. Giraud.

174. *Otiorhynchus ligneus*, Oliv.

Bracon Otiorhynchi ♀ and *B. Barynoti* ♂, described by Boudier, are the sexes of *Ganychorus tuberculatus*,[240] Wesm. (Nouv. Mém. Ac. Brux. 1835). A single larva of the ♀ was bred from *Otiorhynchus ligneus* and a single larva of the ♂ from *Barynotus moerens*, after the perfect beetles had been pierced with pins for preservation. These larvæ, which emerged from the abdomens of their respective hosts, spun their cocoons on to the pins, beneath the beetles' bodies; they were bred at Montmorency (cf. Boudier, Ann. Soc. Fr. 1834, pp. 327–336, et Westwood, Mod. Class. ii, 143). What do we not lose by too thoroughly killing our cabinet specimens now-a-days!

175. *Otiorhynchus maurus*, Gyll.

Oresbius castaneus was conjectured by Marshall (E.M.M. iii, p. 194) to possibly be parasitic upon this weevil (cf. Morley, Ichn. Brit. ii. 109).

176. *Trachyphlœus scabriculus*, Linn.

An instance—our only one—of oviposition in a perfect beetle was witnessed by M. Boudier, who says (Ann. Soc. Fr. 1834, p. 332) that he saw a small, unspecified Ichneumon-fly "cramponné sur le dos de *Trachyphlœus scabriculus*. Il avait introduit sa tarrière entre les elytres et l'abdomen par l'anus" (Westwood, Mod. Class. ii, 144).

177. *Phyllobius urticæ*, DeG.

Under his *Dolops aculeator*, Marshall (Bracon. d'Europ. ii, 269) says that, in default of direct proof, he suspects it to be parasitic upon this common weevil. The only herbage where he took the Braconid, near Teignmouth, was a single clump of *Urtica dioica*, whereon was *Phyllobius alneti* in profusion.

178. *Barynotus elevatus*, Marsh.

[Cf. *Otiorhynchus ligneus*, above.]

179. *Hypera.*

In 1902, Rev. T. A. Marshall was so good as to send me, from Corsica, a specimen of some Pimplinæ (possibly *Pimpla abdominalis*, Grav.), which he had bred from an unspecified *Phytonomus* [C. M.]. Cf. also *Prasocuris phellandrii*, ante.

180. *Hypera rumicis*, Linn.

From a larva of *Phytonomus rumicis*, Kawall bred (Stett. Ent. Zeit. 1855, p. 230) at end of July, both sexes of *Phygadenon rufulus*, Gmel.

181. *Hypera polygoni*, Linn.

Herr Dahlbom bred *Campoplex subcinctus*,[102] Grav., from larvæ of *Phytonomus polygoni*, which were feeding upon *Silene* in the Botanical Gardens at Lund, 8th August, 1837 (Ichn. d. Forst. ii, 82.) Jacobi bred *Mesochorus nigripes*, Ratz., out of the same beetle in Prussia; he found the yellow, translucent cocoons adhering to leaves; towards the end of July the ichneumon emerged and left in the coleopterous cocoon a brown, thick-walled cocoon of its own; the beetle itself emerged from its adjacent cocoons (*lib. cit.* iii, 118—referred to by Kirchner, Cat. 97).

182. *Hypera plantaginis*, DeG.

Curtis mentions (B. E. pl. dxxxvi) that a species of the Cryptid genus *Pezomachus* has been bred from *Curculio plantaginis.*

183. *Rhinocyllus latirostris*, Latr.

Goureau gives an interesting account of *Bracon urinator*, Fab., which is parasitic upon this species in *Carduus nutans.* He says it is full-fed and has demolished its host-larva by about the middle of August, when it spins a cocoon which occupies that of the beetle. Therein it passes the winter and does not assume the pupal condition till the end of the following March; the imago emerges at the beginning of April, but is commonest during June (cf. Bracon. d'Europ. i, 156–7).

184. *Lixus algirus*, Linn.

In the ancient and badly neglected collection of British Ichneumonidæ in the British Museum is an unnamed ♀ *Pimpla* (*Epirus*), a stout insect, as large as *P. graminellæ*, Schr., black with totally flavous legs and terebra half length of body—labelled "Ichneumon of *Lixus angustatus*, Fairlight, Aug. 31st; F. Smith." In August 1902 Mr. Donisthorpe took at Rye, in the same neighbourhood of Sussex, a ♀ of the ubiquitous *Ophion luteus*, Linn., which he says "settled on a larva of *Lixus algirus.*"

185. *Lixus iridis*, Oliv.*

Prof. Dr. Otto Schmiedeknecht gives (Opusc. Ichn. 544) *Hoplocryptus insectator*, Tschek, as parasitic upon *L. turbatus*, Schh.

186. *Larinus carlinæ*, Oliv.

Pteromalus elevatus, Walk., is said by Dr. Giraud (Ann. Soc. Fr. 1877, p. 428) to have been bred from this species by Perris in France.

187. *Cuculio abietis,* Linn.

Ratzeburg gives (Ichn. d. Forst, ii. 213) *Ephialtes tuberculatus, Bracon hylobii* and, doubtfully, *Pteromalus multicolor*,[368] as parasitic upon *Hylobius pini*. Of *B. hylobii* Nördlinger bred in May 40 ♀♀ and 4 ♂♂ from this species, each of whose larvæ supports about ten parasites; the cocoons of the latter are firm, oat-shaped and papyraceous, woven among their hosts' frass and dead bodies, and often constructed at the end of the beetles' borings, beneath fir bark (*l. c.* ii, 38). A single *E. tuberculatus* was bred at the end of July at Hohenheim from a Weymouth pine in which this weevil lived; it had apparently emerged from an elongate cocoon, presumably of its own construction (*l. c.* ii, 100). Taschenberg says (Zeits. Ges. Nat. 1863, p. 267) that it is also preyed upon by *Pimpla terebrans*, which is recorded from *Curculio pini* (Ichn. d. Forst. ii, 38).

188. *Pissodes notatus,* Fab.

Much attention was paid to the parasitism of this species by Ratzeburg, who records (Ichn. d. Forst. i, 23, ii, 214 et iii, 249) the attacks of twenty-nine different Hymenoptera upon it, including *Eupelmus azureus*,[278] *Eurytoma* sp., *Pteromalus pellucens* and *P. ? æmulus. Hemiteles melanarius* and *H. modestus*[18] (iii, 153–4) were both bred by Reissig from young fir trees containing, principally, *Curculio notatus* and *Hylesinus piniperda*; *Neurateles papyraceus* (ii, 86) were bred, probably from this weevil, from firs near Saarbrücken; *Ephialtes carbonarius* (ii, 99) emerged at Neunkirchen in Rhenish Prussia, probably from this beetle; *Pimpla linearis* (ii, 93) was certainly bred from *Curculio notatus*, by both Reissig and Ratzeburg from both young firs and fir-cones, together with *P. laticeps* (ii, 94 et iii, 100), in the same locality. Quantities of both sexes of *Bracon disparator*[175] (i, 46) were bred from fir billets infested by this weevil; two ♀♀ *B. incompletus*[155] (i, 44) were bred from fir, probably from this beetle, in Germany; *B. labrator* (i, 47 et ii, 40) was bred at Borutin in Upper Silesia from fir logs infested with *C. notatus*; both sexes of *B. palpebrator* (i, 47 et ii, 39) were bred in quantities from fir wood full of these larvæ at Trier; ♂♂ of *B. sordidator* (i. 48) were bred, with the last-named species, in Upper Silesia from fir logs, probably also from this beetle. *Brachistes atricornis*[234] (ii, 28) is one of its commonest parasites, in firs in the Neunkirchen district; from fir cones containing larvæ of *C. notatus*, *B. firmus* [235] and *B. robustus* [231] (i, 54 et ii, 27) were bred; at Borutin one specimen of *Microdus abcissus* [207] (i, 57) was bred from fir wood, filled with a brood of these larvæ; a few specimens of *Spathius brevicaudis* (ii, 43) were bred from fir containing this weevil at Neunkirchen and from the Mark. *Eurytoma ischioxanthus* is referred to (iii, 221), though the identification appears not quite established, as bred by Nördlinger with *Pimpla laticeps* out of *C. notatus* in fir cones; a single specimen of *Hadrocerus unispinosa* [430] (iii, 183) was bred, with a mass of *B. palpebrator*, *Pteromalus guttatus* and a few Diptera, from a great number of young dead fir trees from the Ostree coast, which had been killed by this weevil, though the parasitism is doubtful. *Pteromalus guttatus* is said (i, 188 et ii, 193) to be one of the commonest parasites of this beetle; *P. clavatus* (ii, 202) emerged from Trier firs, infested by *C. notatus*, from which also *P. Dahlbomi* (i, 202 et ii, 201) was raised in fir billets from several places in the Mark; several ♀♀ *P. lunula* (ii, 193) were bred from fir plants full of these larvæ at Neunkirchen; *P. suspensus* (*l. c.*) was bred from this weevil at Trier and by Nördlinger from *Pinus pinaster* in which *C. notatus* and *Hylesinus piniperda* had bored; *P. virescens* [375] (ii, 204) was also raised from the same host at Trier. Brischke gives (Schr. Nat. Ges. Danz. 1880, p. 113) *Pimpla brevicornis*, Grav, var. 3, Holmgr., as well as *Pteromalus guttatus*, "Aus *Pissodes notatus* erzogen"; and Giraud adds (Ann. Soc. Fr. 1877, p. 414) *Bracon initiator*,[162] Fab. and *B. palpebrator*, Ratz., as having been bred from it in France.

189. *Pissodes pini*, Linn.

I have had in my collection for some years (says Ratz., Ichn. d. Forst. i. 193) a genuine *Pteromalus pini* which, from the attached number, appears to have been bred from *Pissodes pini*.

190. *Pissodes hercyniæ*, Herbst.*

Curiously distinct parasites from those of *P. notatus* were recorded from *Curculio hercyniæ* by Ratzeburg (*l. c.* ii, 214) who instances *Pimpla terebrans*, bred from it by Wissmann (ii, 89); *Xorides crassipes* and *X. hercynianus*, which two doubtfully distinct species were bred by Hartig from spruce bark in which larvæ of this weevil were boring (ii, 106); *Brachistes atricornis*,[234] bred in spruce bark under which were these larvæ (ii, 28); and *Sigalphus curculionum*,[229] which is said by Hartig to be its chief parasite (ii, 74).

191. *Pissodes piniphilus*, Herbst.*

From this weevil, which is very closely allied to *P. notatus*, Ratzeburg (*l. c.* iii, 249) bred only *Bracon palpebrator*.

192. *Orchestes.*

Nördlinger bred *Entedon confinis* at Grand Jouan, in France (*l. c.* ii, 166), and Ratzeburg records in Germany *Eulophus xanthops*[420] (i, 23), which both preyed upon unspecified individuals of this genus.

193. *Orchestes alni*, Linn.

Tetrastichus orchestis, Först., is indicated by Laboulbène (Ann. Soc. Fr. 1877, p. 434) as having been bred by Dr. Giraud from this species.

194. *Orchestes leucaspis* = ? *scutellaris*, Germ.

Nördlinger bred from *O. leucaspis*, Mus. Ber. (= *semirufus*, Koll.), in birch leaves *Sigalphus fulvipes*[186] (Ichn. d. Forst. ii, 26), *Eulophus dendricornis* (ii, 155) and one ♂ of *Pteromalus Jouanensis* (ii, 199); and Ratzeburg says he obtained only one *Pteromalus orchestis* among many thousands of other parasites bred in this genus (ii, 205), adding that the same species emerged from *Orchestes leucaspis* at Grand Jouan in birch leaves.

195. *Orchestes fagi*, Linn.

Two specimens, and later (*l. c.* iii, 28) a ♂, of *Brachistes minutus*[228] were bred from *Curculio fagi*, together with one ♂ of *Pteromalus cruciatus* (ii, 205), on 10th June by Herr Reissig (ii, 28); both sexes of *Brachistes fagi*,[186] bred by Brischke from this host early in June (iii, 28), as well as (iii, 249) *Exothecus debilis*, bred by Nördlinger and Reissig (iii, 42); *Sigalphus caudatus*, *Entedon luteipes*; *E. flavomaculatus*, bred by Reissig (iii, 208); *E. lineatus*,[389] one specimen bred by Nördlinger at Hohenheim (iii, 209); *E. orchestis*, bred at the same place by Nördlinger (iii, 206), and *E. xanthostoma*; *Eulophus lepidus*,[351] bred with *Entedon xanthops* by Nördlinger at Hohenheim (i, 170 et iii, 242); *E. diachymatis*[337] and *E. pilicornis*—are all recorded by Ratzeburg from this beetle. Marshall adds (Bracon. d'Europ. i, 187) *Collastes braconius* to the list of its enemies; and Brischke gives *Sigalphus pallidipes*, Nees, "aus Larven von *Orchestes fagi* erzogen."

196. *Orchestes ilicis*, Fab.

There are no exact records of hymenopterous parasitism upon this beetle, though Nördlinger has thrice bred Chalcids from *O. ilicis* in company with *O. quercus*: thus we find both sexes of *Eulophus fumatus* (Ichn. d. Forst. ii, 156) bred from oak leaves in which these two species of weevils were feeding; *Entedon medianus* (*l. c.* 169) bred from both or either; and *Pteromalus Jouanensis* (*l. c.* 199) bred in the same way at Grand Jouan.

197. *Orchestes salicis*, Linn.

Upon this species prey *Entedon orchestis* and *E. punctatus*, which were both bred, together with a *Pteromalus*, by Reissig on 1st October (*lib. cit.* ii, 160 et 165); *E. unicostatus*, of which one specimen was bred from this host by Bouché (ii, 163); and Ratzeburg further records *E. medianus* as preying upon it in France.

198. *Orchestes scutellaris*, Gyll.

Giraud thrice bred Chalcids from this species (Ann. Soc. Fr. 1877, pp. 432–4), which were *Pleurotropis orchestis*, Gir., *Tetrastichus frontalis*, Nees, and *T. orchestis*, Först.

199. *Orchestes quercus*, Linn.

The parasites bred in Germany from this common weevil (Ichn. d. Forst. i, 23, revised and extended ii, 213) are very numerous, comprising *Ischius striolatus*, *Entedon confinis* and *E.* ? *luteipes*; Ratzeburg bred one ♂ of *Pimpla alternans* (ii, 92), nearly certainly from this host, among other parasites; *Polysphincta latistriata* (i, 120) bred from this weevil in the epidermal bladders on the white-spotted oak leaves. *Microgaster breviventris*,[202] (ii, 51) bred on 20th July from *Curculio quercus*, after most of its other parasites had emerged; both sexes of *Sigalphus caudatus* (ii, 25) from oak leaves in which this weevil lived and from the same host by Nördlinger on 12th June; both sexes also of *Spathius clavatus*[147] (ii, 42) were obtained on 26th June from oak leaves infested by this beetle. Both sexes of *Elachestus* *obscuripes* (i, 165 et iii, 173) bred sparingly, with *E. sesquifasciatus*[417] (i, 164), from oak leaves mined by *O. quercus*; *Entedon cyclogaster* (i, 167), lying free beside this beetle's larval skin; one ♂ of *E. flavomaculatus* (i, 164), bred on 10th July from oak leaves mined by this host; *E. lunatus* (ii, 166), bred in quantities from *O. quercus*, with *E. orchestis* (i, 165 et ii, 160), at Neustadt; *E. medianus* (ii, 169) bred in France by Nördlinger from mixed *O. quercus* and *O. ilicis*; a single ♀ of *E. amethystinus* (ii, 170) was also bred, among a large number of other species, from *O. quercus*. Nördlinger bred one *Eulophus dendricornis* (i, 161) early in June from mining larvæ of *O. quercus* in alder leaves, and both sexes of *E. fumatus* (ii, 156) from oak leaves containing both this species and *O. ilicis*; *E. pilicornis* (i, 160) was several times bred from the subcutaneous larvæ of *O. quercus*, sometimes alone, at others with *Pteromalus orchestis* and a ♀ *Eupelmus viduus*; *Eulophus pectinicornis* (i, 161) preys on the same host. *Pteromalus Jouanensis* (ii, 199) was bred by Nördlinger from mixed *Orchestes quercus* and *O. ilicis* at Grand Jouan, in France; and Ratzeburg bred *Elachestus obscurus*[391] (ii, 173) infrequently from the former; lastly a single specimen of the Proctotrypid, *Teleas minutus* (ii, 143), was found dead among hundreds of this beetle's parasites. According to Marshall (Bracon. d'Europ. ii, 141), C. Rondani also bred his *Eubadizon orchestis* from this weevil in Italy.

200. *Orchestes viminalis*, Ratz.*

It appears that Ratzeburg considered this species synonymous with, or a variety of, the last, under which (Ichn. d. Forst. i, 203 et 205) he says of *Pteromalus diachymatis*: "I have the five ♀ ♀ out of larvæ of *Orchestes viminalis* in oak leaves, together with my *P. orchestis* and *Eulophus pilicornis*, on 13th July." Kirchner, however, perpetuates the name (Cat. 169): "*Pteromalus diachymatis*, Ratz., Preuss. Aus. *Orchestes viminalis*." Cf. also Forstinsecten, i, 155.

201. *Miarus campanulæ*, Linn.

Brischke (Schr. Nat. Ges. Danz.) gives *Bracon variator*, *B. terebella*, *Pezomachus fasciatus* and *Pimp a brevicornis* as parasitic upon this weevil. The last-named parasite was also bred from it by Giraud (Laboulbène, Ann. Soc. Fr. 1877, p. 408), where *Bracon variator*, Nees, *Systasis encyrtoides*, Walk., and *Pteromalus auronitens*, Först., are also indicated as attacking *Gymnetron campanulæ.*

202. *Gymnetron antirrhini*, Payk.

Sigalphus pallidipes, Nees, is said by Marshall (Bracon. d'Europ. i, 315) to be a common parasite of this species; he adds (*lib. cit.* 320) that *S. obscurellus* also preys upon *Gymnetron noctis*, Herbst.: "des galles produites sur le lin sauvage."

203. *Gymnetron beccabungæ*, Linn.

From this weevil, Brischke (Schr. Nat. Ges. Danz.) has bred an undetermined species of *Bracon*, together with *Pteromalus curculionoides.*

204. *Gymnetron collinus*, Gyll.

Bignell writes of *Sigalphus obscurellus*, Nees (Trans. Devon. Assoc. 1901, p. 667): "Bred from *Gymnetron collinus*, a beetle feeding on the unripe seeds of the toad-flax, *Linaria vulgaris*, September 19th, 1880."

205. *Gymnetron villosulus*, Gyll.

In his Naturgeschichte der Insecten (1834), Bouché tells us that his *Pteromalus curculionoides* feeds upon the larvæ of *Gymnætron villosulus* (cf. Westwood, Mod. Class. ii, 159).

206. *Gymnetron teter*, Fab.*

Kirchner (Cat. 105) gives "*Pimpla gymnetri*, Ratz., Preussen, Gez. aus *Curculio teter*"; as recorded by the latter (Ichn. d. Forst. ii, 96 et iii, 103), bred from the knot-like swellings caused by the larvæ of this beetle on the previous year's, already woody, stems of *Verbascum nigrum.*

207. *Gymnetron asellus*, Grav.*

At Ann. Soc. Fr. 1877, p. 413 *et seqq.*, Laboulbène records *Bracon gymnetri*, Gir., *B. ? dichromus*, Wesm., and *Entedon curculionum*, Gir., from this beetle.

208. *Gymnetron cylindrirostris*, Schh.*

From this species (probably synonymous with the last) also are recorded (*loc. cit.*) *Bracon gymnetri* and *Entedon curculionum*.

209. *Mecinus collaris*, Germ.

Pimpla palliata, Gir., and *Pteromalus revelatus*, Först., are recorded by Laboulbène (*l. c.*) from this weevil.

210. *Anthonomus pomorum*, Linn.

Herr Reissig bred *Pimpla pomorum* from *Curculio pomorum* in a pear blossom (Ichn. d. Forst. ii, 96) and later (iii, 102) both sexes from the same pabulum on apple; Nördlinger also bred it from this host, as well as one ♂ of *Campoplex latus* (ii, 84), at Hohenheim in June. *Microgaster impurus* [201] (ii, 52) was frequently bred by Reissig from apple blossom infested by this weevil; and Ratzeburg refers (ii, 213) to *M. albipennis* [200] as doubtfully preying upon the same host. Of *Chrysolampus æneus* he says (ii, 185): "I bred one out of *Curculio pomorum*, yet it is possible that accidentally imprisoned *Aphidæ* may have yielded this guest." He further bred a single ♀ *Encyrtus flavomaculatus* (ii, 146) from apple blossom containing this beetle—possibly, however, some *Aphidæ* may have been present here also and yielded this parasite. A somewhat doubtful ♂ of *Pteromalus Saxesenii* (iii, 242) was also raised from apple blossom, though no coleopterous host is indicated. Brischke bred from the same host (Schr. Nat. Ges. Danz. 1880, pp. 111, 113) *Pimpla examinator*, Fab., *P. sagax*, Htg., as well as *Microgaster lacteus*,[199] Nees.

211. *Brachonyx pineti*, Payk.

Four or five kinds of Chalcids are recorded from *Braconyx indigena* by Ratzeburg (Ichn. d. Forst. iii, 249), a single, damaged specimen of *Hadroceras vitripennis* [431] (iii, 183) was bred from this weevil—or, just possibly, from the midges which were bred with it; *Entedon vaginulæ* (iii, 213) was freely bred from it by Herr Reissig, and is said to be its commonest parasite; a single *Eupelmus Geeri* (iii, 198) was also bred from this beetle, called the "Fir-leaf Cutter" in Germany; and several ♀ ♀ *Pteromalus vaginulæ* were raised upon two occasions, in both cases with—? its ♂—*P. nanus*, by Reissig at the end of July.

212. *Nanophyes lythri*, Fab.

Laboulbène records (Ann. Soc. Fr. 1877, p. 420) that Perris has bred *Eupelmus Degeeri*, Dalm., and (p. 430) that Dr. Giraud also raised *Pteromalus vaginulæ*, Ratz., from this beetle.

213. *Cionus scrophulariæ*, Linn.

Bignell says (Entom. 1885, p. 152) that he bred *Hemimachus instabilis*,[22] Först., from a pupa of this beetle, August 23rd, 1882. Thomson records (Opusc. Ent. x, 980) *Hemiteles areator*, "Kläckt ur *Cionus scrophulariæ*." And Bridgman tells us (Trans. Norf. Soc. 1895, p. 114): "Mr. Thouless gave me a female *Pezomachus corruptor*, Först., which he had bred from the larva of *Cionus scrophulariæ*, a beetle which he took at Horsford, August 1894. This is interesting, as it is seldom that ichneumons are bred from beetles; it may be due, in a measure, that beetles are not bred to the same extent that butterflies and moths are." This example of *P. corruptor*, which I have examined and found correct, is now in the Norwich Castle Museum [C..M.].

214. *Cionus tuberculosis*, Scop.

Brischke records his ♀ *Pezomachus thoracicus* (Schr. Nat. Ges. Danz. 1881, p. 351): "Aus *Cionus verbasci* erzogen"; and indicates *Entedon discolor* as preying upon the same species.

215. *Stereonychus fraxini*, DeG.*

This weevil is said to be attacked by the Braconid, *Blacus ruficornis*, on the strength of a single example which was bred by Dahlbom, who writes *in lit.* (Ichn. d. Forst. ii, 61): "Exclusus e Pupa Rhychæni (Cioni) fraxini, Gyll., 7th Septb., Lund." Professor Kawall also bred (Stett. Ent. Zeit. 1855, p. 231) two species of *Pteromalus*, and a specimen of *Pezomachus agilis*, Fab., var. 4 b, Grav., from *Cionus fraxini.*

216. *Cryptorrhynchus lapathi*, Linn.

Kirchner records (Cat. 108) *Ephialtes tuberculatus*, Fourc., as parasitic upon this species; and Ratzeburg instances (Ichn. d. Forst, ii, 213) *Pimpla cicatricosa*[50] and

P. Reissigii[39] (ii, 89) as both bred by Herr Reissig from alder in which this beetle lived, the cocoon he says is seven lines in length, clothed with scraps of wood without but perfectly smooth within; both sexes of *Campoplex gracilis*[104] (ii, 81) were also bred from this host by the same observer on April 13th and 14th. Further Reissig bred several specimens of both sexes of *Bracon immutator* (ii, 41) from the pupal nests of this weevil, adding that the thick brown cocoons were disposed without order but all in close proximity; he also bred several *Rogas marginator*[251] (ii, 65) from *C. lapathi* in alder shoots on May 4th, as well as a single Braconid resembling *R. limbata*, but with the neuration of *Brachistes*, which escaped; his last parasite of this species was the Proctotrypid, *Diapria melanocorypha* (ii, 144). A single ♀ of *Ichneumon hassicus*[1] is recorded (*lib. cit.* ii, 136) from the same beetle on April 7th; cf. Morley, Ichn. Brit. i, 292. We captured three ♀♀ *Ephialtes carbonarius*, Christ., flying in the vicinity of this beetle's borings in sallow trees at Tuddenham Fen, in Suffolk, on June 12th, 1900.

217. *Gastcroecreus depressirostris*, Fab.*

This beetle—not *Rhinocyllus depressirostris*, Schh., as erroneously given by Marshall (Bracon. d'Europ. i, 197)—was discovered by Radzay in a small live portion of an otherwise dead eighty-year-old oak, the bark of which was considerably impaired by its borings. With it was *Spathius Radzayanus* (Ichn. d. Forst. ii, 44, footnote) which was parasitic, very probably ektoparasitic, upon it, two or three apparently attacking each of the somewhat gregarious larvæ. The parasitic cocoons are elongate, pale rose-red, two and a half lines in length, and two to six of them lie close together in the excreta beneath bark. [Cf. also *Agrilus biguttatus*, ante.]

218. *Mononychus pseudacori*, Fab.

Fred Smith tells us (Ent. Ann. 1864, p. 114) that Mr. Butler has bred a parasite, "apparently belonging to the genus *Sigalphus*," from this weevil in the capsules of *Iris fœtidissima* at Ventnor.

219. *Cœliodes quercus*, Fab.

Marshall says (Bracon. d'Europ. i, 492) that Ratzeburg bred his *Apanteles breviventris* from *Cœloides quercus* in

Germany. This may be correct, since in every other case the latter writes "*Orchestes*" *quercus* (*q. v.*, *ante*), but in that of *Microgaster breviventris* (Ichn. d. Forst. ii, 52) it becomes "*Curculio*" *quercus.*

220. *Ceuthorrhynchus assimilis*, Payk.

Reinhard bred *Diospilus oleraceus*, Hal., from the galls of this weevil on *Sinapis arvensis* (as recorded by Kirchner, p. 132, and Marshall ii, 259).

221. *Ceuthorrhynchus cyanipennis*, Germ.

Thersilochus moderator, Grav., is said by Brischke (Schr. Nat. Ges. Danz. 1880, p. 193) to have "Aus Larven von *Ceuthorrhynchus cyanipennis* erzogen." Possibly hyper-parasitic—cf. *Orchesia micans*, ante—through the usual enemies of this genus, the species of *Diospilus.*

222. *Ceuthorrhynchus pleurostigma*, Marsh.

In Ent. Ann. 1874, p. 126, Marshall records *Diospilus nigricornis*, Wesm., as bred from *Ceuthorrhynchus sulcicollis*, Gyll.; this is not referred to in his Bracon. d'Europ. (ii, 265), but, at *lib. cit.* i, 320, *Sigalphus obscurellus*, Nees, is given as a parasite of the same beetle "sur le chou." *Diospilus oleraceus* was bred by Dr. Giraud (Zool.-bot. Ver. V. Sitzb. 128) from the galls of this weevil. Mr. Horace Donisthorpe bought a turnip in a London shop because it contained the characteristic cysts of this beetle, from which in February 1900 emerged a ♀ *Sigalphus floricola*, Wesm.

223. *Ceuthorrhynchus punctiger*, Gyll.

From this species Giraud tells us (Ann. Soc. Fr. 1877, p. 403) that both *Bracon maculiger*, Wesm., and *Porizon moderator*,[106] Grav., have been bred. As in the case of *C. cyanipennis*, the latter was very probably hyperparasitic.

224. *Ceuthorrhynchus rapæ*, Gyll.

Diospilus oleraceus, Hal., was bred by Laboulbène from the galls produced by this weevil on the roots of *Lepidium draba* (Ann. Soc. Fr. 1877, p. 411).

225. *Baris laticollis*, Marsh.

226. *Baris chlorizans*, Germ.

227. *Baris cuprirostris*, Fab.*

Rev. T. A. Marshall was somewhat sceptical (in MS.) of the accuracy of M. Edouard Perris' observations regarding the parasitism of *Pentapleura fuliginosa*, Hal., upon the above three species of *Baridius*.

228. *Balaninus nucum*, Linn.

The parasitism of *Pimpla nucum* upon the Nut Weevil appears in need of considerable confirmation. Towards the end of May the former swarmed, says Nördlinger (Ichn. d. Forst. ii, 90), at Hohenheim, on the window of a room in which beech-nuts were stored, and these latter he found to be bored by *Curculio nucum*. Herr Zeller obtained the same Pimplid on April 18th from acorns, "therefore probably from *Balaninus*."

229. *Balaninus pyrrhoceras*, Marsh.

Laboulbène tells us (Ann. Soc. Fr. 1877, p. 413) that Giraud has bred *Bracon discoideus*, Wesm., from this species.

230. *Balaninus villosus*, Fab.

Porizon nutritor, Grav., is said to have been bred from this weevil in France (*loc. cit.* p. 403).

231. *Magdalis*.

Unspecified individuals of this genus have yielded, according to Ratzeburg (Ichn. d. Forst. ii, 213) *Elachestus leucogramma*, *Pteromalus magdalis* and *P. virescens*,[375] which last is the *P. violaceus* of i, 23; and later (*l. c.* iii, 249) he adds *Cryptus echthroides* and *Pteromalus tessellatus*, with doubtfully *Pimpla linearis* and *Eusandalon tridens*. Cf. also *Tetrops præusta*, ante [THAMNOPHILUS, Schönh. = MAGDALIS, Germ.].

232. *Magdalis carbonaria*, Linn.

From *Magdalinus memnonius*, Giraud says (Ann. Soc. Fr. 1877, p. 429) that *Pteromalus magdalis*, Ratz., has been bred by Perris.

233. *Magdalis phlegmatica*, Herbst.

Reissig bred a single ♂ *Hemiteles melanarius* from *Curculio* (*Thamnophilus*) *phlegmaticus* on April 17th (Ichn.

d. Forst. ii, 128); and Ratzeburg obtained a couple of *Alysia rubriceps*,[264] ♀♀ (*l. c.* i, 56) from fir logs infested by the same beetle.

234. *Magdalis violacea*, Linn.

Several specimens of *Chelonus atriceps* were bred by Ratzeburg (Ichn. d. Forst. i. 43) from spruce infested with *Magdalis violacea* in the Frankenwald; *Glypta concolor* (i, 121) was also bred with this beetle, out of fir billets, as were several *Eurytoma abieticola* (i, 174) from fir logs; several ♀♀ *Pteromalus violaceus* (i, 208) emerged from fir billets from the Hartz, in which this beetle had bored; and several *Spathius brevicaudis* (i, 49) from fir wood infested with *Curculio violaceus*. *Brachistes rugosus*[232] (ii, 28 et iii, 29) was bred by both Nördlinger from young dry fir, and Ratzeburg from blocks of wood, in which *C. violacea* was living; many ♂♂ of *Pteromalus virescens*[375] (ii, 204) were also bred by the former, and *Opius rubriceps*[264] (iii 66) by the latter, from this weevil.

235. *Rhopalomesites tardyi*, Curt.

Under *Odontomerus dentipes*, Gmel., in his private copy of the 1872 Catalogue of British Hymenoptera, Marshall has entered a MS. note: "♂ taken by Bignell, Aug. 6, entering burrows of *Mesites tardii*."

236. *Eremotes strangulatus*, Perr.*

Exothecus rhyncoli, Gir., is said by Dr. Laboulbène (Ann. Soc. Fr. 1877, p. 414) to have been bred from this species by Perris.

237. *Scolytus*.

Brischke records *Pachychirus quadrum*[313] from *Eccoptogaster* sp., and Giraud, *Exothecus lanceolator*,[145] Nees, from *Scolytus* sp.; *Brachistes longicaudis*[230] was bred from an unspecified individual by Ratzeburg (Ichn. d. Forst. i, 23), and Kirchner (Cat. 118, probably quoting *lib. cit.* iii, 27) gives *Sigalphus flavipalpis*,[186] Wesm., "Hohenheim. Gez. aus *Eccoptogaster*-Arten."

238. *Scolytus destructor*, Oliv.

From *Eccoptogaster scolytus* some interesting parasites have been recorded by Ratzeburg, who received several ♂♂

of *Ichneumon nanus*[3] (Ichn. d. Forst. ii, 133) out of elms infested by this borer, from Radzay, who also bred a single ♀ *Hemiteles modestus*[18] (ii, 129) from the same host, together with a quantity of both sexes of *Bracon initiatellus* (ii, 39). *B. Middendorffii*,[177] *B. minutissimus*[158] and *B. protuberans*[176] are also given (ii, 214) as preying upon this species. Both Radzay and Nördlinger bred *B. curtisii*,[176] ♂♀ (ii, 32) sparingly from this weevil in elm; and the former further raised from it a single ♀ *Spathius exannulatus*[147] (ii, 42). *Elachestus leucogramma* (ii, 174) was bred by Nördlinger at Grand Jouan in June from a mixed lot of *E. scolytus*, *E. intricatus* and *E. multistriatus*, as well as by Radzay in Germany from *E. scolytus* only together with a single *Pteromalus capitatus* (ii, 196); Nördlinger also bred at the same time and place *Pteromalus bimaculatus* and *P. brunnicans* (ii, 188) from this beetle. An unusually large and untypical ♀ of *P. lunula* (ii, 193) was raised from it by Wissmann; and Radzay added *P. vallecula* (ii, 206) and *P. lanceolatus* (ii, 207) to its list of parasites from Falkenberg in Silesia. *Scolytus destructor* is further attacked (cf. Ann. Soc. Fr. 1877, p. 414) by *Cœloides scolyticida*, Wesm., and—"Scolytus de l'Orme"—by *Cerocephala cornigera*, Westw. "And Mr. Spence has also observed the larvæ and pupæ to be infested to a great extent with minute worm-like OXYURIDES" (Westwood, Mod. Class. i, 255).[1]

[1] "It may be here mentioned, though somewhat out of place, for the purpose of drawing the attention of Entomologists to a new tribe of insect-parasites of which no account appears to have been given in books, that in examining closely the pupæ of *Scolytus destructor* at Brussels, I found them lined in different parts of their external surface, but especially on the thorax and about the cases of the elytra, with numerous transparent eel-shaped vermicles. . . . The vermicles, under M. Wesmael's powerful compound microscope, with which he was so good as to assist me in examining them, exhibit not the slightest trace either of mouth or other external organ, nor of intestines, nor of internal vessels of any kind, which, if any such existed, might be easily seen through their transparent skin and body. This absence of all external and internal organs (the inside of the body seeming filled with *granular molecules*), added to their shape, which is filiform and very slender, sharply attenuated at each extremity, and their hyaline colour, with very indistinct traces under a high magnifying power of about twenty segments, each as long as broad, are all the characters they afford. . . . From their connection with an animal, they might be regarded as referable to the OXYURI, were it not that neither my own nor M. Wesmael's close examination could ever discover any trace of their existence in the interior of either

On an old elm log full of *S. destructor*, at Wherstead in Suffolk, several ♀♀ of *Cheiropachus quadrum* were found on May 3rd, 1904 [C. M.].

239. *Scolytus intricatus*, Ratz.

Its author indicates as preying upon this borer (Ichn. d. Forst. i, 23) *Elachestus leucogramma* (ii, 174), bred by Nördlinger at Grand Jouan in June with *Eulophus albipes* [380]; *Eurytoma eccoptogastri, Pachyceros eccoptogastri* [311A] (i, 280) of which a single ♀ was bred in July, *Pteromalus binævius* [327] and *Cleonymus pulchellus*; adding (ii, 214) *Bracon protuberans*,[176] bred from this host (iii, 32) in oaks at Hohenheim and by M. V. Audouin from larvæ of *Eccoptogaster pygmæus*; *Spathius rugosus* (ii, 44), a unique specimen bred by Nördlinger in spring; *Eurytoma striolata* (ii, 177), a ♀ bred by the same observer at Grand Jouan; *Pteromalus bimaculatus* (cf. *Xylopertha sinuata*, ante), *Roptrocerus eccoptogastri* and, doubtfully, *Helcon carinator*.

240. *Scolytus multistriatus*, Marsh.

Laboulbène records from this species *Meteorus brevipes*, Wesm., *Cœloides scolyticida*, Wesm., *Dendrosoter protuberans*, Nees, and *Cheiropachus quadrum*, Walk. Ratzeburg only gives *Elachestus leucogramma* (Ichn. d. Forst. ii, 174), *Pteromalus bimaculatus* and *P. brunnicans* (ii, 188), all bred by Nördlinger in France. Marshall is somewhat sceptical of its being the host of *Meteorus albicornis*, Ruthe (Bracon. d'Europ. ii, 101), on account of their relative size. Mr. C. T. Gimingham has bred several *Cheiropachus quadrum*

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the larva, pupa, or imago of *Scolytus*. . . . Leaving it to future examination to decide the true genus and relations of these vermicles, I shall here merely observe, in addition to what has been above said, that I have found them upon a large proportion of the pupæ of *Scolytus destructor*, and occasionally on some of the larvæ in an advanced stage of growth, and also on the pupæ of *Hylesinus fraxini*; and in such distant localities, and at such different periods of the year, that I am persuaded that their occurrence was not accidental, but that they are true external parasites, of the family of *Scolytidæ* in the pupa (and partly in the larva) state, in which, however, they do not seem materially to injure them, nor prevent them from becoming perfect insects." (Introd. 7th Ed., 1859, pp. 122-3; cf. also Spence, Trans. Ent. Soc. ii, Proc. xv.) The presence of granular molecules certainly points to a hymenopterous origin of these vermicles, in which case, however, they would have a very decidedly prejudicial effect upon the beetles' final ecdysis.

from this species at Harpenden in Herts. July 22nd, 1904; and he noticed that four or five individuals assisted each imago to emerge. The same parasite has also been commonly found, tapping with its antennæ and running about upon a newly-felled willow pole at Sotherton, in Suffolk, July 6th, 1900.

241. *Scolytus pruni*, Ratz.

Reinhard has, according to Giraud (Ann. Soc. Fr. 1877, p. 427), bred *Raphitelus maculatus*, Walk., from this borer. Kirchner (Cat. 115 et 181) also records from it *Doryctes pomarius*, Reinh., and *Eulophus lophyrorum*, Htg.; though the association appears doubtful in both cases. Of the latter, however, Ratzeburg says (Ichn. d. Forst. ii, 157) that one ♀ emerged with him from *Eccoptogaster pruni* and he received another of the same sex from Bouché, who is also thought to have bred it from *E. pruni*; and he adds, concerning *Elachistus leucogramma* (*l. c.* ii, 174), that, with the described ♂, were numerous ♀♀ from *E. scolytus* and *E. pruni*. Mr. Donisthorpe bred a specimen of *Pteromalus* sp. from this borer in 1906 in London.

242. *Scolytus ratzeburgi*, Jan.

From *Eccoptogaster destructor*, Ratzeburg (*l. c.* ii, 214) says Wissmann bred what he thought was *Pteromalus lunula*, in Germany.

243. *Scolytus rugulosus*, Ratz.

The list of parasites upon this species given by Ratzeburg (Ichn. d. Forst. ii, 214) comprises both *Bracon eccoptogastri* [158] and its variety *B. minutissimus* (ii, 31) bred from it by Reissig in the dying boughs of plum trees; Nördlinger raised *Brachistes longicaudis* [230] (i, 54 et iii, 28) from this borer in ailing apple twigs at Stuttgart; and Bouché *Opius cephalotes* [267] (ii, 63) from the same host and pabulum. *Elachestus leucogramma* (i, 170) is said to also live on this beetle, from which Nördlinger bred one ♀ of *Eurytoma eccoptogastri* (i, 174), with several *Eulophus allipes*, [380] etc., in dying apple boughs which were also tenanted by *Saperda præusta* and several species of *Magdalis*. A few ♂♂ of *Pteromalus bicaliginosus* [327] (i, 190) were also bred from

Eccoptogaster rugulosus, and its ♀ was raised by Bouché (i, 191) from the same host, as has been *P. bimaculatus*[1] and *Storthygocerus subulifer*[308] (ii, 214). Dr. Giraud instances from *C. rugulosus*, *Eucoila minuta*, Gir., *Teleas punctata*, Gir., and *Diapria nigra*, Nees. Reinhard bred his *Dorycetes pomarius* from a tree containing these, among other beetles. Bouché bred *Cænocoelius analis*, Nees, from *S. rugulosus*' boring in an apple tree, and Goureau says that his *Blacus fuscipes* attacks these beetles in their holes in apple trunks and "fait périr un grand nombre de victimes, chaque femelle de *Blacus* en detruisant autant qu'elle a d'œufs à poudre."

244. *Hylastes palliatus*, Gyll.

Herr Saxesen found larvæ of *Pteromalus spinolæ* (Ichn. d. Forst. i, 189 et ii, 193) on the external surface of spruce borers, especially *B. typographus* and *Hylesinus palliatus*, and thought them the commonest and most effective of their foes; though he also found the larvæ of *Pachyceras xylophagorum*[311B] (i, 218) to be a numerous external parasite of the same beetles, in the Hartz. *Pteromalus æmulus* is also indicated (ii, 215) as a doubtful parasite of this species.

245. *Hylesinus.*

Eulophus hylesinorum[408] is recorded by Ratzeburg (*lib. cit.* i, 23) from an unspecified individual of this genus.

246. *Hylesinus crenatus*, Fab.

Nördlinger at Stuttgart discovered that *Mesostenus brachycentrus*[5] (Ichn. d. Forst. iii, 142) was parasitic in the borings of *H. crenatus* and pupated towards the end of May: "it is true," says Ratzeburg, "that there were there

[1] As illustrative of the diversity of this species' hosts, *lib. cit.* ii, pp. 187–8 may be quoted: "This insect emerged from an oak stick in which, besides *Callidium fennicum*, *Apate sinuata* and *Eccoptogaster intricatus* had lived. . . . In July 1846 fresh wood from a two-inch apricot tree was caged in which *Ecc. rugulosus* had numerously bored; already in March 1847 several *Pteromali* had appeared with the sparsely emerging beetles, but fresh ones were bred in the middle of May and even until well into July. . . Lastly a new and very interesting breeding is to be mentioned: Nördlinger at Grand Jouan raised it out of *Bostrichus villosus* in oak, and again out of *Eccoptogaster scolytus* and *multistriatus* in June 1843."

also larvæ of *Clerus formicarius*, but they could not have been the host"—one wonders why not, since their size would appear more appropriate than that of this Cryptid. The same observer also found *Bracon stabilis* (iii, 38) and *Cœloides filiformis* (iii, 72) associating with this borer in ash bark.

247. *Hylesinus fraxini*, Panz.

Feldjäger Angern, in his observations on timber and its injurious insects, bred *Spathius exannulatus*[147] (Ichn. d. Forst. ii, 43) out of this species, as also did Nördlinger at Hohenheim on July 3rd a single ♂ of *Cœloides melanotus* (iii, 40). All its other parasites were, however, Chalcididous: Oberforster Radzay raised fourteen specimens of *Eurytoma flavovaria* (i, 173) from *Hylesinus fraxini* in ash, where they pupated in such a manner as to easily emerge through the beetles' orifice; with it he bred several ♂♂ of *E. ischioxanthos* (i, 174), some spotted-winged *Pteromali* and *Styloceras ladenbergi*[308] (i, 208). From borings of the same species, Saxesen once bred a single *Eurytoma flavoscapularis* (i, 173); and from its larvæ, Radzay raised *Pteromalus fraxini*, *P. bivestigatus*, *P. binimbatus*[327] and a ♂ *P. bicaliginosus*[327] (i, 190–191). Angern also found one ♂ *Tridymus xylophagorum* (ii, 184) among a mass of *Pteromalus bimaculatus* which had emerged from this borer, as well as *Sciatheras trichotus*[286] (ii, 209) and a single *Eupelmus geeri* (ii, 151); *Eurytoma nodulosa* is also indicated (ii, 215) as preying upon this beetle. Giraud adds *Dendrosoter protuberans*, *Cerocephala cornigera* and also bred in France *Cœliodes filiformis*, *C. melanotus*, *Eurytoma flaveolaria*, *Raphitelus ladenbergi*[308] and *Pteromalus bimaculatus*, Spin., from this host. In May 1906 Mr. Donisthorpe bred a ♀ *Cheiropachus quadrum* at Enfield from a pupa of *H. fraxini*, together with both sexes of *Bracon caudatus*, Ratz., and of *B. longicaudis*, Ratz., of which the latter is new to the British fauna. The same observer also bred, at the same time and from the same beetle, a species of *Pteromalus* at Leighton.

248. *Hylesinus oleiperda*, Fab.

Fonscolombe, quoted by Westwood (Mod. Class. ii, 159), tells us that *Cheiropachus quadrum* also feeds upon the larvæ of this beetle; and Dr. Ratzeburg (Ichn. d. Forst.

ii, 152) that he bred from *Bostrichus suturalis* a single ♀ of *Eupelmus inermis*[280] at Neustadt.

249. *Carphoborus* (*Dendroctonus*) *minimus*, Fab.*

From fir wood bored by this species, Ratzeburg bred several *Entedon hylesinorum* (Ichn. d. Forst. i. 167) of both sexes; *Eurytoma pinctorum* (iii, 220) from *Bostrichus minimus*, together with *Pteromalus azureus* (*l. c.* et iii, 235) from bored fir twigs in May, and *Entedon pinctorum*; from fir wood, with *B. minimus* and *B. bidens*, emerged *Pteromalus azurescens* (iii, 235), and, from *B. minimus* alone, he bred *P. vicarius* (iii, 241), together with *P. azureus*, *Entedon pinctorum*, *Eurytoma pinctorum* and *Spathius brevicaudis*. Nördlinger at Hohenheim raised three different Chalcids from this host: a single ♂ of *Pteromalus ramulorum* (ii, 201) in August; *P. dubius*[316] (ii, 192 et iii, 234) also in August; and *Entedon caudatus* (ii, 170). *Pteromalus siccatorum* (iii, 240) and *Bracon hylesini*[159] are also indicated (iii, 249) as probably preying on this beetle.

250. *Phlœotribus oleæ*, Fab.*

Fitch reminds us (Entom. 1880, p. 258) that Bargagli has bred *Spathius rubidus* from this host.

251. *Hylurgus*.

Cheiropachus quadrum is referred to by Westwood (Mod. Class. ii, 159) as bred from members of this genus by Fonscolombe.

252. *Hylurgus minor*, Htg.

From *Hylesinus minor*, Ratzeburg (Ichn. d. Forst. ii, 191) records both sexes of *Pteromalus azureus*, as numerously bred by Nördlinger at Hohenheim in August.

253. *Hylurgus piniperda*, Linn.

Cooper (Ent. Mag. ii, p. 116) recounts the parasitism of *Cheiropachus pulchellus* upon this species. Ratzeburg (Ichn. d. Forst. ii, 215) gives *Bracon palpebrator* (ii, 89), bred from *Pinus pinaster*, in which *H. piniperda* and *Curculio notatus* lived; *Pteromalus latreillei*[317] (ii, 192), one bred from this borer by Reissig; *P. lunula* (ii, 193), one bred at Neustadt out of this host; *P. pellucens*, *P. multicolor*[368] (ii, 194), raised from it by Nördlinger in

May; and *P. suspensus* (ii, 193), bred by the same observer from *Pinus pinaster*, in which both this species and *C. notatus* had bored—as preying upon it; and adds (*lib. cit.* iii, 249), *Hemiteles modestus*,[18] *H. melanarius* and *Pteromalus guttatus* (iii, 236), which was always bred from fir, in one case containing only *H. piniperda*. Of *Bracon Middendorffii* [177] he says (ii, 33) that it was bred by Reissig on June 18th from fir bark, while the imagines of *H. piniperda* therein were still quite pale and only preparing for flight. . . . Herr Reissig sent him several two-lines long, dirty white, delicate, elongate cocoons from which the Braconid had emerged just below the apex. The dust from the boring adhered to them and also a distinct empty skin of a *Hylesinus piniperda*: the Braconid had certainly sucked it from outside. The same observer later sent it again to him, after the time of the hosts' emergence.

254. *Phlœophthorus rhododactylus*, Marsh.

Phlœophthorus spartii is said by Giraud (Ann. Soc. Fr. 1877, p. 427), upon Aubé's authority, to be the host of *Raphitelus maculatus*, Walk. Nördlinger bred (Ichn. d. Forst. ii, 215) *Storthygocerus subulifer*[308] (ii, 208 et iii, 246) at Bordeaux, Grand Jouan and the Schwarzwalk; and several ♀♀ of *Bracon planus*[178] (ii, 33) at Bordeaux, from *Hylesinus spartii*; adding (ii, 31) that a great number of *Bracon hylesini*[159] emerged from it at Hohenheim.

255. *Polygraphus pubescens*, Bach.

From *Hylesinus poligraphus*, Nördlinger bred at Hohenheim at least one *Bracon hylesini*[159] (Ichn. d. Forst. ii, 31), and both he and Radzay also bred *B. Middendorffii*,[177] from this host (ii, 33 et iii, 32). Several specimens of *Cosmophus klugii*[211] (ii, 72) were raised by the latter, as well as of both sexes of *Pteromalus lanceolatus* (ii, 204) from the same borer, which Ratzeburg found was further parasited by *Roptrocerus xylophagorum* (ii, 209), *P. multicolor*[368] (ii, 193), *P. capitatus*, *P. navis*, and, doubtfully, *P. æmulus* (ii, 215).

256. *Cryphalus binodulus*, Ratz.

Out of *Bostrichus binodulus*, its author says (*lib. cit.* ii, 30) that Radzay bred *Bracon silesiacus*[160] (ii, 30) from beneath poplar bark; and probably also *Aphidius obsoletus* (ii, 59), which emerged in this beetles' breeding cage, though possibly other Coleoptera were also in the enclosed large section of wood.

257. *Cryphalus fagi*, Fab.

Bracon hylesini[159] is recorded (*lib. cit.* iii, 249) from *Bostrichus fagi.*

258. *Cryphalus piceæ*, Ratz.

Only *Roptrocerus xylophagorum* was bred by Nördlinger (Ichn. d. Forst. ii, 209) from *Bostrichus piceæ.*

259. *Cryphalus tiliæ*, Panz.

A single ♂ *Spathius exannulatus*[147] and a species of *Eurytoma* are alone recorded (*lib. cit.* ii, 43) from *Bostrichus tiliæ,* though Ratzeburg bred "countless myriads" from lime trees.

260. *Pityophthorus pubescens*, Marsh.

Dr. Ratzeburg (Ichn. d. Forst. ii, 212) bred *Roptrocerus xylophagorum, Pteromalus capitatus, P. navis* and perhaps *P. æmulus* (ii, 203) from *Bostrichus pitiographus*; he adds that Nördlinger also raised *P. multicolor*[368] (ii, 193) from the nests of this borer at the end of June—at the time of, or rather later than, their hosts' emergence; as well as *P. navis* (ii, 205) at Hohenheim in spring from the same beetle, with *B. poligraphus* and *B. abietis,* in spruce.

261. *Xylocleptes bispinus*, Duft.

Pteromalus gravenhorstii[318] was bred by Nördlinger (*lib. cit.* iii, 245) from *Bostrichus bispinus* in clematis.

262. *Dryocœtes autographus*, Ratz.

From *Bostrichus autographus,* Ratzeburg (*l. c.* ii, 211) records only *Pteromalus multicolor.*[368]

263. *Dryocœtes villosus*, Fab.

Marshall (Bracon. d'Europ.) says *Microdus rugulosus,* Nees, and perhaps *Chelonus neesii,* Reinh., have been bred from this borer. Nördlinger (Ichn. d. Forst. ii, 188 et 209) raised *Pteromalus bimaculatus, P. multicolor*[368] and *Roptrocerus xylophagorum* from *Bostrichus villosus* in oaks at Grand Jouan, in France.

264. *Taphrorychus bicolor*, Herbst.

Ratzeburg records from *Bostrichus bicolor* (*lib. cit.* ii, 211), *Roptrocerus xylophagorum* (ii, 209), bred by Wissmann, and *Pteromalus multicolor*.[368]

265. *Tomicus*.

From unspecified individuals of *Bostrichus*, the above author (*l. c.* i, 23 et ii, 211) instances *Pteromalus spinolæ*, *P. suspensus*, *P. bimaculatus*, and *Pachyceras xylophagorum*.[311B]

266. *Tomicus laricis*, Fab.

Giraud bred *Diapria elegans*,[438] Jur. et Nees (Ann. Soc. Fr. 1877, p. 435), from *Bostrichus laricis*; from which Ratzeburg further records *Bracon palpebrator* (Ichn. d. Forst. ii, 39), *Roptrocerus xylophagorum*, *Pteromalus suspensus* (i, 189 et ii, 193), bred by Nördlinger from the larvæ at Hohenheim and Neustadt, *P. virescens*[375] and perhaps *P. æmulus*.

267. *Tomicus typographus*, Linn.

"M. L. Dufour detected great numbers of minute *Ascarides*," says Westwood (Mod. Class. i. 354), "in the entrails of *T. typographus*, as well as numbers of small mites on its external surface"; for latter, cf. footnote to *Scolytus destructor*, ante. Possibly these latter may have been the larvæ of *Pteromalus spinolæ* or *Pachyceras xylophagorum*,[311B] both of which Herr Saxesen discovered (Ichn. d. Forst. i, 189 et 218) to be ektoparasitic upon the larvæ of *Bostrichus typographus* and *Hylesinus palliatus* in spruce; the former, he says, are probably the commonest and most effective foes of these two beetles; the latter were also numerous in the Hartz. Ratzeburg raised from this borer *Pteromalus multicolor*[368] and perhaps *Bracon obliteratus*,[175] (*l. c.* ii, 212). And Giraud adds (Ann Soc. Fr. 1877) *Cœloides bostrichorum*, Gir., *Roptrocerus xylophagorum*, *Acrocormus multicolor*, Ratz., and *Pteromalus abieticola*, Ratz., to its parasites.

268. *Tomicus curvidens*, Germ.*

From *Bostrichus curvidens* in blocks of white fir, Radzay bred (Ichn. d. Forst. ii, 141) *Ceraphron pusillus*[432] and Nördlinger found (ii, 209) *Roptrocerus xylophagorum* to be parasitic upon the same species.

269. *Pityogenes bidentatus*, Herbst.

Ratzeburg records from *Bostrichus bidens*, *Bracon Middendorffii*[177] (Ichn. d. Forst. ii, 33), bred by Hartig with one small ♂ of *Spathius brevicaudis* (ii, 43); *Pteromalus bidentis* (ii, 205), a unique and broken specimen by Nördlinger, who had labelled one *Entedon geniculatus* (ii, 160): "Out of *Bost. bidens* from the Black Forest." He adds later (iii, 249) *Bracon Hartigii*[180] (iii, 32), of which Ratzeburg says that he bred this beautiful and rare insect from Weymouth pine, filled with *B. bidens*, together with *Roptrocerus xylophagorum*; *B. labrator*, *B. palpebrator* (iii, 38), by Nördlinger; *Pteromalus guttatus* (iii, 236), bred from fir wood by Herr von Bernuth with *P. suspensus*, *P. virescens*[375] (iii, 243) bred from firs infested by this borer; and *P. azurescens* (iii, 235), also bred by von Bernuth from *B. bidens* in *Pinus strobus*; as well as, doubtfully, *P. siccatorum* (iii, 240), *Eusandalon abbreviatum*, *E. tridens* (iii, 200) and *Bracon hylesini*.[159] Giraud has also bred *Pteromalus guttatus*, *Roptrocerus xylophagorum* and *Dendrosoter Perisii*, Gir., from this species in France.

270. *Pityogenes chalcographus*, Linn.

Pteromalus abieticola was raised by Radzay (*lib. cit.* ii, 191) from *Bostrichus chalcographus* in the spruce woods of the Hartz.

271. *Xyleborus monographus*, Fab.*

The only parasite, instanced by Ratzeburg, of *Bostrichus monographus* is *Ceraphron radiatus*,[433] of which Herr Wissmann (Ichn. d. Forst. ii, 141) bred a single specimen.

272. *Undetermined Coleoptera.*

Several of both sexes of *Cœloides melanotus*, Wesm., "from some wood-boring beetle" (Marshall, Ent. Ann. 1874, p. 144). Nördlinger found *Hemiteles thoracicus*, Ratz., in a breeding cage containing xylophagous Coleoptera (Ichn. d. Forst. iii, 156); *Rogas rugator*[253] is said (*l. c.* ii, 66) to have occurred in the same situation. Brischke (Allgemeine Wirths-Tabelle) has bred *Sigalphus floricola*, *Pteromalus Dahlbomi* and *Entedon xylobius* "from coleoptera." *Alysia manducator*, Panz., "bred from larva found feeding on carrion" (Bignell, Trans. Devon. Assoc. 1901, p. 685—cf. *Creophilus*, ante). *Rhyssalus indagator*, Hal., "parasite sans doute de quelques petits Coléoptères xylophages" (Marshall, Bracon. d'Europ. i. 183). *Pimpla brevicornis*, Grav., bred "from pupa of beetle" (Entom. 1885, p. 152). *Apanteles salebrosus*, Marsh., "one and one cocoon, bred from a coleopteron" (Morley, *lib. cit.* 1906, p. 100).

CLASSIFIED LIST OF PARASITES.[1]

ICHNEUMONIDÆ.

1 Barichneumon ridibundus, Grav., 217
2 Phæogenes suspicax, Wesm., 105
3 „ nanus, Wesm., 238
4 Diadromus subtilicornis, Grav., 105
5 Helcoztisus brachycentrus, Grav., 41, 246
6 Cubocephalus nigriventris, Thoms., 110
7 Microcryptus nigrocinctus, Grav., 9
8 Phygadeuon rufulus, Gmel., 180
9 „ variabilis, Grav., 2
10 Oresbius castaneus, Marsh., 4, 5, 175
11 Hemiteles bicolorinus, Grav., 47
12 „ areator, Panz., 8, 25, 26, 43, 44, 50, 214
13 „ pedestris, Fab., 126
14 „ niger, Tasch., 146
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17 „ persector, Parf., 7
18 „ æstivalis, Grav., 41, 47, 188, 238, 253
19 Hemiteles completus, Ratz., 57
20 „ thoracicus, Ratz., 272
21 „ subzonatus, Grav., 23, 24
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24 „ comes, Först., 7
25 „ thoracicus, Brisch., 215
26 „ fasciatus, Fab., 16, 201
27 „ palpator, Grav., 49
28 „ sp., 182, 216
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33 „ echthroides, Ratz., 231
34 Cænocryptus tener, Thoms., 96
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37 Ephialtes imperator, Kriech., 105
38 „ manifestator, Linn., 30, 76, 105
39 „ tuberculatus, Fourc., 73, 95, 105, 187, 217

[1] The numbers prefixed to the parasites' names here given refer to those printed in small type after the now obsolete names in the text, and are intended to facilitate synonymy.

The numbers suffixed to the parasites' names here given refer to the corresponding ones attached to the Coleoptera in the text, and will serve as an index.

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93 Bassus lætatorius, Fab., 137
94 Homoporus tarsatorius, Panz., 16
95 Sphecophaga vesparum, Curt., 152
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97 Mesoleptus teredo, Htg., 73, 109
98 Ophion luteus, Linn., 184
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100 Canidia pusilla, Ratz., 39
101 ,, quinqueangularis, Ratz,, 135
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103 Nemeritis transfuga, Grav., 106
104 ,, gracilis, Grav., 217
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PROCTOTRYPIDÆ.

CYNIPIDÆ.

III. *Descriptions of some new Butterflies from Tropical Africa.* By Hamilton H. Druce, F.Z.S., F.E.S.

[Read March 6th, 1907.]

Plate II.

Family SATYRIDÆ.

Neocœnyra cooksoni, sp. nov. (Plate II, fig. 1.)

♂. Upper-side olivaceous-brown; the basal two-thirds rather darker and with a sinuous edging on the fore-wing. A clearly-defined submarginal dark line followed by a much more slender marginal line; cilia brown. Fore-wing with a large black subapical ocellus containing two clear white pupils placed one above the other and surrounded by a broad pale yellow iris. Hind-wing with two smaller black ocelli, each containing one white pupil and surrounded by a clear pale yellow iris placed between the lower median nervules close to the submarginal line. In a line with these and between the lower median nervule and the submedian nervure is a minute yellowish spot containing a central black dot.

The under-side differs only from the upper by the hind-wing having a sinuous dark median line from the costa to the abdominal margin, by the addition of a yellowish-ringed ocellus near the costa and also two small confluent yellow-ringed ocelli near the anal angle. Head, thorax, abdomen, legs and palpi, dark brown.

Expanse $1\frac{7}{10}$ inch.

Hab. Katanga District, S. E. Congo Free State, 3,000 ft. (*H. Cookson*), captured in April.

Type, Mus. Druce.

This species is distinguished from its allies by the position of the dark bands and by the pale yellow rings to the ocelli, those previously described having tawny or red rings. It is allied to *N. gregorii*, Butler,* *N. victoria*, Auriv.,† and *N. heckmanni*, Thurau.‡

* *Neocœnyra gregorii*, Butl., P. Z. S. 1894, p. 560, Pl. XXXVI, fig. 2.

† „ *victoria*, Auriv., Rhop. Æthiopica, p. 72, Pl. I, fig. 4 (1898).

‡ „ *heckmanni*, Thurau, Berlin, Ent. Zeit. xlviii, p. 126, Pl. II, fig. 5 (1903).

Family LYCÆNIDÆ.

Telipna rogersi, sp. nov. (Plate II, fig. 2.)

♂. Upper-side: dull red, with the costa, cell, apex and outer margin of fore-wing and outer margin of hind-wing somewhat unevenly brownish-black. A dull red spot beyond the end of the cell on fore-wing, joining the red discal area. Two black spots on the disc, placed between the nervules close to the lower wall of the cell. Under-side brownish-black, thickly dusted with orange, especially towards the apex of the fore-wing and the outer-margin of the hind-wing. The inner margin and the lower portion of the disc of the fore-wing is reddish, and the two black discal spots of the fore-wing show faintly through. There are no spots as in *T. carnuta*, Hew. Antennæ black above, spotted with white below; thorax, abdomen, palpi and legs reddish.

Expanse $1\frac{1}{5}$ inch.

Hab. British E. Africa. Type, Mus. Oxford.

Captured fourteen miles N.W. of Mombasa, Rabai, on Dec. 26th, by the Rev. K. St. Aubyn Rogers and presented by him to the Oxford Museum. Also in Mus. Druce: one specimen from the same source, kindly presented by Professor Poulton.

This insect is allied to *T. carnuta*, Hew.,* but has several points of distinction.

Mimacræa skoptoles, sp. nov. (Plate II, fig. 3.)

♀. Upper-side uniform reddish-orange, darkest along the upper wall of the cell of fore-wing, with broad blackish-brown apical and outer margins unevenly edged inwardly. Fore-wing: the costal margin narrowly blackish, a distinct black spot at the end of the cell and a narrow black streak along the upper wall of the cell reaching from the base for about two-thirds its length. A creamy white band, commencing near the costa in a small spot about half-way between the end of the cell and the apex and reaching to the upper median nervule, but broadest between the discoidal nervules. The nervules which cross this white band are of a faint orange hue, not black as in *M. marshalli*, Trimen. Hind-wing: the costal margin is unmarked, and the nervules show no indication of becoming black where they run into the dark border. The markings of the under-side show through, but very indistinctly.

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* *Pentila carnuta*, Hew., Ent. Mon. Mag. x, p. 125 (1873).

Under-side: ground-colour pale yellowish, merging to rich orange-buff all over the cell of the fore-wing; an apical and outer-marginal border common to both wings, composed of large Λ-shaped black markings placed between the nervules. Fore-wing: a black spot at the end of, and two smaller ones in, the cell. The white band of the upper-side is reproduced and is inwardly bordered by a distinct black irregular patch. Hind-wing: the basal area, which is dusted with blackish scales, contains about ten distinct black spots which are irregularly distributed and which are individually ringed with pale yellow.

Head, thorax and abdomen blackish-brown above, yellowish below. Legs black with white spots. Antennæ black above, white-spotted below. Cilia of fore-wing black, white between the nervules on hind-wing on both surfaces.

Expanse 2 inch.

Hab. NIGERIA. Type, Mus. Druce.

This insect is perhaps most nearly allied to *Mimacræa gelinia*, Oberthur,* described from Usambara, but has many points of distinction. It is also allied to *M. poultoni*, Neave,† to which it bears considerable resemblance on the under-side, but it has the subapical band on the fore-wing white and differently placed.

Mimacræa neokoton, sp. nov. (Plate II, fig. 4.)

♀. Allied to the preceding species but the orange area on the upper-side is slightly more extensive and paler; the band crossing the fore-wing is pale orange (excepting the first spot on the costa, which is white) and differently placed and the black streak in the cell is absent. On the under-side the Λ-shaped marginal markings are smaller and less prominent, those at the apex of the fore-wing being absent, whilst the nervules between which they are wanting are faintly blackish as also are those on the discal area of the hind-wing. There is an extra black spot at the junction of the lower median nervule, and the abdomen is distinctly black-spotted along its whole length. Cilia black at the extremities of the nervules, white between, on both surfaces.

Expanse $1\frac{4}{5}$ inch.

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* *Mimacræa (Liptena) gelinia*, Oberth., Études d'Ent. 17, p. 31, Pl. II, fig. 24 (1893).

† *Mimacræa poultoni*, Neave, Novitates Zoologicæ, v. xi, p. 337, Pl. I, fig. 18, ♂ (1904).

Type, Mus. Hope, Oxford.

Hab. S.E. RHODESIA: Melsetter, Gazaland.

Captured on Mount Chirinda, about 4,000 ft., in the forest, October 17th, by Mr. Guy Marshall, and presented by him to the museum.

Spindasis menelas, sp. nov. (Plate II, fig. 5.)

♀. Upper-side orange-yellow, with the base, costa, and outer margin of fore-wing, the base, costal, outer and anal margins of hind-wing dark brown. Fore-wing: the whole of the cell is dark brown excepting a small orange spot near the end. On the disc of the wing are two patches consisting apparently of two confluent brown spots placed one towards the apex, one about the middle. Hind-wing: two brown bars running from the costal border evenly and regularly into the orange area.

Under-side: ground-colour very pale yellow with rather broad and short silver bands and spots edged with black; a fine anteciliary black line common to both wings followed by a narrow submarginal line and beyond that a broader black line which is silvery towards the apex of the fore-wing and wholly silvery in the hind-wing.

The tails, which are long, are dark orange along their basal halves on both surfaces, the outer portions being black and the tips white.

The cilia on both surfaces are shining fuscous, those on the fore-wing being darkest. Head and thorax dark brown with two white streaks between the eyes. Abdomen brown above, pale-yellowish at each segment; yellow below.

Palpi pale yellow.

Expanse $1\frac{2}{5}$ inch.

Type, Mus. Druce.

Hab. N. NIGERIA: Afikpo (*Reddick*).

This species appears to be allied to *S. iza*, Hew.,* and *S. crustaria*, Holland.†

Hewitson described and figured a ♀, not a ♂, as stated. The upper surface of the ♂ is shot with opalescent blue.

Stugeta maria. (Plate II, fig. 6.)

Stugeta maria, Suffert. Deutch. Ent. Zeit. "Iris," xvii, p. 60, 1904.

I have figured a ♀ from the Bihe district, Angola.

* *Aphnæus iza*, Hew., Ill. Diur. Lep. Lyc. p. 62, Pl. XXV, fig. 5 (1865).

† *Aphnæus crustaria*, Holland, Psyche 5, p. 430 (1890).

Epamera mermis. (Plate II, fig. 7.)

Epamera mermis. H. H. Druce, Anns. Mag. Nat. Hist. (6) xvii, p. 285 (1896). P. Z. S. 1902, p. 117, Pl. XII, fig. 2, ♂.

♀. Upper-side. Fore-wing: discal area pure white, base and inner margin pale greyish-blue; costa, apex and outer margin blackish-brown. Hind-wing pale greyish-blue, greyer towards abdominal margin; costal margin blackish-brown outwardly edged with white, a submarginal row of irregular deep black patches from apex to anal angle. A black anteciliary line inwardly bordered by a white line. A black spot in the lobe, crowned by a bright orange patch. Tails black; cilia white. Bright orange between the eyes. Under-side as ♂ but black spots towards anal angle more extensive.

Hab. BRITISH E. AFRICA, Mombasa, Rabai.

Captured July 28th by the Rev. St. A. Rogers and presented by him to the Oxford Museum.

Epamera mirabilis. (Plate II, fig. 8.)

Epamera mirabilis, H. H. Druce, Anns. Mag. Nat. Hist. (ser. 7), vol. xi, p. 71 (1903).

Hab. SIERRA LEONE, W. AFRICA.

I have figured the type specimen of this interesting species which is an aberrant form of the genus, being without the row of hairs on the inner-margin of the hind-wing and also without the patch of differently placed scales on the large shining area of the hind-wing above.

Family HESPERIDÆ.

Kedestes rogersi, sp. nov. (Plate II, fig. 9 ♂, 10 ♀.)

♂. Allied to *K. macomo,* Trimen.* Upper-side dark brown with yellow spots and markings as in that species but with an additional outer-marginal row of yellow dashes placed on the nervules and common to both wings. An anteciliary dark line. Under-side uniform yellow; fore-wing with a minute black spot at the end of the cell, otherwise spotless, and with the basal half only of the inner-margin black. Hind-wing with the central discal minute black spots only present. An anteciliary dark line. Cilia of fore-wing brown, of hind-wing yellow, on both surfaces.

♀. Upper-side as ♂ but browner especially over basal areas.

* *Cyclopides macomo,* Trim., Trans. Ent. Soc. 1862, p. 405.

Under-side: ground-colour rich yellow. Fore-wing: a black spot at end of cell, three minute black dots beyond and an outer-marginal row of linear black streaks placed on the nervules. Inner-margin broadly black with the large yellow spots of the upper-side reproduced. Hind-wing with two discal rows of black spots and an outer-marginal row of linear black markings. A black anteciliary line to both wings.

Expanse ♂ $1\frac{1}{5}$ inch, ♀ $1\frac{2}{5}$ inch.

Types, Mus. Oxford.

Hab. British E. Africa, Taveta, about 2,500 ft.

The ♂ was captured on April 27th and the ♀ on October 20th by the Rev. K. St. A. Rogers and presented by him to the Museum. Although the ♀ described differs considerably from the ♂ on the under-side and was taken six months later I think there can be no doubt that they are sexes of one species.

The fore-wing of ♂ is narrower than that of *K. macomo.*

Explanation of Plate II.

[*See Explanation facing the* Plate.]

IV. *The Larva of* Collyris emarginatus, Dej. By R. Shelford, M.A., F.L.S.

[Read March 6th, 1907.]

Plate III.

In Dec. 1905 I exhibited before this Society some specimens of the wood-boring larva of the Tiger-beetle *Collyris emarginatus*, Dej., and made some remarks thereon, which are published in the Proceedings of date Dec. 6th, 1905. It is to Dr. J. C. Koningsberger of the Zoological Museum at Buitenzorg, Java, that we owe the discovery of this very interesting larva. From a brief description of its habits published in "Mededeelingen uit'Slands Plantentuin," vol. xliv, p. 113, 1901, we learn that the larva excavates a burrow in the twigs of coffee-shrubs and that it feeds on the ants and aphides which crawl over the entry to the burrow; pupation takes place in the burrow. No adequate figure of the larva and no account of its external features have yet been published, but I am now enabled to supply some information on these points, thanks to Dr. Koningsberger, who has most kindly sent me two consignments of larvæ. I gladly seize this opportunity of recording my gratitude to my generous correspondent.

The burrows occupied by the larvæ of *Collyris emarginatus* are situated in the central pith of twigs of not more than 5 mm. in diameter; the woody part of the twig does not appear to be attacked at all. The burrow is generally half as long again as the larva occupying it, so that there is room for to-and-fro movements of the occupant. Close to the anterior end of the burrow is a small circular orifice passing through the woody tissue of the twig and placing the burrow in communication with the outer world; the outer margin of this orifice is raised, so that the entry to the burrow appears to be countersunk. This raised margin is brought about by the swelling of the bark of the twig at this point,—a pathological result of its puncture.

Though the oviposition of this Cicindelid has not been actually observed, there can be little doubt but that the adult female perforates the woody tissue of the twig and deposits her egg in the central core of spongy pith. The larva has no organs adapted for boring through wood; the mouth-parts are not very different from those of the larvæ of *Cicindela* spp., the legs are modified merely for burrowing in relatively soft and non-resisting substances, and may well be compared with the legs of Coprid and Passalid beetles, of *Gryllotalpa* and of Panesthiid cockroaches. As already stated, the burrows are made in the centre of twigs and the woody tissue of the twigs is not attacked; the larva on hatching out from the egg has merely to dig out the soft pith of the twig in order to form for itself a cylindrical burrow, and we may presume that the *débris* is expelled from the mouth of the burrow.

As is well known, the adult females of all species of *Collyris* are furnished with a complex genital armature, which, however, has never been really adequately figured or described. If a dried specimen of *C. emarginatus* be examined with a simple lens the gonapophyses appear to consist of a pair of strongly chitinised *crotchets* projecting beyond the last visible tergite and of a pair of short down-curved spines projecting beyond the last visible sternite. Each crotchet is made up of three stout hooks directed upwards and of a much smaller hook; in some specimens these hooks project considerably, in others they are withdrawn almost entirely into the abdominal cavity. When the dorsal integument is removed, it will be seen that the crotchets and spines are attached to a chitinous tube occupying the greater part of the abdominal cavity of the last three segments. The whole apparatus can be removed bodily from the insect and after boiling in caustic potash mounted and examined under the microscope, when it will be seen that the chitinous tube is a segmented structure (Plate III, fig. 8), the number of the segments being apparently four. I have not been able to make out in the first (*i. e.* the most proximal) segment the number of sclerites composing it, but the second segment is made up of two lateral sclerites which meet each other in the mid-dorsal and mid-ventral line, also of a large spoon-shaped sclerite which embraces the ventral half of this and the succeeding segments, runs backwards to the tip of the abdomen and bears on its posterior margin the two short decurved spines that have already been mentioned.* The third segment is composed of the lateral sclerites, and a median dorsal sclerite, which runs backward and ends between the base of the crotchets (Plate III, fig. 9. *d*); the lateral sclerites meet each other in the mid-ventral line. The fourth segment is open ventrally, the lateral sclerites are now pillars bearing the crotchets and each has a small hook on the outer aspect, the dorsal sclerites are represented perhaps by a pair of oval setigerous plates (Plate III, fig. 9. *s.p.*) covering the base of the crotchets. Each crotchet consists of three strong curved hooks, the second of which has on the ventral aspect an inwardly projecting flange (Plate III, fig. 10. *f.*); they are articulated to the lateral sclerites by a transverse joint but, so far as I know, are not movable independently of the chitinous tube. This is all that can be made out from an examination of dried specimens and I am unable to afford any information as to the exact relations of these parts to the other internal organs of the beetle. But there can be no reasonable doubt that the segmented chitinous tube is composed of retracted terminal segments, the last one of which bears appendages in the form of crotchets, and it is these appendages only which can be regarded as the morphological equivalents of the female gonapophyses of the Terebrant Hymenoptera. The *modus operandi* of the genital armature of *Collyris* is obscure, but I have little doubt of its efficiency as an instrument for boring through wood of no greater hardness than young coffee twigs. Strictly homologous organs occur in other Cicindelidæ and doubtless in every case they function as boring tools. So far as is known—though observations on the subject are woefully inadequate—the Cicindelidæ deposit their eggs *in* substances, and not *on* surfaces, and it does not require a great stretch of imagination to suppose that the arboreal *Collyris* only departs from the habits of its allies so far as to deposit her eggs inside the twigs of trees and shrubs. It is of interest to note that the pair of decurved ventral spines are only well-developed in the arboreal species,†

* These spines have been described elsewhere as attached to the last visible sternite, but this is manifestly incorrect.

† Wallace states that *Therates labiata* in Amboina is arboreal and in this species the ventral spines are well developed; in other species that I have examined these spines are minute or absent, and Canon Fowler informs me that occasionally they are modified to form comb-

and I would suggest that in the case of *Collyris* at any rate they function as guides for the passage of the egg through the aperture bored in the woody tissue of the twig. Species of *Cicindela*, to take an example, would have presumably no difficulty in depositing their eggs in the burrows excavated for their reception; the burrow is of sufficient diameter to admit the tip of the abdomen and the egg can be simply dropped before the tip of the abdomen is withdrawn after the operation of excavation. The entrance to the burrow occupied by the larva of *Collyris emarginatus* is not large enough to admit the tip of the abdomen of the adult female, as can be shown by measurements, but the two ventral spines fit into it with ease. Without these spines it is difficult to see how the female *Collyris* could be certain of passing her egg through the aperture in the wood which she has made; she would be liable to deposit it rather on the outer surface of the twig, whence it would drop to the ground, but with the ventral spines inserted in the aperture the egg can readily pass from the oviduct to the place prepared for it.

Description of the Larva. (Plate III, figs. 1–10.)

The largest specimen in my possession is 12 mm. in length. The head is typically Cicindelidan; that is to say, it is strongly chitinised, swollen and concave beneath, flattened above; the mouth-parts are prominent and point in an upward direction. The antennæ are short and four-jointed. There are two ocelli borne on each side of the head near the origin of the antennæ; the area surrounding these ocelli is much darker than the rest of the head and is somewhat inflated. The labrum is broad and transverse with a quadrangular projection from the middle of the front margin, flanked on each side by a tooth; this quadrangular projection is ridged and has a blunt tooth on each side. The mandibles are strong and curved, each bears a tooth on its inner margin at the centre; distad of this tooth the inner border of the mandible is grooved, proximad of it the inner border is sharp and trenchant. The maxillæ consist of a small *cardo*, a stout triangular *stipes*, bearing a two-jointed palp and a narrow *galea* almost equal to the palp in length and furnished with

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like structures. The species of *Therates* that I took in Borneo were not, so far as I can remember, arboreal, and in these the ventral spines are very small indeed. The Australian genus *Distypsidera* is said to be arboreal and in this genus also the ventral spines are present.

a few strong spines (Plate III, fig. 3). The labium is cordiform, densely hirsute above and with a pair of short two-jointed palps; the anterior angles of the basal joints of these palps are spiniform beneath and the tip of the apical joints is beset with numerous sensory pits (Plate III, fig. 4).

The body consists of 13 segments and is seen at once to differ from that of a typical Cicindelid larva by the absence of a marked sigmoid flexure and by the absence of large dorsal tubercles armed with strong hooks on the eighth segment. The *Collyris* larva in fact "fits" its burrow much better than does the *Cicindela* larva, it is thus able to brace itself at the top of the burrow without pronounced curvature of the body; the walls of its burrow being of a denser and harder texture than sand or earth accounts for the absence of long hooks on the eighth segment. The prothorax is as broad as the head; the pronotum is trapezoidal with rounded posterior angles and is strongly chitinised. From the mesonotum backwards to the eighth segment, the segments increase in breadth. The eighth segment is swollen dorsally forming a hump and the hump carries two curved series of small hooks, each series being composed of three hooks; the hooks are of a rather peculiar shape, which can best be understood by a reference to the Plate (fig. 5). In addition to the hooks are numerous stout setæ; both hooks and setæ are directed forwards. The three segments immediately behind the eighth are slightly narrower than it; the twelfth segment is much narrower and shorter and the thirteenth segment is small and sucker-like with six short spines and numerous fine setæ on its posterior margin. Segments 4 to 12 bear on each side in a dorso-lateral position a mamilliform tubercle furnished with three setæ, and a minute mamilliform tubercle with two setæ occurs on the ventral surface of these segments. These tubercles and setæ together with the dorsal armature of the eighth segment doubtless serve to brace the larva in its burrow.

Of the legs the following parts can be distinguished:—femur, tibia and tarsus. In the second and third pairs the femur is flattened and plate-like, with rounded angles; the tibia is rather slender, about two-thirds the length of the femur and with some setæ along its lower border and at its distal end; the tarsus consists of three joints, the terminal hook or claw being included as one joint; the first or basal point is ringed with setæ, the second has some setæ and, in addition, on its outer aspect a blunt tooth (Plate III, fig. 7). The first pair of legs is very different in shape; the femur is flattened and triangular with a row of setæ along its outer aspect; the tibia is short and very stout, broader distally than proximally, its lower anterior angle is produced to form a strong and acute tooth with secondary teeth on the upper border, a small blunt tooth also occurs at the upper anterior angle on the outer aspect; the tarsus is triangular, the basal joint is almost as broad as long with a blunt tooth on its outer aspect, the second joint also is furnished with a tooth on its outer aspect and both joints are beset with setæ (Plate III, fig. 6). The second and third pairs of legs are carried with the femora straight out from the body, the tibiæ bent upwards; no doubt they brace against the sides of the burrow and serve to steady the larva when it catches some large or active insect. The front legs are plainly adapted for excavating the soft core of the twig in which the larva lives.

In conclusion I would beg to express my thanks to Dr. Sharp, F.R.S., Canon W. W. Fowler, and Mr. V. E. Shelford of Chicago University, for the kind help and useful criticism that they have offered me in the preparation of this account of a most interesting insect.

Explanation of Plate III.

[*See Explanation facing the* Plate.]

ADDENDUM.

After the foregoing account went to press, I received from Dr. D. Sharp a letter sent to him from Hongkong by Mr. F. Muir, in which Mr. Muir announces the discovery by himself and Mr. J. C. Kershaw of a wood-boring Cicindelid larva. Mr. Muir writes that the burrow "runs up the stem, the entrance being at the lower end. It [the larva] waits with its head at the entrance of the burrow and whenever an ant or a fly crawls up the stem within reach it quickly darts out its head and catches its prey." Apparently only one specimen was secured, and this, with the piece of wood containing the burrow, Dr. Sharp has kindly handed to me for examination. The larva is larger than that of *Collyris emarginatus*, measuring 12 mm. in length, but it can, I think, be referred to the genus *Collyris* without much doubt. There are only two pairs of ocelli; the legs are very similar in appearance to those of *C. emargi-*

natus; the eighth tergite bears on each side three small forwardly-directed hooks and its posterior margin is fringed with setæ; the terminal segment is armed on its posterior margin above with eight short spines arranged in two groups of four on either side of the middle line. In fact, such differences as exist between the two larvæ may be regarded as specific rather than generic. In one feature the Hongkong larva differs markedly from *C. emarginatus*; the metathorax is bent down almost at a right angle to the mesothorax and the first abdominal and succeeding segments are again bent up at an acute angle to the metathorax, thus producing a very sharp flexure of the body in this region. I cannot be sure, however, that this is not due to the undue contraction of the specimen after being placed in alcohol. The burrow is 24 mm. long and about 3·5 mm. in diameter, it has been formed by the excavation of the central medulla of pith; the affected part of the stem is dilated, being 7 mm. in diameter, whereas above and below the burrow it is only 4 mm. in diameter. This, I expect, is a pathological result of the injury caused by the larva. I have observed something very similar in the stems of a herbaceous plant tenanted by ants, that I found at the foot of Mt. Penrisen in Sarawak.* The consequence of this dilation of the stem is, that the burrow itself is relatively of much greater diameter than that made by the *emarginatus* larva; the dilation appears to be caused, not by a thickening of the wood, but by the expansion outwards with concomitant thinning of the walls, just as a bulb may be blown in the middle of a glass tube. It would be interesting to learn if this dilation of the stem and expansion of the burrow occurs synchronously with the growth in size of the larva. Mr. Muir's observation that the larva, when seizing its prey, rushes a short distance out of its burrow, is of considerable interest in connection with the fact that the entrance to the burrow cannot be enlarged by the larva as it increases in size. The entrance to the burrow of a *Cicindela* larva is a miniature pitfall, the head of the larva being the bottom of the trap; when an insect stumbles into the pitfall it is seized and the captor falls down to the bottom

* If this interpretation is correct it lends considerable support to the view that the enormous swellings on the stems of myrmecophilous plants of the genera *Myrmecodia* and *Hydnophytum* originated as pathological responses to irritant stimuli.

of its burrow with its prey. It is necessary that the head of the larva should always fit more or less accurately the entrance to its burrow, but the same necessity does not arise in the case of the *Collyris* larva, for here the burrow is a hiding-place or lair from whence the animal emerges to capture its prey; so long as the entrance to its lair is not too small it cannot particularly matter what size it is.

V. *A preliminary revision of the* Forficulidæ (sensu stricto) *and of the* Chelisochidæ, *families of the* Dermatoptera.

By Malcolm Burr, B.A., F.E.S., F.Z.S., F.L.S., F.G.S.

[Read March 6th, 1907.]

Plate IV.

A careful study of the genus *Opisthocosmia*, Dohrn., as understood by de Bormans, has revealed a mass of incongruities and a number of new characters. A cursory examination has shown that very dissimilar species were ranged together, and that it was necessary to define the genus with greater precision and to reject many diverse forms which had been hitherto included. The development of this process soon showed that many allied genera were involved, until it became necessary to recast entirely that group of genera in which the second tarsal segment is cordiform. I regard this as a highly significant character (differing in this point diametrically from Dr. Verhoeff), which neatly defines the *Forficulidæ*, a name which I restrict to those earwigs possessing this character, regarding the group as *a family* of the *order Dermatoptera*.

The task of revising the Augæan stable will take so long a time, and so many years must elapse before the appearance of the final monograph, that I have resolved to publish this preliminary report as the result of a study of these genera. Dr. Verhoeff included them in his first "Aufsatz," but lack of material rendered his work in this respect incomplete.

Thus it will be seen that my use of the name *Forficulidæ* does not coincide exactly with that of Verhoeff, for that author rejected the shape of the second tarsal segment as a valuable character; he included *Spongiphora* and *Nesogaster* and *Sparatta*, with their allies, which appears to me to be an eminently unnatural and artificial arrangement. The German author distinguishes the *Forficulidæ* from the *Labiduridæ* by the single development of the genitalia, which we do not employ, for reasons stated elsewhere, and by the presence of the stink-glands on the sides of the abdomen; he excludes *Chelidura* and its allies on account of their entire winglessness, but the lobed second tarsal segment appears to be such a strong character, that I prefer to employ it to define this family; it does not seem likely that the shape of this segment has any direct influence upon the insects' life or habits; it is probably a relic of some ancient specialisation, and therefore unlikely to be so subject to fluctuation as an organ in activity, the lateral stink-glands for instance, which vary with the age of the individual. It is also by the rudimentary remains of once active organs that we may best hope to trace the natural affinities of the different species, which is the ultimate aim of all classifications.

Dr. Verhoeff's work is very valuable, and it is a pity that he marred it by such faults as the incorrect use of the name *Sphingolabis*, and the separation of *Cosmiella* based on the absence of wings, a character upon which Orthopterists and Dermapterists are agreed it is useless to found even a species.

The synoptical tables for the determination of species must not be regarded with too critical an eye; they are offered with no attempts at dogmatism, but only as help-notes for entomologists who wish to determine earwigs.

It will be observed that several new characters are used. Greater stress than previously is here laid upon the form and relative sizes of the first four or five segments of the antennæ, and also on the form of the pronotum and legs. Verhoeff used the carina of the elytra in a few instances; in certain genera the slight fold, which roughly divides the elytra into a large dorsal and a small and narrow costal or lateral portion, is emphasised and strengthened into a sharp ridge or keel, which in some cases extends the whole length of the elytron, and in others dies out half-way down. More attention is also paid to the shape of the abdomen.

The chief point which leads me to hope that this attempt at a new classification will be found to approach more nearly to the true natural arrangement is the fact that the groups are now divided more or less according to their geographical distribution. Formerly, *Opisthocosmia* was regarded as a characteristically Asiatic genus, until *O americana* and *O. amazonensis* were described from South America; conversely, the discovery of *Ancistrogaster javana* robbed that genus, in its old sense, of its peculiarity to America. But a glance at the tables proposed in the following pages will show that true *Opisthocosmia*, as now defined, is confined to the tropical regions of the Old World, and all the *Ancistrogastrinæ, sensu stricto*, occur only in tropical America.

But it takes more than a few years to mature an attempt at originality, and doubtless in the course of time, as our knowledge progresses, this proposed arrangement will be profoundly modified. Still, I do think it is worth while offering this system, as an improvement upon the old arrangement, when all kinds of earwigs from various regions were thrown together in a heterogeneous mass under the hitherto very elastic names of *Opisthocosmia* and *Apterygida*. De Bormans included no less than twenty-seven species in the latter genus, and various recently described forms have been included since. I now confine it to the single typical *A. media*. The other names included by de Bormans under the heading *Apterygida*, will be found scattered in numerous other genera, sub-families, and even families. Some will be found eventually placed near *Labidura*, others near *Labia*; others again near *Spongiphora*, and for others entirely new genera and sub-families must be formed.

I hope that this attempt at revision approaches more nearly to the natural classification; it claims at least the merit of originality.

I. FORFICULIDÆ.

TABLE OF THE SUB-FAMILIES OF THE *FORFICULIDÆ*.

1. Corpus apterum	1. Chelidurinæ.
1.1. Elytra libera, perfecte explicata, vel rudimentaria; alæ perfecte explicatæ vel abortivæ.	
2. Antennæ segmentis 4 et 5 subconicis	2. Anechurinæ.
2.2. Antennæ segmentis 4 et 5 cylindricis.	
3. Antennæ segmentis gradatim elongatis, 4 quam 3 longius, 5 quam 4 etc.	
4. Antennæ segmento primo valido, tricarinato	3. Eudohrniinæ.
4.4. Antennæ segmento primo cylindrico.	
5. Pedes breves; pygidium breve, latum, transversum	4. Diaperasticinæ.

5.5. Pedes longi; pygidium brevissimum, angustum, obtusum, vel nullum.	
6. Abdomen apice attenuatum; segmentum ultimum dorsale valde declive, attenuatum .	5. OPISTHOCOSMIINÆ.
6.6. Abdomen apice vix attenuatum, segmentum ultimum dorsale depressum, breve, latum, rectangulare, transversum . . .	6. ANCISTROGASTRINÆ.
3.3. Antennæ segmentis 3, 4 and 5 inæqualibus.	
4. Antennæ segmento 4 quam 3 multo brevius, quam 5 dimidio brevius; (elytra haud carinata)	7. FORFICULINÆ.
4.4. Antennæ segmentis 4 and 3 subæquantibus.	
5. Elytra carinata.	
6. Elytra per dimidium longitudinis carinata	8. SKENDYLINÆ.
6.6. Elytra per totam longitudinem carinata	9. NEOLOBOPHORINÆ.
5.5. Elytra haud carinata.	
6. Abdomen convexum, cylindricum	10. EPARCHINÆ.
6.6. Abdomen plus minus depressum	11. DORATINÆ.

Sub-family 1.—*CHELIDURINÆ.*

This sub-family has been rearranged by Verhoeff (Zool. Anzeiger, 1902, p. 187). He removed those species with free but rudimentary elytra to the *Anechurinæ*, under the name of *Pseudochelidura*, and the remainder he subdivided into three genera based on the shape of the abdomen, namely, *Chelidura*, *Mesochelidura* and *Chelidurella*. Nothing has been added to our knowledge of these genera since that date.

Sub-family 2.—*ANECHURINÆ.*

This group was first separated from the other genera of the *Forficulidæ, sensu stricto*, by Verhoeff, but he discrimnated *Allodahlia*, for which, quite unnecessarily, he erected a distinct sub-family; the characters, however, are marked enough to separate a genus.

The *Anechurinæ* are distinguished by the sub-conical 4th and 5th segments of the antennæ, by the often short and broad pronotum, by the broad and flattened elytra, often with sharp humeral carinæ, by often short, and broad, pygidium, and by long and slender legs; also by the branches of the forceps in the male, which are remote at the base, not depressed nor thickened; they are often bent and bowed upwards and downwards, in and out, in a very characteristic manner. The last dorsal segment of the abdomen is shorter and narrower than the preceding segments, which are usually somewhat dilated; the last segment is also short, and often armed with tubercles pointing in different directions.

The members of this sub-family usually occur in mountainous countries; with the exception of *A. elongata*, a little known species recorded from Cuba, they appear to be confined to the Old World.

TABLE OF GENERA.

1. Abdomen depressum, fortius dilatatum.	
2. Pedes longi, graciles; abdomen apice latissimum, segmento ultimo brevissimo, transversum.	
3. Elytra carinata, rugosa . . .	1. ALLODAHLIA, Verhoeff.
3.3. Elytra haud carinata, lævia.	
4. Elytra et alæ perfecte explicatæ	2. ANECHURA, Scudd.
4.4. Elytra brevia; alæ nullæ.	3. PSEUDOCHELIDURA, Verhoeff.
2.2. Pedes breves, crassi; abdomen medio dilatatum, apice fortiter attenuatum; segmento ultimo angusto	4. CHAMAIPETES, n.
1.1. Abdomen convexum, subcylindricum; (femora robusta) . .	5. TIMOMENUS, n.

Genus CHAMAIPETES,* nov. gen.

Corpus robustum, depressum; abdomen medio dilatatum, apice fortiter attenuatum; antennæ segmentis validis, tertio quartoque subæquantibus, subcylindricis, ceteris longioribus, conicis; pronotum

* Gr. χαμαιπετής = creeping.

margine antico recto, postico rotundato, prozona elevata, metazona depressa ; elytra alæque perfecte explicatæ ; pedes breves, sat validi, femoribus sat incrassatis ; segmentum anale breve, transversum ; pygidium haud perspicuum.

Type.—*Anechura hermes*, Burr, Ann. Mag. N. H. ser. 7, vol. vi, p. 99, Pl. IV, fig. 1, 1*a*. (1900.) (Sarawak.)

The female is unknown.

I have erected this genus for the reception of the single species referred to which is allied to *T. bicuspis*, Stål, and its neighbours, but differs in the strongly depressed and dilated abdomen.

Genus Timomenus,* nov. gen.

Statura minus gracili; antennæ 12-segmentatæ, segmentis crassioribus, minus elongatis ; caput læve, margine postico recto ; pronotum quam caput æque latum, sublatius quam longius, margine antico recto, postico rotundato, lateribus, subconvexis ; prozona tumida, distincta, a metazona plana sejuncta : elytra ampla, lævia, carinula humerali brevissima, apice truncata vel emarginata ; alæ longæ ; pedes minus graciles, femoribus anticis incrassatis ; abdomen medio dilatatum, plicis distinctis ; lateribus acute recurvis, in modum generis *Ancistrogastris*, sed haud mucronibus deplanatis armatis ; segmentum ultimum dorsale ♂ angustatum, læve, medio bituberculatum ; forcipis bracchia sat valida, margine interno dentibus obsoletis.

This genus will include a few medium-sized, stout, Asiatic earwigs, with thickened femora, strong forceps, and slightly dilated subcylindrical abdomen.

Type.—*Opisthocosmia oannes*, Burr, Ann. Mag. N. H. ser. 7, vol. vi, p. 85. (1900.) (India.)

This genus will also include the following :—

Opisthocosmia komarowi, Semenov., Rev. russe d'Ent. vol. i, pp. 98 and 259. (1901.) (Corea.)

Forficula bicuspis, Stål, in Eugenies Resa, Ins. p. 301, (♂). (1860.) (Java.)

TABLE OF SPECIES.

1. Segmentum ultimum abdominale supra medium spinis 2 fortibus verticalibus armatum . . . . . 1. *bicuspis*, Stål.

* Gr. τιμώμενος = respected.

1.1. Segmentum ultimum abdominale inerme.
 2. Forceps prope medium dentatus . 2. *oannes*, Burr.
 2.2. Forceps prope apicem armatus . 3. *komarovi*, Semenov.

Sub-family 3.—*EUDOHRNIINÆ.*

Genus Eudohrnia, nov. gen.

Corpus cylindricum, elongatum; antennæ sat robustæ; segmentum primum validum, robustum, quadratum, carinatum, inter carinulas sulculatum; segmento 2 minimo, globoso; 3 elongato, apice clavato; 4 elongato, valido; 5 longiori; ceteris gradatim elongatis et conicis; caput globosum, læve, suturis obsoletis: pronotum quadratum, margine antico recto, postico rotundato: elytra sat rugulosa, carinula humerali sat acuta, brevissima: alæ longæ; pedes longi; abdomen cylindricum, punctulatum; segmentum ultimum dorsale ♂ lævius, minus dense punctulatum, breve, latum, medio impressum, vix tuberculatum; pygidium ♀ declive, angustum: pygidium ♂ breve, latum, bi-acuminatum: ♀ parvum, angustum, globosum: forcipis bracchia ♂ valde elongata, horizontalia, subrecta, gracilia, basi triquetra, dente uno parvo medio armata; ♀ recta, subcontigua, simplicia, inermia.

The body is so differently shaped in the insect known as *Anechura metallica*, the forceps and the general colour so different, that I consider it generically quite distinct from true *Anechura*: this opinion is confirmed by the peculiar carinated first segment of the antennæ, which is quite distinctive.

Type.—*Forficula metallica*, Dohrn, Stett. ent Zeit., vol. xxvi, p. 9. (1865.) (Himalayas, Burmah.)

Sub-family 4.—*DIAPERASTICINÆ.*

The species which I range in this family are rightly separated from *Apterygida* by Verhoeff, but that author wrongly revived the name of *Sphingolabis*, Borm., which must be reserved for those species which are related to the type of *Sphingolabis*, namely, *Sph. furcifera*, Borm., which is the male of *Sph. semifulva*, Borm., which latter must stand, as I have shown elsewhere (1905, Ann. Mag. N. H., ser. 7, vol. xvi, p. 495).

At present it only includes certain African earwigs which fall into the genus *Diaperasticus*.

Genus DIAPERASTICUS,* nov. gen.

Corpus sat depressum; antennæ segmentis 4 et 5 cylindricis, gradatim elongatis; elytra et alæ perfecte explicatæ; pedes breves, femoribus plus minus incrassatis; pygidium breve, latum, transversum, depressum, haud spinosum; forcipis bracchia ♂ gracilia, sat elongata.

Type.—*Sphingolabis sansibarica*, Karsch, in Berl. ent. Zeitschr., vol. xxx, p. 90, Pl. III, fig. 8, ♂. (1886.) (Zanzibar.)

This genus will also include :—

Apterygida mackinderi, Burr, Ann. Mag. N. H., ser. 7, vol. vi, p. 83, Pl. IV, fig. 3*a*, 3. (1900.) (British East Africa).†

Apterygida bonchampsi, Burr, Tr. Ent. Soc. Lond., p. 317. (1904.) (Abyssinia.)

Forficula erythrocephala, Olivier (nec Fabr.), Enc. Méth. vol. vi, p. 468. (1791.) (Africa and Madagascar.)

TABLE OF SPECIES.

1. Elytra flava, rufo-vittata.	
2. Forcipis bracchia ♂ margine interno haud dentato, crenulato	1. *erythrocephala*, Oliv.
2.2. Forcipis bracchia apicem versus margine interno dentata . . .	2. *bonchampsi*, Burr.
1.1. Elytra unicoloria, fusca.	
2. Corpus sat robustum; forceps incrassatus, medio fortiter dentatus	3. *mackinderi*, Burr.
2.2. Corpus gracile; forceps gracilis, dente medio parvo, fere obsoleto .	4. *sansibarica*, Karsch.

Sub-family 5.—*OPISTHOCOSMIINÆ.*

This sub-family is used in a very restricted sense, as very many new genera must be formed for the reception of species which were formerly included in the cumbrous and very heterogenous *Opisthocosmia*, and many of the former members of that genus, in its widest sense, must be removed to other sub-families.

* Gr. διαπεραστικός = penetrating.

† Probably this species is a large light-coloured variety of *D. sansibarica*, Karsch.

In its restricted sense, this sub-family includes the true *Opisthocosmia* and its immediate allies, genera, that is to say, in which the feet are long and slender, the pygidium very short, barely distinguishable nor even not visible, and the anal segment very strongly narrowed and sloping in both sexes; the forceps are usually long, slender, and often armed with numerous teeth pointing in various directions.

TABLE OF GENERA.

1. Elytra haud carinata.
  2. Pronotum capite angustius; (pedes gracillimi) . . . . 1. Opisthocosmia, Dohrn.
  2.2 Pronotum capite haud angustius.
    3. Segmentum ultimum ventrale inerme.
      4. Pygidium bifidum . . . . 2. Lipodes, n.
      4.4. Pygidium parvum, obtusum 3. Hypurgus, n.
    3.3. Segmentum ultimum ventrale processu utrinque armatum . 4. Sarcinatrix, Rehn.

1.1. Elytra costa carinata.
  2. Pronotum capite angustius . . . 5. Emboros, n.
  2.2. Pronotum capite haud vel vix angustius.
    3. Alæ perfecte explicatæ; genus americanum . . . . 6. Kleter, n.
    3.3. Alæ abortivæ; genus javanum 7. Cosmiella, Verhoeff.

Genus 1.—Opisthocosmia, Dohrn.

Statura gracili; antennæ 10-12-segmentatæ; segmentis omnibus tenuibus, cylindricis, gracilibus; segmento 3 quam primum dimidio breviori; 4 quam 3 longiori; 5 quam 4 longiori: caput tumidum, suturis distincte impressis, pone oculos tumido-elevatum; pronotum capite distincte angustius, longius quam latius, margine antico recto, postico ovato, postice subangustatum; prozon atumida, metazona ampla, deplanata, lateribus reflexis; elytra ad humeros lata, apicem versus subangustata, lævia, margine exteriori distincta plicata, carinula humerali autem supra humeros ipsos haud producta; margine postico emarginata vel truncata; alæ longæ; pedes longi, gracillimi; femora vix incrassata; tibiæ superne teretes, compressæ; tarsi graciles, segmento primo cetera unita æquanti vel superanti; abdomen basi gracile, medio subdilatatum, haud deplanatum, valde convexum, plicis lateralibus distinctis; lateribus ipsis inermibus, tuberculis nullis instructis: segmentum ultimum dorsale ♂ angustatum, declive; ♀ etiam angustius; pygidium ♂ haud prominens; forcipis bracchia gracilia elongata: ♂ basi remota vel subcontigua, recta, vel sinuata; a latere visa recta vel valde sinuata, dentata; ♀ recta, simplicia, subcontigua, inermia, gracillima.

Type of the genus.—*Opisthocosmia centurio*, Dohrn. Stett. ent. Zeit., vol. xxvi, p. 79. (1865.) (Borneo.)

This genus formerly included a large number of very different species, so that it is necessary to subdivide it to a considerable extent, and to confine it to those species which resemble the type, *O. centurio*, in the extremely slender form and slender antennæ, with regularly lengthening segments, and in the narrow elongate pronotum.

In its restricted sense, this genus now includes the following species:—

TABLE OF SPECIES.

1. Elytra et alæ rufo-maculatæ.	
2. Forceps valde flexuosus et dentatus; statura majore; species borneensis .	1. *centurio*, Dorhn.
2.2. Forceps subrectus, inermis; statura gracili; species africana . . .	2. *formosa*, Burr.
1.1. Elytra unicoloria vel vittata.	
2. Elytra unicoloria nigra.	
3. Forceps ♂ valde flexuosus ac dentatus	3. *cervipyga*, Kirby.
3.3. Forceps ♂ contiguus, rectus, apice ipso arcuatus	4. *erroris*, Burr.
2.2. Elytra testacea vel rufescentia, vittata.	
3. Elytra testacea, fuscovittata; statura parva (12.5 mm.)	5. *ceylonica*, Dohrn.
3.3. Elytra rufa, anguste nigrovittata; statura majore (15 mm.) . . .	6. *armata*, Haan.

Genus 2.—Lipodes,* nov. gen.

Statura robusta; abdomen sat depressum, medio valde dilatatum, apicem versus attenuatum; caput per suturas profundas in tres partes divisum; pygidium persicuum, profunde fissum; forcipis bracchia sensim arcuata, inermia.

The erection of this new genus is necessary for the

* Gr. λιπώδης = fat.

insect which I have described as *Opisthocosmia vivax*; in its general appearance it appears to be distinctly related to the genus *Opisthocosmia* but it differs in the depressed abdomen, in this respect affording a transition towards the *Ancistrogastrinæ*, but in other respects it appears to be referable to this group; the sutures of the head are very deep and well marked, dividing the head into three distinct divisions; the divided bifid pygidium is characteristic.

The unique specimen, which is in the Calcutta Museum, is unfortunately broken, so that it is not possible to determine the sex with satisfaction; the well-marked characters point to a male, but perhaps the simple form of the forceps implies the opposite. In my original description, I regarded it as a female, but upon further consideration I am inclined to consider it a male.

It is unfortunate that further material has not come to hand since, in order to locate its position with accuracy.

Type of the genus.—*Opisthocosmia vivax*, Burr, Journ. Proc. Asiat. Soc., Bengal, N. S. vol. i, No. 2, p. 30. (1905.) (India.)

Genus 3.—Hypurgus,* nov. gen.

Antennæ 12–13-segmentatæ, graciles, segmentis gradatim elongatis cylindricis, 4 quam 3 sublongiori, 5 quam 4, etc.; caput læve, suturis obsoletis; pronotum capite haud angustius, subquadratum, margine postico rotundatum, vel semilunare; margine antico truncato; prozona tumida, metazona plana, lateribus reflexis; elytra ampla, lata, humeris latis, carina exteriori nulla; ab humeris attenuata, margine postico truncata vel subemarginata; alæ perfecte explicatæ, longæ vel abbreviatæ; pedes graciles, longi, femoribus haud incrassatis; tibiis integris; abdomen basi constrictum et angustum, convexum, medio plus minus dilatatum, tuberculis pliciformibus distinctis, segmentis 5-6-7-8-inermibus, apice attenuatum; segmentum ultimum dorsale angustatum, declive, margine postico incrassato, obtuse tuberculato; ♀ angustatum, minus fortiter tuberculatum; pygidium nullum vel vix perspicuum, minimum, brevissimum, obtusum; forcipis bracchia ♂ elongata, paullo curvata, vix arcuata, sat fortia, basi subcontigua, dentibus nonnullis interdum margine interno armata, apicem versus sæpe sat arcuata; ♀ typicæ, graciles, recta, inermia.

In this genus are included those former species of

* Gr. ὑπουργός = minister.

Opisthocosmia in which the pronotum is more or less square and not distinctly narrower than the head; the antennæ are the same as in true *Opisthocosmia*, but perhaps a little less slender, and the segments proportionately shorter; the forceps are simpler than in true *Opisthocosmia* and the feet are somewhat less slender and shorter.

The type of the genus.—*Opisthocosmia humeralis*, Kirby, Journ. Linn. Soc., vol. xxiii, p. 523, ♀. (1891.) (Ceylon).

TABLE OF SPECIES.

1. Pronotum subquadratum.
    2. Elytra et alæ flavo-maculata . . 1. *humeralis*, Kirby.
    2.2. Elytra vittata, haud maculata.
        3. Alæ perfecte explicatæ; species madecassa . . . . 2. *hova*, Bormans.
        3.3. Alæ deficientes; species ethiopica . . . . 3. *micheli*, Burr.
1.1. Pronotum semilunare.
    2. Rufo-testacea, rubro-variegata; forceps rufescens . . . . 4. *simplex*, Bormans.
    2.2. Atra, nitida; forcipe pedibusque læte rubris . . . . 5. *biroi*, Burr.

Genus 4.—Sarcinatrix, Rehn.

Ab *Opisthocosmia* differt lamina subgenitali (segmento ultimo ventrali) ♂ angulis postico-exterioribus in processus tuberculiformes productis.

Sarcinatrix sub-genus, Rehn, Proc. Ac. Nat. Phil., p. 308. (1903.)

Rehn suggested this name for a sub-genus which he characterised by the processes of the subgenital lamina of the male, which is produced into a "recurved spiniform process, which flank the lateral base of the forceps"; in the typical species described by him, the forceps of the male are parallel throughout their entire length; but this is not a generic character, for in my collection I have a second species in which the forceps are distinctly bowed.

Type of the genus.—*Opisthocosmia* (*Sarcinatrix*) *anomalia*, Rehn, Proc. Ac. Nat. Phil., p. 308. (1903.) (Costa Rica.)

TABLE OF SPECIES.

1. Forcipis bracchia recta, parallela, haud dentata, margine interno crenulato-dentata . 1. *anomalia*, Rehn.

1.1. Forceps basi leviter divergentia, tum convergentia; margine interno basi ipso dente armata: dehinc teretia . . . . 2. *rehni*, sp. n.

Sarcinatrix rehni, sp. n.

Colore fusco-testaceo; antennæ 12-segmentatæ, typicæ; caput læve, depressum, suturis obsoletis, margine postico medio incrassato; pronotum quam caput æque latum, subquadratum, sublatius quam longius; margine antico recto, postico rotundato, lateribus rectis; prozona tumida, sutura distincta; metazona lata, plana; prozona a metazonâ distincte sejuncta; lateribus late reflexis; medio castaneum, lateribus pellicidis: elytra lævia, unicoloria, testacea: alæ longæ, fusco-testaceæ, basi indistincte pallido flavo-maculatæ; pedes testacei: abdomen castaneum, sat latum, plicis lateralibus distinctis; segmentis 5 et 6 lateribus subreflexis, subtuberculatis ♂: segmentum ultimum dorsale ♂ transversum, magnum, postice quam antice angustius, margine postico recto, medio impresso, ♀ valde angustatum, simplex: pygidium ♂ haud perspicuum; ♀ minutum, conicum: segmentum penultimum ventrale ♂ rotundatum; segmentum ultimum ventrale ♂ apice profunde fissum, angulis postico-externis in processum tuberculiforme acutum reflexum productis, ♂: ♀ inerme; forcipis bracchia ♂ basi haud contigua, sat incrassata, prope basin margine interno dente acuto armata; primum leviter divergentia per tertiam partem longitudinis, deinde subangulatim incurva, subrecta, sensim convergentia, inermia, apice ipso mucronata, decussata; ♀ subcontigua, recta, gracilia, inermia.

	♂	♀
Long. corporis	9 mm.	8·5 mm.
„ forcipis	4·25	3

Patria: San Esteban (Simon, iii, 83. ♂ ♀, types in coll. mea, ex coll. de Bormans).

Differs from *S. anomalia* in the non-parallel forceps.

Genus 5.—Emboros,* nov. gen.

Statura minore; antennæ 10-segmentatæ; segmento 4 = 3; 5 quam 4 et quam 3 longiori: caput globosum, tumidum, nitidum: pronotum capite subangustius, longius quam latius, rectangulare, margine antico

* Gr. ἔμπορος = merchant.

recto, postico subconvexo, lateribus rectis; prozona tumida, sutura distincta, lateribus reflexis: scutellum nullum; elytra brevia, carinula humerali ad apicem elytri attingenti, margine postico truncato; alæ nullæ; pedes longi, graciles, tarsorum segemento primo cetera unita superanti; abdomen subcylindricum, convexum, plicis lateralibus distinctis, integrum; segmentum ultimum dorsale ♂ angustatum, declive, margine postico medio impresso, utrinque tuberculato; ♀ angustius, inerme; forcipis bracchia sat valida, subrecta, basi remota, sensim convergentia, rotundata; ♀ gracilia, attenuata, contigua.

Type of the genus.—*Opisthocosmia dubia*, Borm., Ann. Mus. Civ. Gen. xxxiv, p. 399, ♀. (1894.) (Burmah.)

This genus removes from *Opisthocosmia* the wingless species described by de Bormans under the name *dubia*; it resembles true *Opisthocosmia* in every respect except the form of the elytra, in which it approaches the large and stout *Skendyle*, from which it differs in the narrow and somewhat elongated pronotum; the elytra are broad, coriaceous, with a sharp keel on the outer edge running the whole length of the elytra; the general form of the forceps also recalls *Skendyle*.

Verhoeff included this species with the other wingless forms previously included in *Opisthocosmia*, in his genus *Cosmiella*, characterised by the keeled elytra and absence of wings; but Kirby fixed *O. rehus*, Burr, as the type of *Cosmiella*, from which this species must be removed by its long and narrow pronotum, which approaches true *Opisthocosmia*.

Genus 6.—Kleter,* nov. gen.

Statura mediocri, gracili; pronotum capite vix angustius; elytra tantum ad humeros carinata; alæ perfecte explicatæ; pedes graciles, longi; abdomen vix dilatatum, subcylindricum; segmentis lateribus 4–7 plicis recurvis depressis instructis; segmentum anale haud angustatum, transversum; forcipis bracchia elongata, gracilia, spinata.

Type of the genus.—*Opisthocosmia amazonensis*, Borm. and Burr, Ann. Mag. N. H. ser. 7, vol. iii, p. 164. (1899.) (Upper Amazons.)

This genus is a transition between the *Opisthocosmiinæ*

* Gr. κλητήρ = policeman.

and the *Ancistrogastrinæ*; in the elongate forceps, slightly dilated body and scarcely keeled elytra it recalls the former, but in the incipient lateral folds of the abdomen and the form of the last dorsal segment, and also the form of the apex of the male forceps, it approaches the latter.

Genus 7.—Cosmiella, Verhoeff.

Antennæ 10-segmentatæ, segmentis 3, 4 et 5 subæquantibus, longis, cylindricis; pronotum caput latitudine subæquans, haud longius quam latius, subquadratum; elytra lata, carinula humerali sat distincta, per dimidium elytri percurrenti; alæ nullæ; abdomen convexum, medio dilatatum; plicis lateralibus distinctis; segmentis lateribus inermibus; segmentum ultimum dorsale ♂ angustatum, tuberculis duobus vix elevatis instructum; forcipis bracchia ♂ basi contigua, valde elongata, a basi divergentia, tum arcuatim incurva, margine superiori dente armata; ♀ simplicia.

This genus was erected by Verhoeff for the wingless species of *Opisthocosmia* which have a keel more or less pronounced on the elytra; Kirby fixed *O. rebus*, Burr, as the type of the genus; *O. dubia* was included by Verhoeff upon the strength of de Bormans' description, but on account of its narrow pronotum, it must be removed; in the shape of the pronotum and elytra this genus approaches *Ancistrogaster*, but in the form of the body and forceps it resembles *Opisthocosmia*; it is a passage between these two chief genera.

It contains the single species *O. rebus*, Burr, fixed by Kirby as the type. *C. aptera*, Verhoeff, is removed to *Skendyle*, q.v.

Sub-family 6.—*ANCISTROGASTRINÆ.*

The essential character which distinguishes this subfamily from the preceding is the form of the anal segment, which is transverse, much broader than long.

The sides of the abdomen are often recurved in the form of depressed sickle-shaped hooks, and the forceps of the male are frequently bowed into a characteristic lozenge-shaped area. In most genera the elytra are strongly keeled.

The genera are all American.

TABLE OF GENERA.

1. Elytra haud carinata	1. SARAKAS, n.
1.1. Elytra carinata.	
2. Elytra tantum per dimidium longitudinis carinata . . .	2. OSTEULCUS, n.
2.2. Elytra per totam longitudinem carinata.	
3. Elytra trapezoidea; rudimentaria ; alæ nullæ	3. PRAOS, n.
3.3. Elytra perfecte explicatæ.	
4. Abdomen lateribus inermibus	4. VLAX, n.
4.4. Abdomen lateribus in spinas et mucrones productis	5. ANCISTROGASTER, Dohrn.

Genus 1.—SARAKAS,* nov. gen.

Ancistrogastri vicinum genus, sed :—elytra haud carinata ; lateribus abdominis minus fortiter armatis, vix tuberculatis, vix mucronatis.

Type of the genus.—*Opisthocosmia devians*, Dohrn., 1865, Stett. ent. Zeit. vol. xxvi, p. 79. (Brazil.)

The genus is characterised by the absence of keels at the shoulder of the elytra; the sides of the abdomen are not strongly hooked but armed with tubercles.

It includes also *Opisthocosmia aterrima*, Borm., Ann. Soc. Ent. Belg. xxvii, p. 83 (1883), and perhaps *O. longipes*, Haan.

Genus 2.—OSTEULCUS,† nov. gen.

Antennæ gradatim elongatæ ; pronotum sublatius quam longius, planum : elytra punctulata, subquadrata, brevia, margine postico oblique truncata ; costa humerali ad humeros carinata, carina in medio elytri evanescenti ; alæ nullæ ; pedes graciles, sat longi ; abdomen basi angustum, medio fortiter dilatatum, sat depressum ; apicem versus attenuatum ; segmentum ultimum dorsale subangustatum, transversum, latum ; tuberculis lateralibus distinctis ; segmentis 5, 6 et 7 etiam tuberculata ; pygidium haud perspicuum ; forcipis bracchia ♂ sat robusta, depressa, basi remota et divergentia,

* σάρακας = wood-eater.
† ὀστεουλκός = forceps.

tum angulatim incurva, convergentia, in tertia parte apicali recta, apice mucronata; ♀ recta, simplicia.

Type of the genus.—*Ancistrogaster kervillei*, Burr, Ann. Mag. N. H. ser. 7, vol. xvi, p. 490. (1905.) (Venezuela.)

In appearance resembles *Praos*, but the elytra are complete, the keel dies out half-way down the elytra, the abdomen is depressed and laterally hooked, and the forceps bowed strongly outwards and inwards in a lozenge form.

In general appearance this genus has even all the aspect of a typical *Ancistrogaster*, but in the feeble carina of the elytra, in the attenuate abdomen and somewhat narrowed last dorsal segment, it approaches the *Opisthocosmiinæ*, but the depressed and dilated abdomen, and the form of the forceps are characteristic of *Ancistrogastrinæ*; the last dorsal segment, although somewhat attenuated, is still much broader than long, distinctly transverse, and rectangular.

The single species, recorded from Venezuela, is very distinct.

It differs from *Praos* in the complete elytra, with a shorter costal carina, in the less sharply flattened abdomen, and the strongly bowed forceps, which include a lozenge-shaped area; from *Ancistrogaster*, *Vlax* and *Sarakas* it differs in the absence of wings and form of the carina of the elytra.

Genus 3.—PRAOS,* nov. gen.

Corpus depressum; antennæ graciles; caput læve, margine postico emarginato; pronotum quadratum, marginibus omnibus rectis, sublatius quam longius, deplanatum; elytra rudimentaria, trapezoidea, margine externo usque ad apicem carinata, margine postico oblique truncata, margine interno quam externo multo brevius, scutellum sat magnum triangulare efficientia; alæ nullæ; pedes longi, graciles, haud incrassati; abdomen valde deplanatum et dilatatum, plicis lateralibus distinctis; lateribus segmentorum 3–6 tuberculis distinctis instructum; segmentis 7 et 8 lateribus acute recurvis; segmentum ultimum dorsale ♂ breve, latum, valde transversum, medio impresso, bituberculato, angulis externis carinatis; forcipis bracchia basi valde remota, depressa, arcuatim incurva, intus dentata, apice mucronata.

Type of the genus.—*Ancistrogaster perdita*, Borelli, Boll.

* Gr. πρᾶος = meek.

Mus. Zool. Torino, vol. xxi, no. 531, p. 16. (1906.) (Costa Rica.)

The only known species of this genus very closely resembles *A. impennis*, Borm., and under that name I received a specimen from de Bormans' collection; on comparing, however, with the type of *impennis*, in the Biologia Centrali-Americana collection, it is obviously different; it is remarkable for the flattened and dilated abdomen, and trapezoid elytra, which are cut away at the basal posterior angle, to show a small scutellum. It has since been described and discussed by Borelli (*l. c.*).

Genus 4.—Vlax,* nov. gen.

Statura minore; corpus minus depressum et minus dilatatum; abdomen ♂ lateribus in mucrones acutos recurvos haud productis sed integris, inermibus, vel paullo angulatis vel tuberculis instructis; ceteris cum *Ancistrogastre* congruet.

Type of the genus.—*Ancistrogaster championi*, Bormans, 1893, Biol. Centr.-Amer. Orth., p. 10, Pl. II, fig. 13, ♂. (Panama.)

This removes from *Ancistrogaster* those small, pale species, with the abdomen but little dilated, and the sides of the abdominal segments not curved backwards into flattened and sharp hooks, but furnished with blunt tubercles.

A. tolteca, Dohrn., and *A. intermedius*, Burr, will also fall into this genus.

Genus 5.—Ancistrogaster, Stål.

Antennæ 10–12 segmentatæ; segmentis 3 et 4 subæquantibus; ceteris elongatis, cylindricis; caput subtumidum, margine postico emarginato; pronotum caput latitudine æquans, antice truncatum, postice rotundatum; elytra ad humeros rotundata, lata, margine postico truncato vel emarginato: carinula humerali acuta, usque ad marginem posticum elytri percurrenti: alæ longæ; pedes graciles; femora vix incrassata; tarsorum segmentum primum cetera duo unita longitudine æquans: abdomen depressum, basi angustum, medio valde dilatatum, ante apicem iterum angustatum; plicis lateralibus distinctis: ♂ segmentorum latera producta, in mucrones valde deplanatos, acutos et recurvos producta; ♀ abdomen inerme, minus dilatatum, minus depressum: segmentum ultimum dorsale ♂ breve,

* Gr. βλάξ = simpleton.

transversum, rectangulare ; ♀ valde angustatum : forcipis bracchia ♂ basi subcontigua, primum divergentia, in dimidio longitudinis repente incurva ; margine interno prope basin saepius dente forti armata, apice incrassata et bimucronata : ♀ recta, simplicia, gracilia, inermia.

Type of the genus.—*Ancistrogaster luctuosus*, Stål, 1855, Ofv. Vet. Akad. Forh., vol. xii, p. 349, ♂. (Brazil.)

I have retained this genus only for the typical species with the sides of the abdominal segments recurved into depressed sickle-like hooks.

Sub-family 7.—*FORFICULINÆ.*

I use this sub-family in a very restricted sense, as including the typical genus *Forficula*, Linn., and the closely allied *Apterygida*, Westw., *sensu stricto.* It is characterised by the form of the antennæ, in which the fourth segment is much shorter than the third, and only half as long as the fifth.

TABLE OF GENERA.

1. Forcipis bracchia ♂ basi dilatata et deplanata	1. FORFICULA, Linn.
2. Forcipis bracchia ♂ basi remota, gracilia, nec deplanata, nec dilatata	2. APTERYGIDA, Westw.

Genus 6.—FORFICULA, Linn.

Corpus convexum ; caput cordiforme, globosum suturis sæpe indistinctis ; antennæ 10–15-segmentatæ ; 1 magnum, incrassatum ; 2 minimum, globosum ; 3 longum, primum subæquans, apice paullo incrassatum ; 4 quam 3 dimidio brevius ; 5 sensim longius ; cetera gradatim longiora, subclavata ; pronotum sæpius capite angustius, margine antico truncato ; marginibus lateralibus aut parallelis, aut convexis ; margine postico rotundato ; sæpius subquadratum, necnon latius quam longius, aut dimidio postico toto late rotundato, arcuato ; prozona plus minus tumida, metazona deplanata ; marginibus lateralibus paullo reflexis : elytra perfecte explicata, sat longa, vel brevia, truncata ; carinula humerali inconspicua, carina ipsa nulla, sed elytra a humeris ad apicem sensim plicata ; alæ aut abbreviatæ, aut longæ, sæpius prominentes : pedes typici, femoribus haud valde incrassatis ; tarsorum segmentum 3 quam primum longius ; segmentum 2 latum, dilatatum, bilobum, cordiforme ; abdomen circa medium subdilatatum, plicis lateralibus segmentorum 2 et 3 distinctis : segmentum ultimum dorsale ♂ magnum, quadratum, margine postico sæpe tuberculatum ; ♀, angustius, simplicius: pygidium parvum, globosom, vel valde productum, acuminatum, vel nullum ; forcipis bracchia ♂ in parte basali valde deplanata et dilatata, hac parte dilatata margine interno sæpe crenulata et dente terminata, vel inermi ; dehinc attenuata, subrecta, aut arcuatim curvata et inermia ; ♀ subrecta, subcontigua, inermia.

This large and homogeneous genus is well characterised by the forceps of the male, in which the branches are flattened and broadened in the basal portion, as in the familiar typical species, *F. auricularia*, Linn. It contains a large number of species occurring in various parts of the Old World.

It is the typical genus of the Order, and in the typical species, *F. auricularia*, Linn., the characters are very well marked. The genus is represented in nearly every part of the globe, but the species are most numerous in the Old World. The discrimination of the species is often rather subtle, and the shape of the forceps must be employed with care and discretion ; these vary considerably in length, showing the two forms *macrolabia* and *cyclolabia* ; the latter appears to be the normal form, and the former a more virile robust race ; in the common species, the *macrolabia* form appears to occur chiefly in islands and in mountains, and the ordinary form is more semi-domesticated in its habits. The elongation of the forceps is generally accompanied by the more robust build of body, and it also modifies the armature of the forceps, owing to the drawing out of this organ. The degree of curvature also varies, more especially in *F. lurida*, which gives the different varieties a very different appearance, which is often misleading.

The type of the genus is *Forficula auricularia*, Linn., Syst. Nat. (ed. x) i, p. 423 (1758).

TABLE OF SPECIES.

1. Pronotum latius quam longius, trapezoidale.
    2. Forcipis bracchia tantum in parte basali dilatata et deplanata.
        3. Forcipis bracchia fortiter extus ac intus flexuosa, inermia; (colore toto atro ; glabra ; species Indiæ borealis) . . . . 1. *schlagintweiti*, Burr.

3. Forcipis bracchia subrecta.
 4. Forceps margine interno prope basin denticulatus ; elytra unicoloria ; alæ longæ ; species indica . . . . 2. *mogul*, Burr.
 4.4. Forceps margine interno crenulatus ; elytra maculata ; alæ breves ; species hispanica et algerica . . . . 3. *ruficollis*, Fabr.

2.2. Forceps bracchia saltem per quartam partem longitudinis dilatata ac deplanata ; species indicæ.
 3. Pronotum semilunare, lateribus haud reflexis ; pars dilatata forcipis dente obtuso terminata . . 4. *beelzebub*, Burr.
 3.3. Pronotum ovatum, tranversum, lateribus reflexis ; pars dilatata forcipis dente acuto terminata . 5. *acer*, Burr.

1.1. Pronotum semilunare, subquadratum, margine postico rotundato, æque latum ac longum.
 2. Pronotum semicirculare, margine antico recto, postice semilunare, lateribus haud parallelis. (Statura minore ; elytra maculata.)
  3. Corpus valde pubescens ; forcipis bracchia paullo dilatata, parte basali in partem apicalem attenuatam sensim transeunti . . . . 6. *ornata*, Borm.
  3.3. Corpus subglabrum ; forcipis bracchia medio subito attenuata.
   4. Elytra fusca, macula humerali pallida ornata ; species ceylonica 7. *greeni*, sp. n.
   4.4. Elytra pallida, apicem versus infuscata ; species Africæ meridionalis . . . . . . 8. *picta*, Kirby.
 2.2. Pronotum subquadratum, lateribus subparallelis, margine postico rotundato.
  3. Pygidium valde prominens.
   4. Pygidium triangulare, apice acutum (alæ abortivæ).
    5. Pygidium lateribus haud incrassatis (colore nigrotestaceo,

forcipe rubro ; species lombokiana) . . . . 9. *miranda*, Borm.

5.5. Pygidium utrinque incrassatum (colore testaceo ; species Europæ orientalis et Asiæ occidentalis).

6. Abdomen punctulatum ; pars basalis forcipis longa, dente nullo terminata . . . . 10. *ætolica*, Br.

6.6. Abdomen vix punctulatum ; pars basalis forcipis brevis, angulo acuto dentiformi terminata . . . 11. *caucasica*, Sem.

4.4. Pygidium apice truncatum vel obtusum.

5. Pygidium valde elongatum, linguæforme, apice haud truncatum ; pars dilatata forcipis longa ; alæ abortivæ ; species Africa orientalis . . . . . 12. *sjöstedti*, sp. n.

5.5. Pygidium brevius ; pars dilatata forcipis brevis ; alæ perfecte explicatæ ; species sinenses et japonicæ.

6. Pars dilatata forcipis apice obtuso-dentata ; species japonica . . . . . . 13. *mikado*, Burr.

6.6. Pars dilatata forcipis apice haud dentata ; species sinensis . . . . . . 14. *davidi*, Burr.

3.3. Pygidium haud valde prominens.

4. Forceps tantum basi ipso dilatatus.

5. Forceps valde arcuatus, brevis ; alæ breves.

6. Elytra longiora ; pedes unicolores . . . . 15. *circinata*, Fin.

6.6. Elytra brevia, truncata ; pedes indistincte fuscoannulati . . . . . . 16. *cabreræ*, Bol.

5.5. Forceps parum curvatus, longior.

6. Alæ breves ; species italica . 17. *apennina*, Costa.

6.6. Alæ longæ ; species indica 18. *ambigua*, Burr.

4.4. Forceps saltem per tertiam partem longitudinis dilatatus.
5. Forcipis pars dilatata longa, per dimidiam longitudinem forcipis producta, parallela ; bracchiis dehinc minus arcuatis.
6. Pronotum quadratum, lateribus rectis, parallelis, angulis posticis rotundatis ; alæ abortivæ (species Asiæ borealis) . . . . 19. *tomis*, Kol.
6.6. Pronotum postice totum rotundatum, lateribus subrotundatis.
7. Elytra haud flavo-maculata.
8. Alæ abortivæ (species Africæ orientalis) . 20. *rodzianko*i, Sem.
8.8. Alæ perfecte explicatæ.
9. Pygidium obtusum ; pronotum parvum ; species africana . . 21. *senegalensis*, Serv.
9.9. Pygidium triangulare ; pronotum magnum ; species novorossica . . 22. *pomerantzevi*, Sem.
7.7. Elytra flavo-maculata.
8. Elytra et alæ longæ . . 23. *lucasi*, Dohrn.
8.8. Elytra et alæ breves . 24. *barroisi*, Bol.
5.5. Forcipis pars dilatata brevior, bracchiis dehinc fortius arcuatis.
6. Pronotum magnum, longe super elytra productum (Elytra et alæ longæ, testaceæ ; species indica) . . 25. *celer*, Burr.
6.6. Pronotum minus longum, vix super elytra productum.
7. Elytra unicoloria.
8. Pars dilatata forcipis dente terminata.
9. Pars dilatata forcipis

usque ad secundam tertiam partem longitudinis producta; (alæ abortivæ; statura minore) . . . . . 26. *pubescens*, Géné.

9.9. Pars dilatata forcipis vix ad dimidiam longitudinem producta.

10. Pars dilatata forcipis paullo ante dentem terminalem jam paullo attenuata 27. *vicaria*, Sem.

10.10. Pars dilatata forcipis dente ipso terminata.

11. Alæ perfecte explicatæ; pronotum postice rotundatum . 28. *auricularia*, L.

11.11. Alæ nullæ; pronotum postice truncatum . 29. *silana*, Costa.

8.8. Pars dilatata forcipis inermis, dente nullo terminata.

9. Alæ nullæ.

10. Forcipis bracchia apice incurva, atque attingentia . . . 30. *decipiens*, Géné.

10.10 Forcipis bracchia apice incurva, sed haud attingentia.

11. Elytra quadrata . 31. *lesnei*, Finot.

11.11. Elytra trapezoïdalia . . 32. *canariensis*, Burr.

9.9. Alæ longæ.

10. Forcipis bracchia apice fere recta, vix incurva, haud attingentia; (species indica) . . . . 33. *interrogans*, Burr.

10.10. Forcipis bracchia apice incurva, attingentia.

11. Caput et pronotum atra ; (statura minore ; species indica) . . . 34. *planicollis*, Kirby
11.11. Caput rufum ; pronotum testaceum.
12. Forceps extus arcuatus . . . 35. *orientalis*, Burr.
12.12. Forceps margine externo recto, tum incurva . . 36. *lurida*, Fisch.
7. Elytra maculata.
8. Pars dilatata forcipis dente horizontali terminata . 37. *smyrnensis*, Serv.
8.8. Pars dilatata forcipis dentibus parvis 2 erectis terminata . . . . . 38. *redempta*, Burr.

Forficula greeni, sp. nov.

Statura minore ; fusco-castaneo, pallido-maculato ; antennæ castaneæ, 12-segmentatæ; 3 sat longo; 5 = 3 ; 4 dimidio breviori, conico ; ceteris subcylindricis, sat validis : caput læve, globosum, suturis obsoletis, fusco-ferrugineum : pronotum semilunare, caput latitudine æquans, margine antico truncato, postice late rotundato, lateribus rotundatis ; latius quam longius ; fusco-castaneum, lateribus pallidis ; prozona vix tumida, sutura mediana brevi, fere obsoleta, punctis impressis lateralibus nullis; elytra lævia, longa, fusco-castanea, medio macula magna pallida flava ornata ; alæ longæ, læves, flavæ, pallidæ, sutura et apice infuscatæ ; pedes breves, testacei; abdomen parallelum, plicis lateralibus distinctis, fusco-rufum vel rufo-fuscum, læve, nitidum ; segmentum ultimum dorsale ♂ subquadratum, læve, medio impressum, margine postico utrinque tuberculo obtuso instructum ; ♀ minute punctulatum, minum læve, angustius tuberculis minoribus : pygidium ♂ vix perspicuum, subglobosum ; ♀ haud perspicuum : forcipis bracchia ♂ basi dilatata et deplanata, hac parte margine interno crenulato ; per tertiam partem longitudinis deplanata ; dehinc attenuata, inermia, teretia, subrecta, apice sensim incurva ; ♀ valida, depressa, subcontigua, subrecta, inermia, apice tantum paullo incurva.

Long. corporis ♂ 9 mm., ♀ 8 mm. ; forcipis ♂ 2 mm., ♀ 1·5 mm.

Chelisoches pulchellus, Burr (nec Gerst.) Journ. Bombay N. H. Soc. xiv, p. 327 (1902).

Patria. CEYLON : Punduloya and Ambegammoa, fairly common (Coll. mea).

This species was confused by me with *Chelisoches pulchellus*, Gerst., and recorded as such in a paper on the earwigs of Ceylon (*l. c.*): I sent some specimens to de Bormans, who also identified them as *Ch. pulchellus*; but that is a West African species, and on comparing the Ceylon specimens with Gerstaecker's description, my doubt as to its identity is confirmed: the head of the African insect appears to be tumid behind the eyes, with distinct sutures, a feature very characteristic of *Chelisoches*, whereas the Ceylon specimens have the head perfectly smooth as in true *Forficula*: *Ch. pulchellus* has the pronotum "quadratisch," and not crescent-shaped: the organs of flight are yellowish with a dark brown band, whereas in the Ceylon specimens they are dark castaneous, with a large pale spot on the elytra, and the wings are pale yellow, with a brownish suture and apical speck; the form of the forceps seems to agree however; Gerstaecker's insect is only known to me from the description of that author.

F. greeni, which I am pleased to dedicate to my friend Mr. Ernest Green, who has procured me such interesting material from Ceylon, more closely resembles in size and colour *F. ornata*, which also has the same shaped pronotum.

Forficula sjöstedti, sp. n.

Statura mediocri, minus fortiori; antennæ 12-segmentatæ, segmentis subconicis, fusco-testaceis; caput læve; pronotum sublatius quam longius, postice rotundatum; elytra brevia, unicoloria; alæ abortivæ; pedes testacei; abdomen typicum, castaneum, minutissime punctulatum; segmentum ultimum rectangulare, punctulatum; pygidium ♂ elongato-productum, linguæforme, angustum, apice attenuatum et obtusum; ♀ breve, angustatum, apice truncatum; forcipis bracchia ♂ gracilia, per tertiam partem basalem margine interno deplanato ac dilatato, margine ipso crenulato, hac parte dente parvo obtuso terminata, dehinc attenuata, inermia, arcuata; ♂, recta, simplicia. ♂ ♀.

Long. corporis ♂ 8·5–9·75 mm., ♀ 8·5–9 mm.; forcipis ♂ 3·5–6 mm., ♀ 1·75–2 mm.

Hab. EAST AFRICA: Kilimandjaro, Kiboscho, at the highest limits of vegetation.

This species was discovered in great numbers by Dr. Yngve Sjöstedt, who has kindly given me permission to include its diagnosis in this paper. It will be more fully described and discussed in a work upon the results of Dr. Sjöstedt's travels in East Africa.

Genus 2.—APTERYGIDA, Westwood.

The older authors included a large number of diversified and highly heterogeneous forms in this genus, which I have reduced to its narrowest limits, including only *albipennis Meg*,* the typical species for which Westwood erected the genus.

The genus *Sphingolabis*, Borm., I formerly pointed out coincided with *Apterygida* unless the two species *S. furcifera* and *A. albipennis* could be shown to be not generically related to each other (Ann. Mag. N. H. ser. 7, vol. iv, 1899, p. 255). *Sphingolabis* was wrongly revived by Verhoeff for *S. sansibarica*, which is very different in structure from *S. furcifera.*

A. arachidis, Yers., has always been regarded as closely allied to *A. albipennis*, but the second tarsal segment has not that large and prominent lobe which is characteristic of this group of sub-families, from which it must consequently be removed. *A. linearis* and the other forms with a spiny pygidium I have placed together in a new genus.

The type is *Forficula albipennis*, Megerle apud Charp. Hor. Ent. p. 68 (1825), from Central Europe.

Sub-family 8.—*SKENDYLINÆ.*

It is necessary to separate the species *aptera*, Verhoeff, from the genus *Cosmiella*, and as it does not fall naturally into any other group it is necessary to make a separate sub-family for its reception. The only known species recalls certain *Ancistrogaster* in appearance, and its affinities are undoubtedly with that genus, but the fourth antennal segment is somewhat shorter than the third, a fact which precludes it from that sub-family.

The form of the antennæ separates it from the *Opisthocosmiinæ.*

* The name *Forficula media* is preoccupied by Marsham, Col. Brit. p. 530 (1802) = *Labia minor* (L.).

Genus 1.—SKENDYLE,* nov. gen.

Antennæ segmento quarto quam tertio subbreviori vel subæquanti, nequaquam longiori; elytra in parte humerali per dimidium costæ carinata; alæ abortivæ; abdomen medio sat dilatatum, lateribus acute reflexis; segmentum anale breve, sat angustatum, transversum; forcipis bracchia subcontigua, valida.

This genus contains the single species described as *Cosmiella aptera*, Verhoeff, who, as we have seen, made a distinct genus for species of *Opisthocosmia sensu latiori*, without visible wings; but this insect differs in structure from *C. rebus*, the type of *Cosmiella*. There seems to be no doubt that the insect described as *Ancistrogaster javana*, Borm., 1903, Ann. Mag. N. H. ser. 7, vol. xi, p. 266, is identical, and therefore falls in favour of Verhoeff's prior name. It is a native of Java.

The type is *Cosmiella aptera*, Verhoeff, Zool. Anz. xxv, p. 195 (1902).

Sub-family 9.—*NEOLOBOPHORINÆ*.

The species formerly included in *Nelobophora*, though evidently allied to *Opisthocosmia*, are nevertheless sufficiently distinct to merit a separate group. The Asiatic forms are undoubtedly generically distinct from the American species.

TABLE OF GENERA.

1. Pygidium bifidum; genus americanum; segmentum anale quadratum.	1. NEOLOBOPHORA, Scudd
1.1. Pygidium integrum; segmentum anale attenuatum, declive; genera asiatica.	
2. Costa elytrorum incrassata . . .	2. LIPARURA, n.
2.2. Costa elytrorum carinata, sed haud incrassata	3. OBELURA, n.

Genus 1.—NEOLOBOPHORA, Scudder.

This genus is now restricted to the American forms. It has been recently dealt with by me in the Ent. Mo. Mag. 1906, p. 112.

* σκενδύλη = pincers.

The type of the genus is *N. bogotenis*, Scudd.; the other three described species are *N. bicolor*, Borelli, *N. ruficeps*, Burm., and *N. borellii*, Burr.

Genus 2.—LIPARURA,* nov. gen.

Pronotum latum, quadratum, lateribus subreflexis; scutello patente; elytra costa carinata, carina sat incrassata; abdomen punctatum; pedes longi, graciles; segmentum anale valde attenuatum, declive; forcipis bracchia ♂ subcontigua, gracillima, elongata, sinuata; ♀ recta, simplicia.

I form this genus for a pair in the Paris collection which I take to be *Neolobophora asiatica* of de Bormans, although the pair in question are from Northern India, and *N. asiatica* was described from Madras; it differs from the following genus in its stouter build, longer legs, punctated abdomen, reflexed borders of the pronotum, and by the strong costal carinæ of the elytra. I have not seen the type of de Bormans' species, but the pair in question agree perfectly with his description; the male is from Dardjiling, and the female from Bhoutan. There is nothing in de Bormans' description and illustration to show any generic distinction from *N. tamul* (q. v.), but the pair which I take to be his species are undoubtedly generically distinct.

The type is *Neolobophora asiatica*, Borm., Ann. Soc. Ent. Fr., 1897, p. 285, Pl. X, fig. 2, from Southern India.

Genus 3.—OBELURA,† nov. gen.

Statura minore, gracili; antennæ 12-segmentatæ, typicæ, graciles: caput læve, tumidum, margine postico recto; pronotum quam caput æque latum, marginibus omnibus rectis, quadratum, lateribus reflexis, vix tumidum; elytra rudimentaria, trapezoidea, margine externo usque ad apicem carinata, margine interno quam externo distincte breviori, scutellum parvum efficienti; margine postico oblique truncato; alæ nullæ; pedes graciles; abdomen subdilatatum, plicis lateralibus distinctis, lateribus integris; segmentum ultimum dorsale valde angustatum, læve, inerme; forcipis bracchia ♂ valde gracilia et elongata, basi subcontigua et margine superiori per quartam partem longitudinis carinata, dehinc valde attenuata, leviter arcuata, denticulata.

* λιπαρός = fat; οὐρα = tail.
† ὀβελός = spike; οὐρα = tail.

This is for the reception of *Neolobophora tamul*, Burr, Journ. Bombay Soc. N. H. xiv, p. 67 (1902), from Ceylon, which is therefore the type.

Sub-family 10.—*EPARCHINÆ.*

This sub-family consists of five new genera formed for the reception of several forms hitherto included in *Opisthocosmia* and in *Apterygida*, with the types of which they have little close relationship.

TABLE OF GENERA.

1. Abdomen segmento ultimo dorsali attenuato, declivi.	
2. Pedes longi, graciles	1. Eparchus, n.
2.2. Pedes breves; femora antica incrassata	2. Skalistes, n.
1.1. Abdomen segmento ultimo haud declivi, transverso.	
2. Tibiæ superne sulcatæ	3. Rhadamanthus, n.
2.2. Tibiæ integræ.	
3. Abdomen haud depressum; forceps prope basin dentatus, gracilis . .	4. Kosmetor, n.
3.3. Abdomen depressum; forceps propo basin subdilatatus ac basi ipso dentatus	5. Elaunon, n.

Genus 1.—Eparchus,* nov. gen.

Antennæ segmentis 3 et 4 subæquantibus; pronotum quam caput subæque latum; elytra et alæ perfecte explicatæ; elytra costa humerali haud carinata; abdomen convexum, subcylindricum paullo dilatatum; pygidium varium, sed haud spinosum; forcipis bracchia ♂ elongata, gracilia. Segmentum anale declive, vel attenuatum; pedes longi graciles; abdomen lateribus tuberculis instructum.

This genus is made for the reception of a number of species formerly included in *Opisthocosmia*, with which it has undoubted affinities, but the pronotum is not notably narrow and the antennæ are different.

The type of the genus is *Forficula insignis*, Haan, Verh. Nat. Gesch. Orth., p. 243, Pl. XXIII, fig. 14 (1842), from Java.

* Gr. ἔπαρχος = sub-prefect.

TABLE OF SPECIES OF *EPARCHUS.*

1. Forcipis bracchia supra processu verticali clavato-obtuso armata	1. *insignis*, Haan.
1.1. Forcipis bracchia ♂ supra dentibus acutis armata, vel inermia.	
2 Abdomen læte nitens.	
3. Corpus valde elongatum ; æneo-nitens ; forceps valde elongatus, vix arcuatus	2. *nevilli*, Burr.
3.3. Atra, haud æneo-nitens ; forceps valde arcuatus	3. *lugens*, Borm.
2.2. Corpus innitidum.	
3. Statura minore (6 mm.)	4. *minuscula*, Dohrn.
3.3. Statura majore (10–13 mm.).	
4. Colore castaneo.	
5. Forceps inermis, valde curvatus	5. *dux*, Borm.
5.6. Forceps valde dentatus . . .	6. *æsculapius*, Burr.
4.4. Colore atro.	
5. Pronotum albo-limbatum ; elytra innitida	7. *shelfordi*, Burr.
5.5. Pronotum totum atrum ; elytra nitida	8. *vicina*, Burr.

Opisthocosmia bogotensis, Rehn, will probably fall into this genus.

Genus 2.—SKALISTES,* nov. gen.

Pedes breves, femoribus incrassatis ; segmentum anale declive attenuatum ; abdomen lateribus haud tuberculatis.

The type is *Forficula lugubris*, Dohrn., Stett. ent. Zeit. xxiv, p. 230, (1862), from Mexico.

This is formed for *F. lugubris*, Dohrn., which was formerly placed in *Forficula* in spite of its striking resemblance to certain species of *Opisthocosmia*; in the attenuate anal segment, it approaches that genus.

F. metrica, Rehn, appears to be a *macrolabia* variety of *F. lugubris.*

Genus 3.—RHADAMANTHUS, nov. gen.

Abdomen subcylindricum, haud depressum ; segmento ultimo transverso, haud declivi ; forceps elongatus, ♂ superne cristatus ;

* Gr. σκαλιστής = weeder.

pedes longi, femoribus incrassatis, tibiis superne sulcatis in dimidio apicali.

The type is *Forficula lobophoroides*, Dohrn., Stett. Ent. Zeit. xxvi, p. 96 (1865).

The only species falling in this genus is the rare and little known *Forficula lobophoroides* of Stål, from the Philippines. In appearance somewhat resembling certain black *Chelisochidæ*, its affinities are undoubtedly with *Forficula*, while the long slender legs and forceps recall *Opisthocosmia*. I place it in this sub-family with some hesitation. It is curious that in the right antenna of a male in my collection, the fourth segment is noticeably shorter than the third, while in the left antennæ, the fourth is about the same length as the third, which is the case in both antennæ of a female which I possess; in a male in the British Museum the segments are almost of the same length, if anything the fourth is slightly longer than the third, and the fifth than the fourth; perhaps when we can examine more material, we shall be obliged to place it nearer to *Opisthocosmia*.

Genus 4.—Kosmetor,* nov. gen.

Abdomen cylindricum, vix dilatatum; segmentum anale transversum, vix declive; pedes graciles; forceps gracilis, attenuatus; tibiæ integræ, haud sulcatæ.

The species for which I have erected this genus were formerly placed in *Opisthocosmia* and in *Apterygida*, and they have certain superficial resemblances to the former, but in the form of the abdomen they more nearly approach to the typical form of *Forficula*, from which they differ in the long slender forceps and different antennæ.

The type of the genus *Opisthocosmia annandalei*, Burr, Trans. Ent. Soc. Lond. 1904, p. 311, from Siam.

All the species are from tropical Asia, and all have long slender forceps with one tooth.

TABLE OF SPECIES.

1. Abdomen læve, nitidum (caput, pedes, pronotum, alæ flavæ; elytra castanea) . 1. *poultoni*, Burr.

1.1. Abdomen punctulatum (caput et pronotum castanea).

* Gr. κοσμήτωρ = overseer.

2. Pedes flavi, atro-geniculati; alæ flavæ; antennæ pallido-annulatæ . . . . 2. *annandalei*, Burr.
2.2. Pedes unicolores sordide testacei; alæ fuscæ; antennæ haud annulatæ.
3. Forceps ♂ intus unidentatus.
4. Elytra nigra; alæ nigræ, apice flavo-punctatæ; forceps ♂ subrectus, subsinuatus . . . . . 3. *brahma*, Burr.
4.4. Elytra fusca; alæ fuscæ, flavo-binotatæ; forceps elongato-ovatus, haud sinuatus . . . 4. *vishnu*, Burr.
3.3. Forceps ♂ bidentatus . . . . 5. *temora*, Burr.

Genus 5.—Elaunon.*

Cum genere precedenti congruet, sed, abdomen distincte depressum, parallelum, haud cylindricum; forcipis bracchia ♂ basi ipso subdilatata atque intus dentata.

This genus is for *Apterygida bipartita*, Kirby, which approaches true *Forficula* and *Apterygida*, but the fourth segment of the antennæ is not sufficiently short to justify its being placed in the latter genus, and the dilatation of the forceps at the base is only incipient, being emphasised by the flattened triangular tooth there, so that the resemblance to the typical *Forficula* forceps is more apparent than real; but in the form of the abdomen and body generally, it is nearer to that group than to *Eparchus*.

The type is *Sphingolabis bipartita*, Kirby, Linn. Soc. Journ. Zool., xxiii, p. 526 (1891), from India and Ceylon.

Sub-family 11.—*DORATINÆ.*

Genus.—Doru,† nov. gen.

Antennæ segmentis 4 et 3 subæquantibus; elytra haud carinata; abdomen subparallelum, sat depressum; segmentum anale transversum, depressum, haud declive; pygidium spinosum vel acutum; forcipis bracchia ♂ gracilia, basi remota, haud dilatata.

I have separated into this group those species of *Apterygida* with a sharp, pointed or spiny pygidium; they all

* Gr. ἐλαύνων = driving.
† Gr. δορύ = spear (cp. Latin *genu* and *cornu*).

have a strong family likeness, and are undoubtedly related to *Apterygida*.

The type of the genus is *Forficula linearis*, Esch., Entomogr. p. 81 (1822), from Tropical America.

TABLE OF SPECIES.

1. Pygidium apice truncatum.
  2. Forceps inermis; alæ longæ; species americana . . . . 1. *binotata*, Kirby.
  2.2. Forceps ♂ dentatus; alæ abbreviatæ; species australica . . . . 2. *subaptera*, Kirby.
1.1. Pygidium apice acutum, conicum, vel spinosum.
  2. Pygidium triangulare, acutum, sed haud spinosum.
    3. Pygidium ♂ carinatum; species africana . . . . 3. *protensa*, Gerst.
    3.3. Pygidium ♂ haud carinatum; species americana . . . . . 4. *exilis*, Scudder.
  2.2. Pygidium ♂ spinosum.
    3. Forceps ♂ basi dentatus . . . . . . 5. *spiculifera*, Kirb.
    3.3. Forceps ♂ basi ipso haud dentatus.
      4. Forceps ♂, a latere visus, valde sinuatus (alæ abbreviatæ) . . . 6. *luteipennis*, Serv.
      4.4. Forceps ♂, a latere visus, paullo sinuatus, vel fere horizontalis.
        5. Elytra unicoloria . . . . . . 7. *luteipes*, Scudd.
        5.5. Elytra maculata vel vittata.
          6. Elytra maculata . . . . . . 8. *bimaculata*, Fabr.
          6.6. Elytra vittata . . . . . . 9. *linearis*, Esch.

II. CHELISOCHIDÆ.

This family includes all those earwigs in which the second tarsal segment is produced into a narrow lobe beneath the third, that is, the two species of *Auchenomus*, Karsch, and some twenty odd species included in *Chelisoches*, Scudd.

The former genus requires no treatment at present; its species are few and individuals are rare in collections.

The twenty odd species of the *Chelisoches* are here divided for the first time into no less than nine genera, of which seven are new. I hope that all will stand the test of time.

The *Chelisochidæ* fall into two sub-families as follows:—

1. Corpus valde depressum ; pronotum antice valde angustatum (forceps valde tenuis, elongatus) . . . . 1. AUCHENOMINÆ.
1.1. Corpus subdepressum ; pronotum subquadratum vel ovatum, haud valde angustatum . . . . 2. CHELISOCHINÆ.

The first sub-family includes only the genus *Auchenomus*, Karsch, which superficially strongly resembles *Sparatta* and its allies. It is with the *Chelisochinæ* only that this paper deals.

TABLE OF GENERA.

1. Carina externa elytrorum longa, usque ad apicem elytri percurrens ; (pedes longi, graciles).
   2. Elytra quadrata, truncata; (statura mediocri ; haud metallica ; alæ abortivæ) . . . . 1. KINESIS, n. g.
   2.2. Elytra ampla, lata ; (statura maxima ; metallica ; alæ longæ) . 2. CHELISOCHELLA, Verh.
1.1. Carina humeralis externa elytrorum brevissima, tantum ad humeros ipsos situata.
   2. Tibiæ superne in dimidio apicali deplanatæ et sulcatæ.
      3. Tarsi longi, graciles ; tibiæ longæ ; (elytra et alæ metallica) . . . . 3. EXYPNUS, n. g.
      3.3. Tarsi tibiæque breves.
         4. Pronotum longius quam latius, vel saltem postice quam antice latius, trapezoidale. (Caput sæpius tumidum et impressum.)
            5. Antennarum segmentum 4 conicum vel clavatum ; (species majores ; colore nigro vel fusco) . . . . 4. CHELISOCHES, Scudd.
            5.5. Antennarum segmentum 4 cylindricum vel ovatum, haud clavatum ; (statura mediocri vel

parva ; colore brunneo, vel nigro, rufo variegato, vel testaceo).

6. Alatæ ; elytra angulo basali rectangulari, scutello nullo ; corpus haud cylindricum, sat latum et depressum ; forceps validus, vel deplanatus, plus minus dentatus, et arcuatus . 5. PROREUS, n. g.

6.6. Alæ nullæ ; elytra angulo basali rotundato, scutellum parvum liberantia ; corpus valde cylindricum et elongatum ; forceps gracillimus, elongatus, subrectus, haud dentatus . . 6. SOLENOSOMA, n. g.

4.4. Pronotum subquadratum, latius quam longius ; caput globosum, læve . 7. ENKRATES, n. g.

2.2. Tibiæ superne integres, teretes, in apice ipso tantum deplanatæ.

3. Statura valida ; forceps robustus ; colore metallico ; (pronotum postice dilatatum, trapezoidale) . . . . 8. ADIATHETUS, n. g.

3.3. Statura debilis ; colore haud metallico ; forceps tenuis ; pronotum subovatum, postice haud dilatatum . . . 9. HAMAXAS, n. g.

Genus 1.—KINESIS,* nov. gen.

Statura mediocri ; antennæ segmento 3 sat brevi, quintum subæquanti ; quarto paullo breviori, cylindrico ; caput sublæve, suturis indistinctis vix impressum ; pronotum trapezoidale, longius quam latius, parallelum, margine antico recto, angulis humeralibus distinctis, rectangularibus ; lateribus rectis, reflexis, margine postico

* Gr. κίνησις = movement.

ubrotundato; prozona sat tumida, sutura mediana distincta, utrinque impressa; elytra brevia, truncata, quadrata, carina laterali acuta, per totam longitudinem elytri percurrenti; alæ abortivæ; abdomen punctulatum; segmentum ultimum dorsale ♂ magnum, tumidum, transversum: ♀ declive, angustatum; pygidium haud perspicuum; forcipis bracchia ♂ basi remota, brevia, valida, incrassata, incurva, intus dentata; ♀ recta, gracilia, inermia.

This genus is well characterised by the form of the elytra which are almost square, with a sharp and very distinct carina along the edge, running throughout the length of the elytra; the wings are wanting in the only known species, which in general characters otherwise resembles *Chelisoches.*

The type, and only known species, is *Chelisoches punctulatus*, Burr, Ann. Mag. N. H. (6), xx, p. 315 (1897), from the Southern Celebes.

Genus 2.—CHELISOCHELLA, Verhoeff.

Statura maxima, valida; antennarum segmentis 4 et 5 æque longis, unitis 3 superantibus: caput valde impressum at tumidum; pronotum caput latitudine æquans, postice haud dilatatum; elytra lata, ampla, dilatata, nitentia, lævia, carina humerali per totam longitudinem percurrenti; alæ longæ, nitidæ; abdomen validum; pedes longi, graciles; tibiæ compressæ, integres, nec deplanatæ nec sulcatæ; tarsi longi; segmentum ultimum dorsale magnum, læve, tuberculatum; pygidium parvum breve; forcipis bracchia valida, elongata, depressa, margine interno valde dentata, margine interno depresso, acuto.

Chelisochella, Verhoeff, 1902, Zool. Anzeig., No. 665, p. 196.

This genus, very inaptly named by Verhoeff, for it contains the giant of the group, is characterised by the form of the elytra, which are broadened in the middle, and furnished with a lateral keel throughout their length. Verhoeff includes in it the species *Chelisoches pulchripennis* and *glaucopterus*, Borm., but he was evidently not familiar with the species, for they do not possess the essential character mentioned by him, that is, the long keel of the elytra; in other respects, *C. pulchripennis* approaches to this genus, that is, in colour and in the form of the feet;

I propose for it a new genus intermediate between this and *Chelisoches* properly so called.

The type is *Lobophora superba*, Dohrn., Stett. Ent. Zeit. xxvi, p. 71 (1865), of which *Ch. doriæ*, Borm., is probably the male.

Genus 3.—EXYPNUS,* nov. gen.

Colore fusco, æneo-nitido; antennæ 20-segmentatæ, segmento 3 segmenta 4 et 5 unita æquanti; 4 = 5; 6 sublongiori; 4 crasso, globoso; caput tumidum, per suturas impressas divisum, margine postico excavato; pronotum caput latitudine æquans, margine antico recto, medio in collem perductum; lateribus parallelis, postice haud dilatatum, margine postico rotundato-truncato; elytra lata, apice truncata, carinula humerali brevissima; alæ longæ; pedes longi, graciles; tibiæ antice et intermediæ superne in dimidia apicali deplanatæ et sulcatæ; pygidium breve; forcipis bracchia depressa, margine interno acuto; ♂ arcuatim incurva, intus dentata; ♀ recta, gracilia, inermia.

Ch. pulchripennis, Borm., is included by Verhoeff in the preceding genus, but as it does not possess the characteristic sharp edge to the elytra, it cannot be placed there; it has, however, the broad elytra, tumid and impressed head, and long and slender feet of that genus, but the tibiæ are depressed and sulcate as in *Chelisoches*; the forceps of the female are simple as in *Chelisoches*, and not strongly toothed as in *Chelisochella*. It forms an intermediate genus between these two.

The type and only known species is *Chelisoches pulchripennis*, Borm., Ann. Soc. Ent. Belg., xxvii, p. 78, Pl. III, fig. 15, 1883, from the East Indies.

Genus 4.—CHELISOCHES, Scudder.

Statura mediocri; antennæ 15–20-segmentatæ; segmento 3 sat longo, 4 et 5 unita subbreviori; segmento 4 conico, subclavato; 4 et 5 subæquantibus, ceteris longioribus; caput tumidum et impressum; postice plus minus excavatum; pronotum longius quam latius, postice paullo dilatatum, margine postico rotundato vel rotundato-emarginato; elytra angusta, carinula humerali brevi; haud metallica; alæ perfecte explicatæ; abdomen sat depressum, plicis lateralibus distinctis; segmentum ultimum dorsale ♂ magnum, margine postico tuberculatum; ♀ angustatum; pedes breves, tarsis

* Gr. ἔξυπνος = brisk.

brevibus; tibiæ anticæ et intermediæ, necnon posticæ, superne in dimidio apicali deplanatæ et sulcatæ; pygidium parvum; forcipis bracchia ♂ elongata et gracilia, vel brevia, robusta, subrecta, vel arcuatim incurva; margine interno dentato depressa vel subtriquetra margine interno acuto; ♀ subrecta, inermia, elongata, vix incurva.

This genus contains the typical species allied to *Ch. morio*; the species are mostly dark in colour, if not quite black, though *Ch. plagiatus*, while agreeing in structural characters, differs in its bright and variegated uniform.

The type is *Forficula morio*, Fabr., Syst. Ent., p. 270, No. 6, 1775. From the East Indies and Pacific Islands.

TABLE OF SPECIES.

1. Pronotum capite haud multo latius.	
2. Pronotum elytra alæ læte metallica.	1. *glaucopterus*, Borm.
2.2. Color haud læte metallicus.	
3. Forceps tenuis; pygidium bilobum .	2. *ater*, Borm.
3.3. Forceps validus; pygidium integrum.	
4. Elytra et alæ nigræ; corpus nigrum, tarsis exceptis pallidis; antennæ pallido-annulatæ . .	3. *morio*, Fabr.
4.4. Elytra colorata.	
5. Corpus nigrum; elytra alæque auriantiacæ; species australica	4. *australicus*, Gou.
5.5. Colore rufo, testaceo, flavo et fusco læte variegato; species africana	5. *plagiatus*, Fairm.
1.1. Pronotum capite multo latius . . .	6. *malgachus*, Borm.

Chelisoches stratioticus of Rehn is probably only a finely developed variety of *Ch. morio*, with which I have always placed it in my collection.

Chelisoches tenebrator, Kirby, may perhaps require another genus, as the feet seem to have a somewhat distinct structure.

Genus 5.—PROREUS,* nov. gen.

Statura mediocri; cum *Chelisoche* congruet; differt autem antennis gracilioribus, segmento 4 ovato, vel cylindrico, nec incrassato, nec clavato nec conico.

* Gr. πρωρεύς = pilot.

I have erected this new genus, of which *P. simulans*, Stål, may be regarded as the type, for those somewhat smaller species, generally brown or reddish in colour, though sometimes black and variegated, which are closely allied structurally to *Ch. morio*, and long regarded as congeneric with that species; they have, however, a different appearance, but I was long unable to find a satisfactory character common to all the species; in *P. simulans*, the antennæ are noticeably thin and slender, but *P. ritsemæ* approaches nearer to *Ch. morio.* The shape of the pronotum is that of typical *Chelisoches*, as also that of the feet.

The type is *Forficula simulans*, Stål, Eug. Resa. Ins., p. 302. (1858.)

TABLE OF SPECIES.

1. Forceps validus, deplanatus.	
2. Forceps inermis (colore nigro, rufo-variegato, pedibus annulatis) .	1. *variopictus*, Borm.
2.2. Forceps dentatus.	
3. Pronotum sublatius quam longius	2. *sobrius*, Borm.
3.3. Pronotum sublongius quam latius, postice quam antice paullo latius.	
4. Unicolor fusco-testaceus . . .	3. *ritsemæ*, Borm.
4.4. Versicolores.	
5. Elytra unicoloria testacea (statura parva; caput nigrum)	4. *melanocephalus*, Dohrn.
5.5. Elytra vittata.	
6. Pronotum bicolor.	
7. Colore nigro; antennæ pedesque rufescentes .	5. *lætior*, Dohrn.
7.7. Colore rufo; antennæ annulatæ	6. *elegans*, Borm.
6.6. Pronotum unicolor flavum .	7. *ludekingi*, Dohrn.
1.1. Forceps tenuis, haud vel vix deplanatus.	
2. Elytra unicoloria fusca; forceps rectus, tantum apice ipso curvatus	8. *fuscipennis*, Haan.
2.2. Elytra vittata.	
3. Forceps arcuatus.	

4. Pronotum rufum, nigrovariegatum . . . . 6. *elegans*, Borm. var.
4.4. Pronotum unicolor flavum . 7. *ludekingi*, Dohrn. var.
3.3. Forceps rectus, tantum apice ipso curvatus . . . . . 9. *simulans*, Stål.

Genus 6.—SOLENOSOMA, nov. gen.

Corpus gracile, cylindricum ; antennæ segmento 3 quam primum tertia parte breviori, elongato, tenui ; 4 ovato, cylindrico, quam tertium dimidio breviori ; ceteris elongatis, cylindricis ; caput sat planum, postice timidum, margine, postico recto : pronotum capite subangustius, dimidio longius quam latius, postice dilitatum, margine antico recto, postico truncato, angulis rotundatis ; lateribus rectis, reflexis : elytra brevia, apice truncata, carinula humerali brevissima ; angulo humerali haud rotundato ; angulo basali rotundata, scutellum parvum liberantia ; alæ nullæ : pedes sat graciles ; femora subincrassata, haud elongata ; tibiæ breves, in dimidio apicali superne deplanatæ et subsulcatæ ; tarsorum segmento secundo sub tertium in lobum angustum producto : abdomen cylindricum, elongatum, parallelum, gracile, minute punctulatum, plicis lateralibus distinctis : segmentum ultimum dorsale magnum, quadratum, margine postico rugoso ; pygidium parvum ; forcipis bracchia basi remota, gracillima, valde elongata, subrecta, margine interno basi crenulata.

The unique species for which I have raised this genus was first ranged by de Bormans in *Auchenomus*, from which it differs in the form of the pronotum, and then in *Chelisoches*, from which it differs in the elongate and almost perfectly cylindrical body and the forceps, which recall in type those of *Neolobophora*. The pronotum has the form typical of *Chelisoches* and *Proreus*.

The type is *Auchenomus birmanus*, Borm., Ann. Mus. Civ. Gen. (2), vi, p. 436, fig. ♂. (1888.) (Burmah.)

Genus 7.—ENKRATES,* nov. gen.

Statura mediocri ; antennæ fortiores ; segmento 3 sat longo, quam 4 + 5 subbreviori ; 4 et 5 subæquantibus, incrassatis, subclavatis ; ceteris longioribus ; caput læve, tumidum, haud impressum, suturis obsoletis ; pronotum caput latitudine æquans, paullo dilatatum, latius quam longius, transversum, margine postico rotundato ; elytra

* Gr. ἐγκρατής = temperate.

angusta, apice truncata, carinula humerali brevissima; alæ longæ; pedes breves; tibiæ vix depressæ, haud vel vix sulcatæ; abdomen subdilatatum; segmentum ultimum dorsale magnum, transversum, margine postico medio impresso, utrinque tuberculato; pygidium parvum; forceps ♂ basi incrassatus, subtriquetris; margine interno dente acuto magno armatus, arcuatus; ♀ subrectus, inermis.

In its variegated colour and the armature and shape of the forceps, as well as in the broad and transverse pronotum, this genus approaches more nearly to *Forficula*; it has the head of typical *Forficula*, while the tarsi are clearly referable to the group of the *Chelisochidæ*.

The only known species is *Enkrates flavipennis*, Fabr., from West Africa, of which the synonymy is rather confused.

Forficula flavipennis, Fabr., Ent. Syst., ii, p. 5. (1793.)

Forficula flavipennis, Scudd., Proc. Bost. Soc. N. H., xviii, p. 314. (1876.)

Sphingolabis flavipennis, Kirby, W. F., Cat. Orth. i, p. 46. (1904.)

Sphingolabis variegata, Kirby, W. F., Linn. Soc. Journ. Zool., xxiii, p. 326. (1891.) id. op. cit. xxv, p. 529, Pl. XX, fig. 9. (1896.)

Forficula variegata, Borm., Tierreich, Forf., p. 127. (1900.)

Chelisoches vittatus, Burr, Ann. Mag. N. H. (7), xi, p. 274. (1903.)

Chelisoches limbatus, Borg. Arkiv. för Zool. Bd., i, p. 575, Pl. XXVI, fig. 7. (1904.)

Genus 8.—ADIATHETUS,* nov. gen.

Statura mediocri vel magna; antennæ 20-segmentatæ, segmento 3 longo, sed quam 4 + 5 unita breviori; 4 quam 3 dimidio breviori, clavato; 5 clavato, 3 subæquanti: ceteris elongatis, subconicis: caput tumidum, suturis sat distinctis, margine postico recto; pronotum subquadratum, postice haud vel vix dilatatum, margine antico recto, postico subrotundato, lateribus rectis, angulis posticis rotundatis; prozona tumida, sutura mediana distincta, utrinque puncto impresso instructa; metazona plana, lata; elytra carinula humerali brevi, lævia vel granulosa, læte metallico-nitentia; alæ longæ, eodem colore: pedes sat graciles, tibiis superne integris; abdomen validum, convexum, parallelum; plicis lateralibus distinctis; segmentum ultimum dorsale ♂ magnum, quadratum

* Gr. ἀδιάθετος = indisposed.

læve, tuberculatum ; ♀ magnum, subquadratum, integrum : pygidium ♂ parvum ; ♀ parvum, vel longe productum ; forcipis bracchia ♂ brevia, incurva, robusta, valida, depressa, denticulata ; ♀ elongata, gracilia.

The species which I include in this genus was included by Verhoeff in his genus *Chelisochella,* but as that is characterised by the long keel of the elytra, a feature which is wanting in this species, they cannot be ranged in that genus. The German author appears to have been unfamiliar with the insects themselves, and assumed from the metallic colour and somewhat broad elytra that they fell in his genus.

The type and only known species is *Chelisoches shelfordi,* Burr, Ann. Mag. Ent. (7), vi, p. 96, Pl. IV, fig. 4. (1900.) (Sarawak.) (*Ch. hercules,* Burr, *l. c.* is the male.)

Genus 9.—Hamaxas,* nov. gen.

Statura minore ; colore nigro, rufo-variegato ; antennæ 16-segmentatæ ; segmento 3 sat brevi, subconico ; 4 + 5 tertium superantibus, ovatis, 5 quam 4 longiori ; ceteris subconicis, elongatis ; caput læve, depressum, suturis vix perspicuis, margine postico truncato : pronotum quam caput æque latum, paullo longius quam latius, subovatum, margine antico lateribusque convexis, postico rotundato, postice haud dilatatum ; prozona vix tumida, sutura distincta ; elytra minute punctulata, apice truncata, lata, carinula humerali brevissima, valde pubescentia ; alæ similes : pedes breves, valde pubescentes ; tibiæ superne teretes, integres ; abdomen valde pubescens, sat depressum, parallelum, plicis lateralibus distinctis ; segmentum ultimum dorsale ♂ magnum, quadratum ; ♀ angustatum : pygidium ♂ brevissimum, quadratum, transversum ; ♀ vix perspicuum, subglobosum : forcipis bracchia ♂ depressa, sat valida, vix incurva, brevia, valde pubescentia, intus dentata ; ♀ subcontigua, recta, brevia, inermia.

The species of the genus have always appeared quite unnaturally associated generically with *Chelisoches morio* ; the brown and black uniform, the small size, very hairy body, all point to a different group ; but the general characters of *Chelisoches* are present, except that the pronotum is shorter and broader, and more ovate, not dilated posteriorly, and also the tibiæ are smooth above, and not depressed nor sulcate.

* Gr. ἅμαξας = coachman.

The type is *Chelisoches feæ*, Borm., Ann. Mus. Civ. Gen., xxxiv, p. 383. (1894.)

TABLE OF SPECIES.

1. Pronotum nigrum.	
2. Antennæ segmentis 1–2 nigris, 3–7 flavis, 8–9 brunneis, 10–11 flavis, 12–15 fuscis, elytra fusco-brunnea .	1. *variicornis*, Borm.
2.2. Antennæ nigræ, ante apicem pallido-annulatæ ; elytra nigra	2. *feæ*, Borm.
1.1. Pronotum flavidum.	
2. Antennæ segmentis 1–13 nigris, 14–15 albis, apice fuscæ ; elytra nigra . .	3. *dohertyi*, Burr.
2.2. Antennæ segmentis 1–4 flavidis ; 5–10 fuscis ; elytra fusco-brunnea	4. *semiluteus*, Borm.

Explanation of Plate IV.

[*See Explanation facing the* Plate.]

VI. *Catalogue of the Australian and Tasmanian* Byrrhidæ; *with Descriptions of New Species.* By ARTHUR M. LEA, F.E.S., Government Entomologist, Tasmania.

[Read March 6th, 1907.]

THE *Byrrhidæ* are fairly numerous in Australia and Tasmania, although few species have been recorded thence. This is no doubt due to the small size and retiring habits of most of the species; and probably when moss and fallen leaves have been systematically examined in many parts of Australia, the number herein recorded will be more than trebled.

MICROCHÆTES.

The Rev. T. Blackburn has recently described several species belonging to this genus and made remarks on others. The late Rev. R. L. King had previously remarked on the variation of species of the genus, and in all the species I have seen there is considerable variation in the size and clothing. In *M. scoparius* and *sphæricus* (and probably in others) the prothoracic fascicles have a decided tendency to degenerate into scattered setæ, so that the prothorax is occasionally non-fasciculate; the elytral setæ and fascicles are also variable.*

MICROCHÆTES AUSTRALIS, Boisd. (*Byrrhus*, Boisd.), Voy. Ast. Col., p. 149; Blackb., Trans. R. Soc. S. Aust., 1903, p. 174.

Referred by Boisduval to *Byrrhus,* but evidently a *Microchætes.* His description † is quite useless, as it would apply to every species of the genus, and without some definite information as to the type I think the name should be ignored. I wrote to Mons. Albert Bovie of Brussels about the type, but he informed me that it was

* This to a certain extent may be accidental, as the scales and setæ are liable to abrasion. Specimens are also frequently heavily encrusted with mud, which is difficult to remove without at the same time injuring the clothing.

† "Niger, thorace elytrisque verrucosis."

not in the Brussels Museum,* nor could he find it in the Paris Museum on a visit to that institution.

Hab. AUSTRALIA.

MICROCHÆTES SPHÆRICUS, Hope, Trans. Ent. Soc. Lond., 1833, p. 13, Pl. I, fig. 2; King, Trans. Ent. Soc. N. S. Wales, ii, p. 72; Blackburn, Trans. R. Soc. S. Aust., 1903, p. 174. *M. coloratus*, Blackb. *l. c.*, p. 176.

The Rev. T. Blackburn says this species "could certainly not be identified with confidence except by specimens from the original locality." This locality was the Swan River, where I have taken numerous specimens † which agree with both the description and figure. In all these the under-surface is reddish whilst the upper-surface is dark, except that sometimes the outer parts of the elytra are also reddish. The elytra have large punctures in the striæ, but they cannot be seen in fresh specimens, and the punctures of the metasternum are much as in *scoparius*. On some of them there is a patch of greyish or obscure ochreous scales on each elytron towards the base, the patch usually commencing on the shoulders (where it is narrowest) and obliquely directed towards the suture, which, however, it does not reach. In one specimen it is again directed towards the base so that each appears to be supplied with a semicircle of pale scales. The clothing is liable to abrasion, but several of the specimens before me agree well with the description of *coloratus*, and I believe that name to be synonymous.

Hab. W. and S. AUSTRALIA—coastal districts.

MICROCHÆTES SCOPARIUS, Er., Wiegm. Arch., 1842, p. 153; King, Trans. Ent. Soc. N. S. Wales, ii, p. 72; Blackburn, Trans. R. Soc. S. Aust., 1903, p. 174.

This species is very abundant in Tasmania, and is the common species in New South Wales and Victoria. On fence tops and stumps at dusk it may sometimes be taken in hundreds; it also occurs under logs (usually in dry situations) and occasionally in moss. As a rule Tasmanian specimens have more uniformly dark clothing than those

* Boisduval's types of Curculionidæ of the Astrolabe are in that institution.

† I have taken specimens also on Rottnest, Garden, and Pelsart Islands and at Albany.

from the mainland, and the under-surface is nearly always black.

The punctures in the elytral striæ are normally concealed by the clothing, but when this has been abraded they are seen to be rather coarse at the sides and practically absent from the disc. When the clothing of the metasternum has been abraded the punctures there are seen to be considerably larger at the base than at the apex.

Hab. TASMANIA, VICTORIA, N. S. WALES.

MICROCHÆTES MINOR, King, Trans. Ent. Soc. N. S. Wales, ii, p. 73; Blackb., Trans. R. Soc. S. Aust., 1903, p. 174.

The Rev. T. Blackburn regarded this species * as probably not being a true *Microchætes.* It has every appearance of being one however, despite the want of fascicles. My specimen (a co-type from the late Rev. R. L. King's collection) is in rather bad preservation and I have been unable to examine its antennæ and tarsi; but this (owing to their small size and the frequency with which they are covered with dirt) is not often easy even in the larger species; so King may quite easily have been misled in describing the tarsi as tetramerous.

Hab. N. S. WALES.

MICROCHÆTES FASCICULARIS, Macl., Trans. Ent. Soc. N. S. Wales, ii, p. 171; Blackb., Trans. R. Soc. S. Aust., 1903, p. 174.

The Rev. T. Blackburn mentions having received specimens from me under the above name and queries the correctness of same. I received the name originally from Mr. George Masters and subsequently compared my specimens with the type. On examining them again, however, in April 1905, I found that I had two species mixed together, one being *scoparius* and the other *fascicularis*; this latter was again and more carefully compared with the type and found to agree with it. Macleay's remark, "Thorax . . . . with a transverse series of five fascicles" is erroneous, as on the type there are only four. On abrasion the metasternum of my specimen is seen to be covered with very coarse punctures, becoming smaller (but still rather coarse) to apex; there are also a few minute punctures

* Unknown to him except by description.

scattered about. The punctures are after the same style as in *scoparius*, only much larger.

Hab. Queensland, N. S. Wales.

Microchætes solidus, Blackb., Trans. R. Soc. S. Aust., 1903, p. 175.

Hab. Queensland.

Microchætes nigrovarius, Blackb., *l. c.*, p. 175.

Hab. S. Australia.

MORYCHUS.

To this genus have been referred many species, which structurally would appear to belong to several genera. The wingless species, however, have been regarded as belonging to the genus, or sub-genus *Pedilophorus*.

Morychus torrensensis, Blackb. (*Byrrhus*, Blackb.), Trans. R. Soc. S. Aust., 1889, p. 138; 1903, p. 173.

Hab. S. Australia.

PEDILOPHORUS.

One species only has been referred to this genus from Australia, but I have now to add seven more. Superficially these would appear to belong to several genera, but they are all evidently closely allied despite the fact that some are smooth, others are tuberculate and others hairy. I have not ventured therefore to propose new genera for their reception as the boundaries of *Pedilophorus* are rather vague.

The natural groups appear to be :—

1. *raucus* and *mixtus*.
2. *bryophagus* and *griffithi*.
3. *simplicicornis*.
4. *multicolor*.
5. *carissimus* and *dives*.

In all the species the head is widely rounded in front with practically no clypeus, the antennæ are widely separated and close to the eyes and in repose would just pass the middle coxæ. Their basal joint is large and about twice as long as the second, the third is variable between the species, the seventh is transverse, and the eighth to eleventh form a rather wide club. In *simplicicornis*, however, the antennæ are otherwise.

The third joint of the tarsi is lamellate beneath in all the species, but the lamellæ are sometimes so thin that when closely pressed to the tarsi they cannot always be seen; in *raucus* on one specimen I can see them clearly, in *mixtus* they are very thin, and except from the side and in a good light they appear to be absent, in *multicolor* they are indistinct; but in all the others they can be seen clearly and from the sides are very conspicuous.

In *raucus* and *mixtus* the epipleuræ of the elytra are comparatively narrow and suddenly terminate at the hind coxæ; in the others they are very much wider, and especially in *simplicicornis*; in *bryophagus* they are strongly depressed at the hind coxæ.

In *carissimus* and *dives* the intercoxal process of the prosternum is wider than in the others, in *multicolor* it is considerably narrower.

The species may be tabulated as follows:—

Elytra tuberculate—	
Prothorax with punctures	*carissimus.*
Prothorax with ridges . . .	*dives.*
Elytra without tubercles—	
Upper-surface hairy.	
Upper-surface not uniformly coloured .	*multicolor.*
Upper-surface uniformly coloured.	
Clothing uniform	*raucus.*
Clothing not uniform	*mixtus.*
Upper-surface glabrous.	
Under-surface black	*bryophagus.*
Under-surface reddish.	
Antennal joints gradually increasing in width	*simplicicornis.*
Antennæ with terminal joints forming a distinct club	*griffithi.*

PEDILOPHORUS RAUCUS, Blackb. (*Byrrhus*, Blackb.), Trans. R. Soc. S. Aust., 1891, p. 133; 1903, p. 173.

Two specimens from New South Wales (obtained in flood débris on the Hawkesbury River) were named by

Mr. Blackburn as this species, but they differ from the description in having the clothing of a reddish-brown; in all other respects, however, they agree with the description.

Hab. Victoria, N. S. Wales.

Pedilophorus mixtus, n. sp.

Bronze-black and shining; under surface dull red, appendages paler. Upper surface with long blackish hair mingled with shorter whitish hair; under-surface with greyish pubescence.

Head rounded in front, with fairly numerous but partially concealed punctures. *Antennæ* with third joint almost as stout as second, and not much longer. *Prothorax* widely transverse, strongly but evenly convex, with numerous distinct but not quite evenly distributed punctures. *Scutellum* very distinct. *Elytra* strongly and evenly convex, punctures as on prothorax; epipleuræ rather narrow and suddenly terminated at hind coxæ. *Under-surface* with moderately dense but rather small and partially concealed punctures. Length 3 mm.

Hab. Tasmania: Hobart, Mount Wellington.

The outline is a perfect oval. The whitish hair gives the upper-surface a faintly speckled appearance and from some directions appears to be in about five feeble bands across the elytra. Several specimens were taken dead at Sandy Bay whilst searching for blind sand-beetles, others were taken from moss on trees.

In general appearance rather close to *raucus* but smaller and narrower than that species, the under-surface paler and with much smaller and sparser punctures, the legs paler, the clothing different, and the punctures of the elytra smaller, sparser and less uniform.

Pedilophorus bryophagus, n. sp.

Of a bright metallic green with a slight coppery gloss; under-surface black, legs dull red, antennæ and tarsi somewhat paler. Under-surface and appendages sparsely pubescent, elsewhere glabrous.

Head widely rounded in front, with fairly large and numerous clearly-defined punctures. *Antennæ* with third joint distinctly thinner than and almost twice the length of third. *Prothorax* strongly convex, the sides almost vertical, with numerous comparatively small but clearly defined punctures. *Scutellum* minute. *Elytra* very strongly convex, punctures rather smaller than on prothorax, but almost as clearly defined; epipleuræ wide and somewhat sinuous internally, strongly diminished towards but not suddenly terminated at hind coxæ. *Under-surface* almost impunctate. Length 3-3¼ mm.

Hab. TASMANIA: base of Mount Wellington.

With the head as normally concealed the outline is a perfect oval. The elytral epipleuræ, although not suddenly terminated at the hind coxæ, are strongly depressed there for the reception of the apex of the femora. Mr. H. H. D. Griffith and myself have taken numerous specimens in moss, but always near the base of Mount Wellington; the following species was always obtained at a considerably greater elevation.

PEDILOPHORUS GRIFFITHI, n. sp.

Of a metallic green with a slight coppery gloss; under-surface and appendages of a dull red. Under-surface and appendages very sparsely pubescent, elsewhere glabrous.

Head widely rounded in front, with fairly numerous punctures of moderate size and clearly defined in front, becoming smaller and less clearly-defined posteriorly. *Antennæ* with third joint much thinner than and twice the length of second. *Prothorax* and *elytra* of the same shape as in the preceding species but with much less distinct punctures, especially on the elytra; the epipleuræ of these wide, rather strongly narrowed behind the hind coxæ, and not depressed there. *Under-surface* with sparse and minute punctures. Length 4-4½ mm.

Hab. TASMANIA: Mount Wellington.

In general appearance close to the preceding species but larger, the under-surface not black, elytra with different punctures, and their epipleuræ different. The colour is sometimes almost as bright a green as the preceding species, but is usually not so metallic; the prothorax in some specimens is almost black.

Dedicated to Mr. H. H. D. Griffith, in memory of many very pleasant excursions on Mount Wellington, where we have frequently taken this species in moss from old logs.

PEDILOPHORUS SIMPLICICORNIS, n. sp.

Black or brown, and usually with a metallic greenish gloss, under-surface and appendages more or less reddish. Under-surface and appendages very sparsely pubescent, elsewhere glabrous.

Head widely rounded in front; with numerous clearly defined punctures of moderate size in front and on the sides sparser and smaller elsewhere. *Antennæ* in repose extending to hind coxæ, their first joint stout and more than thrice the length of second, second subglobular, third thinner than and twice the length of second, fourth the width of third and the length of second, the others regularly increasing in width, eleventh the length of ninth and tenth combined. *Prothorax* very strongly convex, sides almost vertical, in front with small indistinct punctures, elsewhere smaller and still less distinct. *Scutellum* extremely minute or absent. *Elytra* very little longer than head and prothorax combined, almost as wide as long, outline not regularly continuous with that of prothorax, punctures very minute and indistinct; epipleuræ very wide, strongly narrowed behind but not depressed at hind coxæ. *Abdomen* with fairly numerous but small punctures, rest of under-surface almost impunctate. Length 3½-4 mm.

Hab. TASMANIA: Mount Wellington (in very wet moss).

There are seven specimens before me, and not two are exactly alike in colour. The colour of the upper-surface is more commonly black glossed with metallic green, but in three specimens whilst the greenish gloss is present the ground-colour is more of a reddish-brown especially towards the tip of the elytra; the tip, however, is always more or less reddish; the under-surface is of a more or less dark reddish-brown, sometimes paler at the sides and the appendages are usually paler, the legs and basal joints of the antennæ being sometimes almost flavous. In some lights the elytra at the base appears to have very faint traces of striation.

Although in many respects close to the preceding species the antennæ differ from those of that species and from all the others here noted in not forming a distinct club, the four terminal joints are certainly larger and wider than the others, but the increase in width is quite regular from the fourth joint. It is also more convex than *griffithi* and the elytral epipleuræ are very much wider and are otherwise different.

PEDILOPHORUS MULTICOLOR, n. sp.

Upper-surface (except sides of prothorax and elytra) dark, with various metallic glosses, lower-surface reddish-flavous, appendages paler. Upper-surface with fairly long golden semi-decumbent hair; elsewhere with fine pubescence.

Head widely rounded in front, with dense and rather coarse clearly-defined punctures. *Antennæ* stout, third joint thinner but no longer than second. *Prothorax* strongly convex, sides in places quite vertical, disc towards base almost flattened; densely and coarsely punctate. *Scutellum* minute. *Elytra* strongly convex, sub-cordate, punctures almost as on prothorax, epipleuræ very narrow, strongly narrowed behind hind coxæ and with sparse but rather large punctures. *Under-surface* with fairly numerous and distinct punctures. Length 2 mm.

Hab. TASMANIA: Mount Wellington.

The head is usually of a dark metallic green, the prothorax is usually also metallic green, but much brighter than the head, its sides are widely diluted with red, but the colours are not sharply limited; the elytra are black with a bronzy or greenish gloss, their apex and sides are widely diluted with red, the red being sometimes advanced along the suture; the meso- and metasternum are usually somewhat darker than the rest of the under-surface. One specimen has the dark parts of the head and elytra slightly bronzed, but the prothorax of a beautiful purple.

A lovely little insect, all my specimens of which were obtained in moss on stones continually wet with spray, just above the Silver Falls.

PEDILOPHORUS CARISSIMUS, n. sp.

Of a bright metallic coppery green; tubercles coppery bronze; under-surface and appendages black; second joint of antennæ, palpi, claws and trochanters of a more or less dull red. Under-surface and appendages with very fine pubescence, elsewhere glabrous.

Head almost semicircularly rounded in front, with dense clearly defined punctures, rather smaller along middle than elsewhere. *Antennæ* with third joint much thinner than and almost twice the length of second, seventh almost the width of eighth. *Prothorax* very strongly and almost regularly convex, densely but not very coarsely punctate. *Scutellum* small. *Elytra* very strongly convex, with rows of slightly elevated burnished tubercles, the whole surface with small evenly distributed punctures, the spaces between the tubercles finely shagreened; epipleuræ rather narrow, and very narrow behind the hind coxæ. *Under-surface* with fairly dense and very distinct punctures, becoming coarse on intercoxal process of prosternum. Length 6 mm.

Hab. TASMANIA: summit of Mount Wellington.

The tubercles, of which there are about 36 on each elytron, may be regarded as being in five irregular rows on each, the rows being in places irregularly doubled and they appear to be always slightly different in disposition ; although very conspicuous they are not much elevated above the general surface ; they have punctures as the rest of the elytra but are not shagreened.

A lovely insect which has been obtained on the summits of several mountains in Tasmania. Mr. Aug. Simpson has one specimen probably from Ben Lomond. My own was obtained on the summit of Mount Wellington in January 1904, under a deeply buried stone ; fragments are numerous there, but although both Mr. Griffith and myself repeatedly searched for it there we never succeeded in taking more than one living specimen. For years we have been in the habit of referring to this species as "Simpson's beauty."

PEDILOPHORUS DIVES, n. sp.

Of a metallic coppery green, tubercles coppery purple, under-surface black, appendages dull red, tarsi paler. Under-surface and appendages with very fine pubescence, elsewhere glabrous.

Head very widely rounded in front, immediately behind which is an irregular transverse impression ; surface with short ridges and granules. *Antennæ* short, third joint thinner than and more than twice the length of second. *Prothorax* very strongly convex, densely covered with short ridges. *Scutellum* minute. *Elytra* strongly convex, with numerous small granules, and each with four somewhat irregular rows of strongly elevated tubercles, epipleuræ narrow and strongly narrowed at hind coxæ. *Sterna* with dense and coarse punctures ; abdomen with sparser, smaller, and more irregular punctures. Length 4 mm.

Hab. TASMANIA : Frankford (in moss).

The prothoracic ridges on the sides are more or less parallel with the sides, but elsewhere they are very irregular in direction, except that from two points they appear to radiate like the spokes of a wheel. The elytral tubercles are usually somewhat elongated, those of the two sutural rows are largest, the sutural row extends almost to the apex where it joins in with the third row ; the second row terminates at about one-third from the apex, the outer row consists of little more than tubercular swellings of the apparent margin *; between the second and third rows there are on the specimens before me from one to three tubercles.

LIMNICHUS.

LIMNICHUS AUSTRALIS, Er., Wiegm. Arch. 1842, p. 153.
Hab. TASMANIA.

ASPIDOPHORUS.

ASPIDOPHORUS HUMERALIS, Blackb., Proc. Linn. Soc. N. S. Wales, 1894, p. 92.

Hab. TASMANIA.

ASPIDOPHORUS GLOBOSUS, Macl. (*Trinodes*, Macl.), Trans. Ent. Soc. N. S. Wales, 1871, ii, p. 171.

I recently examined the type of *Trinodes globosus* referred by Macleay to the *Dermestidæ*; it is certainly an *Aspidophorus*. The original description is quite worthless and the specimen, when I examined it, was very greasy. There are two species before me, either of which may be *globosus*, but until they have been compared with the type, after this has been cleaned, it would be unsafe to describe one of them as new.

SPECIES REFERRED IN ERROR TO THE *BYRRHIDÆ.*

MICROCHÆTES COSTATUS, Macl.

Macleay states of this species that it "ought probably to constitute a new genus." I recently examined the type and found that it belongs to the *Histeridæ* and is *Epiechinus tasmani*, Lewis.† The species therefore must now be known as *Epiechinus costatus*, Macl.

LIMNICHUS FRONTALIS, Macl.

This has already been referred to the genus *Stictostix* of the *Histeridæ* by Lewis.

* From above they appear to be on the extreme sides of the elytra, but these are incurved below them.

† Of this species I have specimens named by Mr. Lewis.

BIZENIA FORMICICOLA, King.

This also belongs to the *Histeridæ,* and is stated to be a synonym of *Chlamydopsis striatella,* Westw.

MORYCHUS HETEROMERUS, King.

This belongs to the *Tenebrionidæ,* and I have recently commented upon it in the Proceedings of the Linnean Society of New South Wales.*

* 1906, p. 226.

VII. *Entomology in N. W. Spain (Galicia and Leon).* By T. A. Chapman, M.D., F.Z.S. (Lepidoptera), and G. C. Champion, F.Z.S. (Coleoptera and Hemiptera).

[Read March 6th, 1907.]

Plates V–XI.

District visited, Itinerary.

For our sixth (fifth together) entomological excursion in Spain Mr. Champion and I agreed to visit Galicia, the north-west corner of the Peninsula. The choice was determined probably by a wish for an area new to us and a fear that our date was not early enough for a south-eastern district, where more interesting collecting could no doubt be done. Our visits to the Western Cantabrian Mountains, two years ago, left me with a distinct wish to see some of the more western ranges. One of the drawbacks of a visit to Spain is the long railway journey, the railways in Spain being often neither very quick nor very comfortable. To Galicia, however, one can go by R.M.S.P. Co.'s steamer to Vigo, and this also was not a small item in our selection. We left Southampton on the 15th of June by the steamer "Amazon" on her first trip, a ship of 10,000 tons and described in a newspaper notice as a "floating electrical palace." The Bay of Biscay was like a millpond, so that the comfort as compared with a railway journey was immense. We were also fortunate on our return journey to come by the "Danube," and to have a fairly calm sea.

Vigo is a small town with considerable commercial activity and a large business in fish and especially in sardines. It is not always easy to escape the flavour of fish even by going some miles into the country. Our favourite excursion from Vigo was by small steamer across the fiord to Cangas. The weather was warm enough to make an excursion to a sufficient distance, on the much-populated Vigo side, rather trying, whilst the half-hour on the water was always inviting. Cangas is a large fishing village, but close to it is open wild ground. Vigo is situated on a bay or inlet of the sea some mile and a half or two miles across, and some twenty miles long, the country is mountainous, but the elevations are low, cultivation reaching well to the tops. There are woods, including some of pine, but the rarity of pine species confirms their appearance of being planted and not indigenous. To get more than scraps of waste ground one must go inland seven or eight miles, on towards Porriño, where we found open heath and woodland. The roads, however, are very dusty and not inviting either for walking or driving, whilst cross-country footpaths, though more pleasant, go up and down hill in a most fatiguing way, and yet involve much longer routes, and many occasions for getting lost or having to turn back. A prominent feature of these excursions was the bullock-carts, with wooden axles and solid wooden wheels, which always made loud screeching noises, pleasing if at a sufficient distance and one were in a good humour, but otherwise at close quarters. Some ten miles up the bay we explored the very similar neighbourhood of Redondela (by train), and found some items of interest close to Vigo itself, as for instance the handsome larvæ of *Diplura loti* on the slopes of the forts.

Our efforts to ascertain how we should best reach any of the higher ground of Galicia were unsuccessful and we ended by going to El Barco (de Valdeorras) by train, as being more amongst the mountains, and from here we went on mule-back some five or six hours' journey to Casayo, about 3,500 feet up; the highest and furthest village in the valley of the Casoya, a stream running from the south into the main stream of the Sil. From here we could get up another 2,000 feet or so, but were still about a day's journey from where we wished to be, amongst the ridges of over 7,000 feet. Nor was there any other village near them on the north side where we were. Possibly a nearer resting-place may be found on the south, starting from La Puebla de Sanabria, but we did not definitely ascertain this. I think for really good work in this region camping out will be a necessity. Unfortunately, both Mr. Champion and myself have a prejudice in favour of a roof over our heads, although our quarters at Casayo would prove to any one that we are far from being too particular beyond this.

Thence we returned to El Barco, and went on to Brañuelas, at the highest point attainable by railway.

Here, at 3,300 feet, we found we were in the middle of a wide plateau of which the highest accessible point some four or five miles off only gave us another 1,000 feet. Brañuelas is some way beyond the boundary of Galicia in the province of Leon.

At El Barco (de Valdeorras) we had an experience that was quite new to us in Spain, and though not altogether pleasant, was of considerable interest entomologically, anthropologically and probably in several other directions. We made a short excursion on the afternoon of our arrival, and on the next day tried a rather longer one to the ridge at the top of a side valley, with very similar country to that we afterwards more fully examined some twenty miles off (as the crow flies) at Casayo. We thought several of the people we met were less civil and friendly than had been our universal experience previously, and at our evening meal one of the other guests asked us pointedly as to how we found the people disposed towards us. This seemed a very curious and unusual question, but that evening and the following day we had no difficulty in ascertaining from our landlord and from visitors at the inn what was alluded to, a remarkable delusion of a great majority of the inhabitants, a delusion of whose existence we had abundant evidence in the virulent abuse one lady bestowed on Mr. Champion on our excursion the next morning, which we purposely made a short one, and which was elucidated and explained to us in detail by Mr. Edward Jones, an English gentleman long settled in El Barco, of whose kindness to us we have most genial recollections, as well as by his brother, Mr. H. Jones, whom we remember with pleasure. It appeared that (twenty-five to thirty ?, I forget the exact date) years ago, the *Phylloxera* reached El Barco and caused widespread disaster amongst the vine-growers, more or less the whole population. Incidentally, it may be noted that Mr. E. Jones was one of the largest of these, and that he made further sacrifices as a pioneer in ascertaining what remedies were available, and introducing American vine-stocks and otherwise restoring the vine culture of the district to prosperity. The natives, it appears, were convinced that the *Phylloxera* had been wilfully introduced by some Frenchmen with a view to their ruin, and to destroy Spanish competition in the wine trade. No doubt we did not hear all the history of this delusion, and what we did hear was too long to repeat here. The delusion was, however, very firmly established, and persists strongly to the present time. About ten years ago, some Italian workmen in search of employment passed through the district, and were taken by the natives to be Frenchmen (all foreigners are supposed to be Frenchmen) with a similar sinister exploit in view, and several of them were beaten and one or two seriously injured. Our position was that we also were Frenchmen come to El Barco with an identical purpose, an idea possibly suggested, certainly confirmed, by our manipulation of nets, satchels, pill-boxes, etc. As vineyards were everywhere, except on the higher ground, it seemed self-evident that we took out of our satchels *Phylloxera* spawn and by means of our nets scattered it broadcast over the country.

It must be remembered that our real objects are wholly incomprehensible to the country people, and even when, as we had always before found them, most friendly and polite, it was always clear that they regarded our account of our proceedings as being obviously insincere. Their usual belief was that we were gathering materials for some potent and valuable medicine, at other times they seemed to think we were mining engineers unwilling to avow our explorations.

Unfortunately, at El Barco, another explanation fell in at once with their prejudices, and there was no doubt much sincerity in the threats of what would happen to us, that we heard of a man going so far as to say he would certainly use a gun if he found us near his vines. Our informants, being more educated, regarded these popular views as nonsense, but had no doubt they were strongly held, and would be acted on by the small cultivators. Others of the peasant class with whom we talked clearly held the popular view, and found their innate politeness under an extreme strain when desiring to show their belief in our honesty. A very curious point was, that within thirty-six hours of our arrival not only were these opinions of us adopted, but everybody apparently for miles around was aware of our presence, and knew, and I fear usually accepted, this extraordinary view of the object of our visit.

We could no doubt have claimed official protection and got some persons to go with us as guards, but as the immediate locality was not attractive, and the friendly bearing towards us of the inhabitants was always an indisputable item in the enjoyment of our excursions in Spain, we decided to move on at once, proceeding to Casayo.

El Barco is on the river Sil, and some five miles above the town (or village), some way beyond Sobradelo, the Casayo Valley opens to the south. Casayo is the highest village in the valley at an elevation approaching 4,000 feet. Its position is approximately 42° 16′ N., 6° 44′ W. We hoped to obtain fair quarters here, but on arrival were disappointed to find that the elevation was less than we had hoped, and that the promised accommodation was absolutely impossible. After for some time seriously considering an immediate retreat, we finally discovered that the schoolroom of the village was for the time unused and at our service. It was infinitely rough and dirty, and none too large, but we could have it to ourselves, the neighbouring farmer's wife could find us clean bedding and cater for us, and it possessed a practicable balcony. So here we stayed for a week, and have been less comfortable under more conventional conditions.

The different branches of the Casayo valley presented considerable variety of conditions, generally steep and rocky slopes, clad with heath, *Cistus*, *Cytisus*, and often patches of scrub oak, and in one or two places moister wooded slopes. The roughness and steepness of the country rendered excursions to any distance impossible, except where there were regular tracks. One of these leading across a high plateau towards La Baña passed the habitat of *Lycæna idas*. *Lycæna argus*, var. *casaiacus*, occurred everywhere, but commonly only along another road leading up the main valley, a little further up which at about 4,000 feet *Erebia palarica* was not infrequent, but quite *passée*. There were other spots in view, but practically inaccessible, that we should like to have visited; the varied character of some of these makes it probable that not a few species as unexpected as *L. idas* may be found in this region by more enterprising explorers than we were.

On our way back we stayed a day or two at Tuy and made an excursion to Valença, on the Portuguese side of the Miño. Then we went northwards to Pontevedra, and visited Santiago de Compostela. From Valença to Pontevedra the country is very similar to that about Vigo, the Bay at Pontevedra very like that at Vigo or Carril; low, often, however, steep hills, more or less wooded, chiefly with oak and fir, cultivated valleys and slopes. The butterflies most abundant along all this region are *Lampides bœtica* and *telicanus*, imagines, eggs and larvæ always common, wherever the showy *Adenocarpus intermedius* grew, and that is by almost every wayside, on every slope and the margins of the woods. *Cœnonympha dorus mathewi* was frequent on all open grassy or heathy slopes, but rare before the middle of July.

The following notes on some of the Lepidoptera observed may be of use:—

Cœnonympha dorus mathewi, Tutt.

(? præc. = var. *bieti*, Stdg.)

(Plate V, figs. 1–12.)

Cœnonympha dorus, var. *mathewi*, Tutt.

We found this species at all localities visited, it was very rare at Vigo in the third week in June; in the third week in July it was much more frequent, but beginning to go over in condition. Here and at Pontevedra (July 19th) as well as at Tuy (July 18th) it occurred down to nearly sea-level, and up to about 1,000 ft. (at Redondela). At Casayo it was frequent along our walk on the hill-side (first week in July) at about 3,500 ft. and at Brañuelas a week later at 3,000 to 4,000 ft. At all these stations the form of the insect is much the same, perhaps the Brañuelas specimens have more individuals with paler under-sides. *Cœnonympha mathewi* of Tutt is, in view of these specimens, only a local race of *dorus*, and there is probably no great difference between it and Staudinger's *bieti* from North Portugal, though Staudinger does not mention as a character of *bieti*, the most striking difference between *mathewi* and *dorus*, viz. the dark hind-margin of the hind-wing beneath, narrowing the pale area to a band or line, barely reaching the ocelli, the outer dark margin of this however has a small pale patch, just beyond the middle ocellus. *Mathewi* is, like *dorus*, very variable on the upper-side. In the male the whole surface may be of a uniform deep or blackish-brown without trace of ocelli or other marking. The absence of the apical ocellus is however very rare, occurring in only three specimens, though several others have it so faint, that one feels sure it is only shining through from beneath. More or less shading of reddish or ochreous occurs on the upper wings of about half the specimens. As regards the hind-wing it is remarkable that the nearest approach to *dorus* (type) occurs in the Casayo specimens, those from Brañuelas, though so much nearer central Spain, being very like those from Vigo. A majority of the Casayo specimens have red ochreous colouring in the hind-wing, but of the others only about half, in most of these the colour does not extend outside the ocelli, and in not more than three or four does it extend so far as to leave only a dark line between it and the marginal pale line. In *dorus* the pale hind-wing may be said to have a dark subterminal line, in *mathewi* this line is so wide, and so much part of the general dark colour of the wing, that one notes rather the pale subterminal line beyond it. This is often absent, but there is usually some trace of it, especially in the Casayo series.

The ocelli vary much, on the fore-wing the apical eye is almost invariably present, occasionally double (beneath as well as on upper-side). In several specimens there is an ocellus between veins 2 and 3, those in the intermediate spaces are perhaps not so rare, but are usually when present faintly indicated points only. The hind-wing is never quite spotless, the spot between veins 2 and 3 being however the only one present in several specimens. There may be 2, 3, or 4 spots, and these vary much in intensity and may be black spots faintly ringed or may have a bright yellow circle; these are very striking in the darkest specimens, when these yellow circles are all that remain of the pale area of the hind-wing (in *dorus*).

The under-side is not very variable, many specimens have the leaden metallic line, but in none is it so broad and bright as in *dorus*, and in only one or two does it appear on the fore-wing, where its place is often taken by a dark line, or dark shade broadened into a patch at the anal angle. On the hind-wing the area outside the eye-spots is of the same tint as the basal area. The spots are always much smaller than in my Spanish *dorus*, but vary a good deal in size, and may be reduced to three in number. The costal spot is nearly always in the white band, in *dorus* it is usually largely or quite in the basal dark area.

In *dorus* the fore-wing rarely has any rufous, but in *mathewi* it is not only frequent, but is usually more or less present on the fore-wing, when it appears on the hind one.

The ♀ is much darker than that of *dorus*, the hind-wings may be entirely dark except the eye-spots, and when rufous is present it is usually restricted much as in the ♂♂ that have it. The fore-wings also have the rufous much restricted as compared with *dorus*, the dark hind margin is broader in all, often much broader, and the light colour may be restricted to a few patches. Additional ocelli are more frequent in the ♀ than the ♂, and indications of 3 and 4 (upper-side of upper-wing) occur on several specimens. The under-side is perhaps paler than in the ♂, but the under-surfaces are practically identical in the two sexes. The expanse is ♂ 27–35 mm., average 31; ♀ 30–36, average 32 mm. There is one dwarf ♂ only 23 m. *Mathewi* is thus smaller than any other (Spanish) *dorus*. The cilia are very pale, hardly perhaps white, and darker apically; in *dorus* they are more nearly of the tint of the wing surface.

Egg of *Cœnonympha mathewi*, 0·84 mm. high; 0·7 wide. Has a hemispherical base and a flat top. The hemisphere is 0·7 mm. in diameter, from the margin of the hemisphere the sides rise for 0·4 mm., gradually narrowing (from 0·7) to 0·5 mm., here there is an almost angular margin, the nearly flat top further rising however to its centre about 0·09 mm.

The central micropylar area has extremely fine cellular tracery of raised lines. Outside this the top nearly to its margin has large hexagonal cells, somewhat deeply impressed. These pass at the margin into longitudinal ribs running down the sides of the egg; the ribs are high and broad, the valleys between them flat and smooth. The secondary ribs are quite absent in the valleys but are indicated by beading or offsets of the primary ribs, which here and there project as fine ribs, just into the valleys, but never cross them. The ribs are not quite straight, occasionally branch, but more often end, between two others which approach beyond it.

The colour is an ochreous-yellow, with a small proportion of pink and darker to nearly black, in fine clouds and wisps, sometimes in little rings and streaks.

Mathewi LARVA NEWLY HATCHED.

Almost exactly 2 mm. long, rather pale ochreous, head very pale, eye-spots and spiracles dark. Abdominal segments with six sub-segments. The tubercular hairs are colourless, very short curved and clubbed and lie down nearly flat to the larval surface, there are similar hairs on head, those on head and prothorax are directed forwards, the others backwards, and there are two tails extending beyond the pro-legs, carrying each a rather longer and straighter hair beneath it and another at its tip. The hairs on segments 8 and 9 are rather longer than the others, but are equally curved, clubbed, and parallel with the surface.

As to coloration the thorax is pale like the head, there is a darker dorsal line and a paler lateral, on the abdomen the interval between shows three reddish or flesh-coloured longitudinal bands, divided in separate blotches on each segment.

September 19.—The little larva (only one remains, three others having disappeared whilst behaving like this one) has rested motionless on a grass-blade for the last seven weeks and has not only eaten nothing but has shown no wish to eat. It looks much the same as it did at first.

This larva remained thus till found dead in the winter. It seems tolerably certain that the larva hibernates without eating anything as that of *Argynnis paphia* does.

LYCÆNA IDAS, Ramb. (Plate V, figs. 13, 14, 15.)

Lycæna idas, Ramb., already referred to Ent. Proc. 1906, p. lxxxix.

Some 92 specimens were taken, unfortunately too large a proportion of them not in fine condition. As the species has hitherto had only a very limited known habitat in the S.E. of Spain, and this new station is not only over 400 miles distant, but in the apparently very different climate of N.W. Spain, it may be well to note the facies of the Galician specimens, compared as well as one may with Rambur's figures and description; the only specimens I have seen are those in the B. M. collection, they are rather small compared with mine and rather faded and differ from my specimens and equally from Rambur's description in having much less of the white addendum to the discal spot. The Galician specimens are 26–30 mm. in expanse. They are not perhaps quite as black as *astrarche*, and when fresh they have a very distinct metallic or iridescent sheen. The discal spot has, I fancy, the white addition more frequently than the Andalusian specimens. No figures I have seen present it, so that it seems to be regarded an an aberration. Rambur says it is present "*interdum*" and "*souvent*;" of my 92 specimens only 6 are without it, and of these only one is in sufficiently fine condition to be trustworthy, the others may have had a few scales that have been lost, a good many of the 86 that show it having it reduced to only a few scales. So that in my specimens to be without the white scales is the aberration and not at all a common one. (Perhaps the greatest difference from *astrarche* is in the form of the wing, which is almost the same in both sexes, rounded, especially towards the apex, without any trace of the produced sharp tip to the wing that often is seen in ♂ *astrarche* and is indeed a sexual character of the species as in many coppers.)

The discal spot varies much in size and shape and in the amount of white addition. It is not often lunulate simply, usually it is angulated having a point directed to the hind margin and sometimes another directed basally giving the black spot a square form. The white addition is on the inner and outer margin of the spot, usually both, and it is common for the outer portion to be divided in two by the outer point of the black spot above referred to; in a very few specimens the black spot is very large and the white abundant, in these both white and black are produced in a radiating manner both basally and towards the hind margins. The separation of the median row of ocelli on the under-side from the margin orange ones, which Rambur points out is very marked especially on the fore-wings, the ocelli between veins 4 and 5 are widely apart, in *astrarche* their white bodies are almost always in contact.

Rambur describes the orange spots of the under-side as pale and sometimes wanting on the fore-wing and the apical one as being white instead of orange. In the Galician specimens the orange is just appreciably less bright than in *astrarche* but tending to fuscous rather than to being pale, the orange only a little reduced in the apical spot. The double spot at anal angle rarely shows a trace of orange, its place being taken by a fuscous extension of its dark inner margin, and the white outer margin being rather wider. The alignment of the ocelli of the middle row is as described by Rambur; on the fore-wing, the three between veins 3 and 6 are nearly in line instead of in a curve as in *astrarche* and the 1 (or 2) above seem unduly moved basally. I have one or two ♂ specimens in which traces of orange spots are seen on upper-side of fore-wings, and several with considerable variations in size and form of ocelli beneath, but no decided radiated varieties.

In two or three specimens there is a distinct discal spot on the hind-wing, with black and white scales. A close examination shows it to be present on a few others, but it is vague and indistinct when unaccompanied by any white scaling.

The habitat was high up on open hill-slopes, but in little hollows of these, where a species of *Erodium* with extremely large and dark marked flowers grew, and it was not found away from these. Several species of *Helianthemum* were abundant all about, but it was quite absent amongst these. Females were seen to lay eggs on the *Erodium*, selecting the smaller leaves and as near the ground as possible. The eggs gathered were unfortunately destroyed by the rotting of the succulent leaves, before they were properly examined, and no young larvæ were obtained. Several were however placed in formalin.

L. idas is of much the same size as *astrarche*, but the latter runs to a somewhat greater expanse in some of its varieties. This small difference is much exceeded by that which exists in the ancillary appendages, those of *astrarche* being more than half as large again as those of *idas*. The clasps are in *astrarche* 2·2 mm. long, in *idas* 1·3 mm., and the other parts in much the same proportion. The general scheme of construction is nearly identical (as it is in a number of allied *Lycænas*). In my preparations the clasp seems broader in *idas*, especially basally, but I think this is probably not the case. The difference is rather in some of the curvatures, that result in the clasp being spread open in *idas* and somewhat folded in *astrarche* when pressed down on a slide. The greatest difference is in *idas* having the clasp quite free of the curious processes on its disc found in *astrarche*, and that do not occur in any other European *Lycænas* I have examined except in *eumedon*. The dorsal processes and their attendant hooks, besides being smaller, are shorter and thicker to a marked degree in *idas* (see Plates VI and VII).

Egg of *Lycæna idas* from a specimen preserved in formalin and so stained by colouring matter from the bit of leaf of *Erodium* on which it is. Hence a dirty brownish, instead of the nearly white as when laid. The size is 0·56 mm. in diameter and about 0·3 mm. high. Edges rounded, top nearly flat. It has the usual network of white material rising into points at the intersections. At the margin of the top where the structure is most developed the pillars at the intersections are very thick, looking in some views like cones with rounded tops, in others like pillars as thick as the width of the spaces between them. In this situation they are arranged in triangles with five forming a pentagon (owing to curvature of egg), not six to a hexagon; the connecting ridges are very narrow and sharp, and sag apparently nearly down to the true egg-surface. Taking a wider view, they are arranged in the usual "engine-turned" pattern. This sculpturing continues up to the micropylar area, a circle about 0·07 mm. in diameter, with less than the usual dwindling, at least of the ribs, the columns nearly disappear, the ribs become more radial, and the cells between them more radially elongated. They change into the small cells of the micropylar area by the intermediation of a circle of rather square cells. The largest cells (marginal) are about 0·05 mm. in their longest (radial) diagonal. Those of the micropylar circle are only about 0·01.

Lycæna argus casaiacus, n. var.

(Plate V, figs. 16–19.)

Lycæna argus was found at all the stations visited. At Vigo the specimens were about 26 mm. in expanse of very ordinary facies, but presenting traces of the peculiar character more marked in the Casayo specimens yet to be referred to. Such small specimens only occurred at Brañuelas and Casayo as occasional aberrations. At these localities the form is a large one, up to 35 mm. in expanse, of a very brilliant blue above, reminding one of *corydon*, var. *corydonius*, and a uniform pale silvery tint below, fairly close to vars. *hypochiona* and *bejarensis*. It differs from these further by a very fair proportion of specimens having on the hind margin of the hind-wing two or three of the red arches that are present in the ♀; they are however not orange or red-brown as in the female, but modified by the blue so as to be a rosy pink. I believe such ♂ coloration is recorded in an Asiatic form that otherwise differs, and the faintest traces of it may be seen even in

English specimens, if closely and sympathetically examined. I propose *casaiacus* as a varietal name for this race.

At Brañuelas *Cœnonympha iphioides* was very abundant in all the swampy hollows that occurred on the frequent little streams; they were rather over at the time of our visit.

At Casayo, at one point on a slope a little further on than the best locality for *L. argus*, var. *casaiacus*, a good many specimens of *Erebia palarica* were seen, and they occurred less freely as far along that valley as we extended our excursions. They also were unfortunately in somewhat bad condition (first week in July). They were therefore about a fortnight earlier than we found them at Pajares, and more close to the dates recorded by Mrs. Nicholl on the Picos de Europa.

We saw no trace of *Erebia stygne.* Casayo is about 130 miles from the Picos de Europa, and about 100 miles from Pajares. It is moreover in Galicia, so that its discovery here gives a large extension to its known habitat, which is no doubt all suitable places in the Cantabrian mountains for something like 150 miles. These Galician *palarica* are a slightly larger, finer race than those taken at Pajares. Measured as set, which is 2 to 3 mm. less than the true expanse, in order to compare them fairly with measurements given in Trans. Ent. Soc. 1905, p. 33, 4 out of 12 ♂ examples are respectively 61, 62, 63 and 65 (accurately 67·4) mm. in expanse, to compare with the 2 (out of 115) largest from Pajares of 61 mm. The others range down to 53 mm., identical with the smallest from Pajares, the mean being 58·8 mm. as against 57·2 for the Leon specimens. Three ♀♀ are 57, 57, 58 mm., practically identical with Pajares specimens which average 57·25. So far as these rather poor specimens can be compared, there seems to be no difference in markings or coloration.

We saw no other *Erebias* except two very worn *evias* at Casayo, of 47 and 48 mm. expanse, probably very late specimens of the low-level form.

Melitæa athalia was largely in very poor condition, so that only about a score were brought home. They vary in size from 37 mm. to 52 mm. Some are very dark and suffused, several vary in the tints of the bands of light brown, and look both in this respect and in wing outline so like *phœbe,* that they were so considered at first glance by entomologists who examined them, the under-sides however disproved such a suspicion; others Mr. Tutt pronounces to be *dcione*. I can only say that I cannot think the whole series are other than all of one species.

Altogether we met with some 69 or 70 species of butterflies, of which only one or two others call for any remark. Of the *Cœnonympha pamphilus* taken, one or two might be ordinary British examples, most are well marked both as to border and ocelli, and especially as to the pale band of under-side hind-wing being well marked and sharply cut off by a dark line from the dark basal portion. These are no doubt the form that passes as *lyllus*, none of them have the pale, nearly uniform, ochreous tone beneath that characterises the specimens from the Cuenca district.

Pyrameis cardui was common everywhere, in all stages. Several larvæ were found on *Echium*, an extraordinary food plant, already recorded, however, by Mr. W. H. B. Fletcher. On July 9th, in descending the Casayo valley, we saw many specimens about the chestnut trees that were in flower. A few trees had none, most a dozen or so flying around them, but one tree, and one only, that to our senses did not differ from the others, had literally thousands flying about and settled on it. The sight was remarkable in itself, as a mass of butterflies, apart altogether from the curious selection of one special tree for the congregation.

Aporia cratægi was uncommon, but several were seen at Brañuelas, and one ♀ was observed laying its eggs. She investigated several leaves (of hawthorn) before finding one that pleased her. So far as I understood her selection, it was necessary that she should secure a firm and satisfactory grip of the leaf, generally by the margin, so as to maintain her station without moving throughout the laying of the whole of the batch. The eggs are laid in as regular order as those of a Noctua, who keeps her ovipositor in constant touch with the groups, and so appears to have quite an easy task in keeping the alignment.

A. cratægi does not do so. After laying an egg she raises her abdomen right away from the leaf as if the whole process was finished and remains so for several seconds, and then brings it down again on exactly the spot for laying the next egg. To secure such accuracy it is obvious that her footing must be absolutely firm and fixed.

Other butterflies met with were *Papilio machaon*, not very common; *P. podalirius*, rare; *Colias edusa*, abundant; *Gonepteryx rhamni* at Redondela, *Leptidia sinapis*, *Pieris daplidice* common everywhere, often abundant, much more so than all the other whites taken together, *Pieris rapæ*, *P. napi*, *P. brassicæ*. *Apatura iris*, two large butterflies, little more than glimpsed at Casayo flying about honeysuckle on a large sallow tree, were probably this, but possibly *camilla*, neither were seen on any other occasion. *Grapta c.-album* (and larva), *Vanessa polychloros*, *V. urticæ*, *V. io*, *V. antiopa*, *Pyrameis atalanta*, *Argynnis pandora*, one only, *A. lathonia*, *A. aglaia*, common, *A. adippe*, rather *chlorodippe* than type form, but not so marked as in Central Spain, rare, *Melitæa didyma*, *M. aurinia*, *Satyrus arethusa* (Pontevedra), *semele*, *fidia*, *statilinus*, *alcyone*, *Epinephile janira*, marked *hispulla* forms, *E. lycaon*, *E. tithonus*, *E. ida*, *Cœnonympha arcania*, *Pararge mæra*, *P. megæra*, *P. ægeria*, *Arge lachesis*, especially common, no *cataleuca* form seen. *A. japygia*, *Thecla ilicis*, abundant. *Thecla spini*, Vigo. *Zephyrus quercus*, *Chrysophanus virgaureæ*, common, *Ch. alciphron* (*gordius*), common, *Ch. phlæas*, common, *Ch. hippothoë*, rare, Casayo, *Cyaniris argiolus*, frequent, *Lycæna telicanus*, *L. bætica*, both abundant in all stages (except pupa that seems to be hidden). *Lycæna baton*, *L. astrarche*, *L. amandus* (Casayo), *L. icarus*, *L. melanops*, *L. arion* (Casayo), *Hesperia thaumas*, *H. actæon*, *H. comma*, *Syrichthus sao*, *S. alveus*, *S. carthami* (? a worn example ?).

The *Heterocera* observed present few species worth mentioning, except that a list of Galician insects has still to be written. Perhaps the most interesting is *Prothymnia sanctiflorentis*, a species characteristic of the drier eastern and southern portions of Spain, and that would hardly be looked for in an Atlantic area. It occurred at Vigo and at Casayo. The handsome larvæ of *Diplura loti* on *Helianthemum* at Vigo and elsewhere, were always pleasant to see.

The abundance everywhere of *Crambus craterellus*, and at Brañuelas of *Acrobasis porphyrella* on the wing, and of *Acalla mixtana* in the larva state at Brañuelas, where in many places their nests were extremely abundant on the heath, may be mentioned. One hardly expected to meet with the latter so abundantly so far south.

Heterogynis paradoxa occurred at Casayo, on a steep slope facing west at an elevation of about 4,000 ft., an odd specimen lower in the valley at about 3,000 ft. amongst broom of several species. It was however apparently rare, as I only obtained 5 males and 5 cocoons of females and one larva. The moths, so far as one may generalise from so few, are large, four being 26 mm. and one 28 mm. in expanse, averaging therefore 1 mm. more than var. *piedrahitæ*, the largest of the forms taken at Bejar. They are also dark, quite as dark as var. *piedrahitæ*. The cocoons are rather paler than the Bejar examples, a pale rose-pink, rather than the red of the Bejar forms. The ♀ moth showed a broad series of dark dorsal markings, the subdorsal and spiracular lines united into one band, with pale included patches and dark subspiracular and ventral lines broad. To describe the larva almost the same terms would be used, but the dark lines were a little less pronounced. This habitat is by a long way the most extreme north spot yet recorded, indeed until I took it at Bejar, Andalusia and the neighbourhood of Madrid (La Granja, etc.) were its known habitats.

At Brañuelas, I met with another species of *Heterogynis*, which I must provisionally indicate as *penella*, var. *ucedinis* (*Ucedo*, a village near Brañuelas), though it may prove to be a distinct species; of this I found four ♀ cocoons on July 15th. They were on heath-stems two or three feet from the ground, I searched closely and could find no more, nor could I detect any leguminous plants within some hundred yards or so. From these cocoons emerged numerous parasites and some young larvæ; the larvæ agreed with those of *penella* and not with *paradoxa*, the cocoons, however, were large for *penella* and too pale (nearly white) for *paradoxa*, they agreed with the latter however in an important point of structure, viz. the outer cocoon was woven into a network of large openings like the work of *paradoxa* and not like *penella*, which has each thread independent in an equally distributed tangle.

Callimorpha hera (*quadripuncta*), *C. dominula*, *Endrosa irrorella*, *Coscinia striata* (abundant). *Orgyia antiqua*, *Malacosoma castrensis*, *Heliothis peltigera*, *Dicycla oo* (var. *renago*), *Acontia luctuosa* and *lucida*, *Mamestra brassicæ*, *Bryophila ravula*, var. *ereptricula*, *Sesia fuciformis*, *Zygæna trifolii*, *Z. transalpina*, *Z. scabiosæ*, *Aglaope infausta*, as usual when it occurs, swarming near Brañuelas (at La Granja), *Ino globulariæ* and *geryon*, *Crambus pascuellus*, *culmellus*, *pinetellus*, *pratellus* and var. *alfacarellus*, *Cledeobia angustalis* and *moldavica*, *Pyrausta ferrugalis*, *P. purpuralis*, *cespitalis*, *Heliothea atralis*, *Titanio pollinalis*, *Stenia punctalis*, *Myelois cribrella*, *Homœosoma sinuella*, *Ephestia mistralella*. For the naming of this and of the following *Trochiliums* I am indebted to Sir G. Hampson: *T. uroceriformis*, Tr., *T. asiliformis*, Rett., *T. leucospidiformis*, Esp., *T. leucomelæna*, Zell. Cases of *Fumea casta* were found at Vigo, and an imago of *F. crassiorella* taken on the wing at Brañuelas. *Bactra lanceolana* was common in marshes and *Tortrix viridana* and *lœflingiana* amongst oak trees. The few Tineæ sent to Lord Walsingham contained nothing of note.

The *Neuroptera* are reported on in the Entomologist, 1906, pp. 275, 276, by Mr. K. J. Morton and Mr. W. J. Lucas; they include a new Trichopteron, *Adicella meridionalis*, Morton. The Geometræ are in the hands of Mr. L. B. Prout.

The *Diptera* have been presented to the British Museum at South Kensington. A few Asilidæ with their prey are exceptions, and are noted in Ent. Trans. 1906, pp. 335, 340, 357, 358. The larva of *Microdon* sp. was also found in an ants' nest at Vigo.

The *Hymenoptera* have been handed to Mr. E. Saunders.

The *Coleoptera* observed during the present excursion were not, as a whole, of particular interest, at any rate in the neighbourhood of Vigo and Pontevedra, most of the species taken being well-known or widely-distributed forms. The heaths, pine-woods, and oak-thickets, covering the mountain slopes, where not planted with vines, maize, etc., looked rather suggestive of Scotland, and the heath-covered, well-watered moorland at Brañuelas and Ucedo, also, was anything but productive. At Casayo, however, we got well amongst the mountains, and the slopes and valleys here afforded a varied beetle-fauna, though the highest summits reached (about 6,000 feet) scarcely repaid the climb, perhaps owing to the close grazing everywhere by goats and cattle. As might be expected, most of the insects observed in this last-mentioned district were similar or closely allied to those observed in previous years at Canales, Bejar, or Pajares, the most striking addition, perhaps, being *Lobonyx æneus*, for the first time seen alive by us. Various species of *Zonabris* were of course much in evidence here, *Z. dufouri* being the best. On the young oaks were to be found numerous Buprestids (*Corœbus*, *Agrilus*), Clythrids, *Cryptocephalus bimaculatus* (wonderfully like a common *Lachnæa*, both on the wing and when at rest), *Rhynchites sericeus*, *Athous godarti*, Muls., and *A. nigricornis*, Bris., and on flowers in open places various Clytids, Lepturids, Malachiids, Mordellids, Œdemerids, *Cryptocephalus globicollis*, *Omophlus ruficollis*, *Cerocoma*, *Coryna*, *Lobonyx*, *Trichius*, *Anisoplia bætica*, etc. In grassy places on the higher slopes one or two *Rhizotrogi* flew about freely in the hot sun (all males), and a *Hymenoplia* and a *Henicopus* were locally abundant. On the summits, *Otiorrhynchus dentipes* was almost the only species to be met with. Fresh horse-droppings attracted many *Geotrupes coruscans*, a brilliant insect in the sunshine, *Sisyphus*, etc., and on the banks of the mountain streams various *Bembidia*, *Tachys*, *Stenus*, *Philonthus rufimanus*, *Parnus*, *Pæderus*, etc., occurred. About Vigo and Pontevedra, a small hairy Lamellicorn, *Chasmatopterus hirtulus*, swarmed in flowers, on which also were to be seen *Exocosoma lusitanicum*, *Omophlus ruficollis*, etc. A large *Genista* with woolly-pods, and an *Adenocarpus*, were the most attractive plants in the district, producing *Cneorrhinus ludificator* and *C. dispar* ?, *Pachytychius sparsutus* (in abundance), *Apion flavofemoratum* (commonly), a beautiful *Eusomus*, *Cryptocephalus vittatus* and *C. koyi*, a *Helops*, *Cardiophorus signatus*, etc. ; and on the heath-clad hillsides a white-flowered *Daphne* (*cnidium* or near it) seemed to attract most of the beetles in the immediate vicinity * (*Melanotus*, *Cardiophorus*, *Apion*, various small Malachiids, etc.). On young oaks a *Malthinus*, *Clythra læviuscula*, and *Cyphus nitens* were found in numbers, and on young sallows a *Stylosomus* and a *Luperus*, both in abundance. Older oaks on the dry hillsides harboured various *Balanini*, *Brachyderes lusitanicus*, *Xylophilus neglectus*, a minute Malachiid, etc. At Cangas, in the bay of Vigo, an *Erodius* abounded on the sand-dunes, and at the roots of grass, etc. *Chrysomela diluta* (in profusion), a very minute Malachiid (*Colotes punctatus* ?), and divers species of *Harpalus*, *Anthicus*, and *Melanophthalma* were captured. On the muddy tidal flats at Pontevedra *Cillenus lateralis* was not uncommon. In the pine-woods about Vigo and Redondela (all apparently planted) but little was obtained beyond *Spondylis*, *Hylotrupes*, *Leptura stragulata*, *Hylastes ater* and *Ernobius mollis*. On the heath-covered moorland about Brañuelas and Ucedo the fine *Crytocephalus cynaræ*

* On Moncayo, in 1893, a white-flowered *Erica* was noticed as being very attractive in the same way.

was occasionally brushed up with the sweeping-net, and in the boggy valleys here many small beetles were beaten from sallow, etc., as *Rhynchænus foliorum* (in profusion), a *Malachius*, etc., most of which were familiar British forms. The numerous small streams hereabouts teemed with small fish, and in consequence but few aquatic Coleoptera were obtainable.

The following is a list of the species so far as at present determined :—

[Cang. = Cangas ; Cas. = Casayo ; Brañ. = Brañuelas ; Barco = El Barco de Valdeorras ; Pont. = Pontevedra.]

Cicindela campestris, L., var. *funebris*, St., one specimen, on the mountains, Cas. *Carabus melancholicus*, F., Vigo. *Omophron limbatus*, F., Barco, on the banks of the Sil. *Tachypus pallipes*, Duft., and *T. flavipes*, L., Barco. *Cillenus lateralis*, Sam., common on the tidal mud, Pont. *Bembidium hispanicum*, Dej., *B. tricolor*, F., *B. quadriguttatum*, F., Barco ; *B. ibericum*, Pioch., *B. mannerheimi*, Sahlb., Brañ. ; *B. decorum*, Panz., Cas. ; *B. elongatum*, Dej., Cas., Barco ; *B. articulatum*, Gyll., *B. quadrimaculatum*, L., Barco, Brañ. *Tachys parvulus*, Dej., Brañ., Barco, Cas.; *T. sexstriatus*, Duft., Cas. *Ocys harpaloides*, Serv., Vigo. *Pogonus chalceus*, Marsh., Pont. *Pœcilus cœrulescens*, L., Brañ. *Abacetus salzmanni*, Germ., Brañ., Cas. *Amara bifrons*, Gyll., Cas. *Zabrus asturiensis*, Heyd., one specimen, on the mountains, Cas. *Harpalus neglectus*, Dej., *H. attenuatus*, Steph., Cang. ; *H. honestus*, Duft., Vigo, Cang., Cas. *Anisodactylus binotatus*, F., Vigo. *Stenolophus teutonus*, Schr., Vigo, Pont. *Acupalpus brunnipes*, St., Vigo, Pont., common in damp places. *Chlænius dives*, Dej., rarely, on the mountains, Cas. *Cymindis scapularis*, Schm., Cas.

Agabus guttatis, Payk., in the streams, Cas.

Aleochara rufipennis, Er., Vigo. *Polystoma obscurella*, Grav., Pont. *Tachyusa balteata*, Er., Barco ; *T. coarctata*, Er., Barco, Vigo. *Diglotta sinuaticollis*, M. & R., El Marin. *Mycetoporus brunneus*, Marsh., Cas. *Philonthus rufimanus*, Er., on the banks of streams, Cas. *Cafius xantholoma*, Grav., swarming, and *C. sericens*, Holme, Cang. *Bisnius procerulus*, Grav., Cas. *Lathrobium angustatum*, Lac., Pont. ; *L. multipunctum*, Grav., Barco, Brañ., Vigo. *Pæderus caligatus*, Er., and *P. sanguinicollis*, Steph., Vigo, Bran., Barco, etc. *Scopæus lævigatus*, Gyll., Vigo. *Sunius uniformis*, Duv., Vigo. *Stenus ocellatus*, Fauv., Brañ., Cas.; *S. bipunctatus*, Er., Barco; *S. guttula*, Müll., Cas.; *S. atratulus*, Er., Pont., Brañ.; *S. tarsalis*, Ljungh, Brañ.; *S. ossium*, Steph., Pont.; *S. declaratus*, Er., *S. pusillus*, Er., Barco. *Bledius grællsi*, Fauv., Pont.; *B. longulus*, Er., Barco.

Mastigus palpalis, Latr., Cas. *Liodes nigrita*, Schmidt, Brañ. *Olibrus millefolii*, Payk., Brañ.; *O. bisignatus*, Mén., Cas.; *O. flavicornis*, St., Cas. *Melanophthalma distinguenda*, Com., and *M. fulvipes*, Com., Cang. *Brachypterus cinerus*, Heer, Brañ. *Meligethes fuscus*, Oliv., Brañ., Vigo. *Attagenus trifasciatus*, F., Vigo. *Pelochares versicolor*, Waltl, Barco. *Limnichus pygmæus*, St., Barco. *Hister sinuatus*, F., Vigo. *Saprinus immundus*, Gyll., *S. maritimus*, Steph., on the sandy beach, Cang.

Sisyphus schæfferi, L., Vigo, Cas., Pont., not rare. *Onthophagus taurus*, Schr., Vigo; *O. schreberi*, L., Vigo. *Oniticellus fulvus*, Goeze, Brañ. *Aphodius hæmorrhoidalis*, L., Cas.; *A. fœtens*, F., dark var., Vigo. *Ammœcius frigidus*, Bris., Cas., rarely on the mountains. *Pleurophorus cæsus*, Panz., Vigo. *Geotrupes hypocrita*, Serv., rarely, and *G. coruscans*, Chevr., in abundance, on fresh horse-dung, Cas. *Oryctes grypus*, Ill., Cas. *Rhizotrogus cantabricus*, Heyd. (*felicitanus*, Reitt.), flying in the hot sun, on the mountain slopes, the ♂ in numbers, the ♀ singly, Cas., Brañ. *Anoxia villosa*, F., Vigo. *Hymenoplia*, sp., in profusion, locally, on grass-stems, Vigo, Cas., etc. *Chasmatopterus hirtulus*, Ill., in abundance on flowers, Vigo, Cas. *Anisoplia bætica*, Er., in all its varieties, swarming in places, on plants by the roadside, Cas., Brañ. *Hoplia philanthus*, Füssl., Brañ., Vigo. *Potosia morio*, F., in thistle-heads, Cas. *Leucocelis stictica*, L., Vigo, Cas. *Trichius gallicus*, Heer, rarely, Cas.

Anthaxia funerala, Ill., and *A. millefolii*, F., in flowers, Cas., Brañ. *Acmæodera tæniata*, F., and *A.* sp., Cas. *Corœbus æneicollis*, Villers, in abundance on young oaks, Cas. *Agrilus biguttatus*, F., Cas.; *A. cinctus*, Oliv., Cas.; *A. roscidus*, Kies., Brañ.; *A. derasofasciatus*, Lac., Cas.; *A. angustulus*, Ill., Cas.; *A. hyperici*, Cr., Vigo. *Aphanisticus emarginatus*, Villa, and *A. pusillus*, Oliv., Brañ., Vigo.

Melanotus tenebrosus, Er., swarming on a white-flowered *Daphne*, on the hillsides at Vigo, also at Casayo. *Cardiophorus signatus*, Oliv., with the preceding, also at Brañuelas;

C. atramentarius, Er., Vigo; *C. equiseti*, Herbst, Vigo. *Athous godarti*, Muls., *A. angustulus*, Cand., and others of the genus, Cas., etc.

Hydrocyphon deflexicollis, Müll., on sallows, Brañ. *Cyphon variabilis*, Thunb., with the preceding. *Lampyris noctiluca*, L., males attracted to light, Cas., Brañ., Barco. *Telephorus bivittatus*, Mars., Cas., *T. rufus*, L., Brañ. *Malthodes forcipifer*, Kies.?, Vigo, Cas., in plenty, *Ebæus glabricollis*, Rey, Vigo, Barco, Brañ. *Malthinus* sp., common on oaks, Vigo. *Colotes punctatus*, Er.?, in plenty at the roots of plants on the sand-dunes, Cangas. *Antholinus amictus*, Er., Cas., Vigo, Brañ. *Charopus plumbeomicans*, Goeze, Vigo, Brañ. *Malachius barnevillei*, Puton, and others of the genus, Cas.; *M. viridis*, F., Brañ. *Henicopus heydeni*, Kies., Barco, Brañ., Cas., swarming in places, on grass-stems, the two forms of the ♀ occurring together with the ♂ ♂; *H. hoplotarsus*, Duv., Vigo. *Dasytes subæneus*, Schönh., Cas. *Psilothrix cyaneus*, Oliv., Brañ. *Haplocnemus andalusicus*, Ros., Cas. *Danacæa* sp. n.?, Cas. *Lobonyx æneus*, F., sparingly on *Helianthemum*-flowers, on the mountain-slopes, Cas. *Trichodes octopunctatus*, F., Cas.; *T. leucopsideus*, Oliv., Cas.; *T. apiarius*, L., Brañ., Cas.; *T. ammios*, F., Brañ. *Ernobius mollis*, L., on pines, Vigo. *Xyletinus laticollis*, Duft.?, Cas.

Erodius tibialis, L., commonly, on the sand-dunes, Cangas. *Tentyria* sp., Cangas. *Asida leonensis*, Esc., Barco, a single specimen found in the road; *A. sabulosa*, Goeze, Vigo. *Heliopathes* sp. n.?, a very distinct form, Vigo, two specimens, on the hillsides. *H. montivagus*, Muls., etc., Cas. *Micrositus* sp., under stones, Barco, Cas. *Cœlometopus clypeatus*, Germ., Cas. *Helops laticollis*, Küst., Cas., Barco. *Gonodera hispanica*, Kies., Cas. *Omophlus ruficollis*, F., on flowers, etc., one of the commonest beetles in Spain., Cas., Vigo, etc. *Lagria rubida*, Graells, Cas. *Scraptia dubia*, Oliv., Cas. *Xylophilus neglectus*, Duv., on oaks, Vigo, Pont. *Notoxus trifasciatus*, Rossi, and *N. monoceros*, L., Vigo, Brañ. *Anthicus rodriguesi*, Latr., *A. fenestratus*, Schm., and *A. tristis*, Schm., Vigo. *Mordella aculeata*, L., common on flowers, Cas., etc. *Cerocoma schreberi*, F., Cas. *Zonabris dufouri*, Graells, common on flowers, Cas., a very active species, readily taking to wing, and hiding away at the roots of plants immediately it drops from the flowers, of a pale straw colour when alive; *Z. dejeani*, Gyll., *Z. 4-punctata*, L., Cas., etc., *Z. hieracii*, Graells, Vigo. *Coryna billbergi*, Gyll., Cas. *Œdemera podagrariæ*, L., common and very variable, Cas.; *Œ. flavipes*, F., Vigo, Pont., Barco; *Œ. barbara*, F., Vigo; *Œ. nobilis*, Scop., and *Œ. lurida*, Marsh., Vigo.

Otiorrhynchus dentipes, Graells, on the mountains, Cas. *Phyllobius tuberculifer*, Chevr., common, Vigo, Cas., etc. *Polydrusus setifrons*, Duv., Vigo. *Sciaphilus carinula*, Oliv., Vigo, Pont., Cas., on *Genista*. *Barypithes sulcifrons*, Boh., Cas. *Strophosomus ovulum*, Seidl., Vigo, Barco, Brañ. (the type was from this locality); *S. erinaceus*, Chevr., Cas.; *S. retusus*, Marsh., Vigo, Cas., etc. *Brachyderes lusitanicus*, F., a common species on oaks, pines, etc., Vigo, Pont., Cas., Barco; *B. incanus*, L., Cas. *Eusomus smaragdulus*, Fairm., an interesting form with metallic green scales, on *Genista*, Vigo. *Sitones cambricus*, Steph., Vigo. *Cneorrhinus ludificator*, Gyll., Vigo, etc., on *Genista*, not rare and easily abraded, Vigo, Cas., Pont.; *C. dispar*, Graells, Vigo, Cas. *Cleonus tigrinus*, Panz., Barco. *Lixus spartii*, Oliv., Cas., Pont. *Larinus buccinator*, Oliv., Vigo; *L. planus*, F., Cas. *Gronops lunatus*, F., Vigo. *Pachytychius sparsutus*, Oliv., in profusion on a large *Genista*, also bred from the woolly seed-pods of the same plant, Vigo, Pont.; *P. scabricollis*, Ros., Cas. *Smicronyx* sp.?, *Cœliodes ilicis*, Bedel, Cas.; *C. erythroleucus*, Gmel., Pont. *Ceuthorrhynchus campestris*, Gyll., Vigo; *C. litura*, F., *ericæ*, Gyll., Cas., Brañ.; *C. geographicus*, Goeze, Vigo. *Ceuthorrhynchidius dawsoni*, Bris., Cangas. *Phytobius waltoni*, Boh., Brañ. *Balaninus turbatus*, Gyll., common on oaks, Vigo, Pont. *Balanobius ochreatus*, Fåhr., Vigo; *B. pyrrhoceras*, Marsh., Vigo, Cas. *Anthonomus rubi*, Herbst, Vigo, Brañ. *Sibinia potentillæ*, Germ., Brañ. *Rhynchænus erythropus*, Germ., *R. quercus*, L., *R. ilicis*, F., and *R. avellanæ*, Donov., on oaks, Cas.; *R. foliorum*, Müll., swarming on sallows, Brañ.; *R. sparsus*, Fåhr., in marshy ground, Brañ. *Rhamphus pulicarius*, Herbst, Vigo. *Gymnetron tetrum*, F., Vigo. *Miarus campanulæ*, L., Brañ., Cas. *Nanophyes lythri*, F., Vigo. *Apion flavofemoratum*, Herbst,* in abundance, and *A. argentatum*, Gerst., sparingly, on *Genista*, Vigo, Pont.; *A. elongatissimum*, Desbr., on *Genista*, Vigo; *A. wenckeri*, Bris., Vigo; *A. perrisi*, Wenck., Vigo, Brañ.; *A. acuminatum*, Schilsky, Vigo; *A. cantabricum*, Desbr., Vigo, Cas.; *A. cyanescens*, Gyll., Vigo, Brañ.; *A. curtulum*, Desbr., on a

* I am indebted to Herr J. Schilsky for the names of various species of this genus.

white-flowered *Daphne*, Vigo; *A. lævicolle*, Kirb., *A. immune*, Kirb., *A. loti*, Kirb., *A. ervi*, Kirb., Vigo; *A. desbrochersi*, Kirsch, Brañ.; *A. nigritarse*, Kirb., Brañ.; *A. sedi*, Germ., Pont.; *A. æthiops*, Herbst, *A. varipes*, Germ., Brañ.; *A. carduorum*, Kirb., Vigo, Cas., *A. striatum*, Marsh., Cas., Barco; *A. assimile*, Kirb., Cas. *Auletes pubescens*, Kies., Brañ., Vigo. *Rhynchites sericeus*, Herbst, on young oaks, Cas.; *R. cæruleocephalus*, Schall., Vigo; *R. nanus*, Payk., Vigo. *Cyphus nitens*, Scop., common on oaks, Cas., Vigo. *Hylastes ater*, Payk., Vigo. *Bruchus biguttatus*, Oliv., var. *fulvipennis*, Germ., Cas.

Spondylis buprestoides, L., in the pine-woods, Vigo. *Leptura fontenayi*, Muls., Brañ.; *L. fulva*, De G., commonly, and *L. distigma*, Charp., rarely, on *Umbelliferæ*, Cas.; *L. stragulata*, Germ., not rare in the pine-woods, Vigo; *L. maculata*, Poda, *L. nigra*, L., and *L. melanura*, L., Cas. *Stenopterus ater*, L., commonly, on flowers by the roadside, Barco; *S. flavicornis*, Küst., Cas. *Hylotrupes bajulus*, L., Vigo. *Xylotrechus arvicola*, Oliv., Cas., Barco. *Clytanthus trifasciatus*, F., Vigo, Barco, Brañ.; *C. figuratus*, Scop., Cas.; *C. massiliensis*, L., Cas. *Clytus rhamni*, Germ., Cas. *Agapanthia asphodeli*, Latr., and *A. cardui*, L., Cas.

Donacia versicolorea, Brahm, very small, and *D. discolor*, Panz., Brañ. *Crioceris lilii*, Scop., Cas. *Lachnæa sexpunctata*, Scop., *L. tristigma*, Lac., and *L. pubescens*, Duf., on oak, etc., Vigo, Cas., Brañ. *Labidostomis lusitanica*, Germ., Vigo, Cas. *Clythra læviuscula*, Retz., common on oak, Vigo, Brañ.; *C. atraphaxidis*, Pall., Cas. *Gynandrophthalma concolor*, F., Vigo, Cas. *Cryptocephalus cynaræ*, Suffr., Cas., Brañ., sparingly, on heath, etc.; *C. sexmaculatus*, Oliv., *C. bimaculatus*, F., Cas.; *C. bipunctatus*, L., common, Cas., Brañ., Vigo; *C. lusitanicus*, Suffr., on *Genista*, Cas.; *C. crassus*, Oliv., Cas.; *C. koyi*, Suffr., Vigo, Cas.; *C. vittatus*, F., *C. mystacatus*, Suffr., Vigo; *C. globicollis*, Suffr., *C. violaceus*, Laich., Cas.; *C. moræi*, L., and vars., Cas., Brañ.; *C. rufipes*, Goeze, and vars., Brañ.; *C. pygmæus*, F., Cas., Brañ. *Pachybrachys hippophaës*, Suffr., Cas., Barco, Brañ.; *P. viridissimus*, Suffr., Cas., Brañ. *Stylosomus minutissimus*, Germ., in profusion on sallows, Vigo. *Chysomela diluta*, Germ., in abundance at roots of grass, on the sand-dunes, Cangas; *C. americana*, L., Cas.; *C. rufoænea*, Suffr., Brañ.; *C. sanguinolenta*, L., Cangas; *C. hyperici*, Forst., Cas. *Hydrothassa aucta*, F., Brañ. *Plagiodera versicolora*, Laich., Vigo. *Exosoma lusitanicum*, L., abundant on flowers, Vigo, etc. *Luperus nigrofasciatus*, Goeze, Vigo, Brañ.; *L. lividus*, Joann., Brañ.; L. sp.?, near *niger*, Goeze, in abundance on sallows, Vigo. *Lochmæa capreæ*, L., var. *scutellata*, Chevr., on sallows, Brañ. *Epitrix pubescens*, Koch, Vigo. *Hispa atra*, L., Vigo; *H. testacea*, L., Vigo, Cas.

Subcoccinella 24-*punctata*, L., Vigo. *Adonia variegata*, Goeze, Brañ. *Halyzia* 16-*guttata*, L., Pont. *Adalia obliterata*, L., Vigo. *Coccinella* 14-*pustulata*, L., common, Brañ.; *C. congloblata*, L., Cas. *Exochomus flavipes*, Thunb., Vigo, Pont. *Hyperaspis reppensis*, Herbst, Vigo. *Micraspis* 16-*punctata*, L., Brañ. *Platynaspis luteorubra*, Goeze, Pont., Vigo, Cas. *Scymnus*, spp., Vigo, etc.

The *Hemiptera-Heteroptera* observed were as follows:—

Eurygaster maura, L., Cas., Brañ. *Cydnus* sp., at roots of grass, Cang. *Ochetostethus nanus*, H.-S., Vigo. *Neottiglossa inflexa*, Wolff, Brañ. *Palomena viridissima*, Poda, Vigo. *Peribalus sphacelatus*, F., Pont. *Piezodorus lituratus*, F., Pont. *Eurydema oleraceum*, L., Cas; *E. dominulus*, Scop., Barco. *Syromastes marginatus*, F., Vigo. *Verlusia sulcicornis*, F., Vigo. *Pseudophlœus falleni*, Schill., on the sand-hills, Cangas. *Camptopus lateralis*, Ger., Barco. *Stenocephalus agilis*, Scop., Vigo. *Bothrostethus annulipes*, Costa, var. *sabulicola*, Horv.?, Vigo, three specimens. *Coreus hirticornis*, F., Cas. *Corizus crassicornis*, L., Brañ., Barco, Cas.; *C. subrufus*, Gmel., Cas. *Lygæus pandurus*, Scop., Vigo; *L. superbus*, Poll., Brañ. *Lygæosoma reticulatum*, H.-S., Vigo. *Cymus melanocephalus*, Fieb., Vigo, Brañ.; *C. glandicolor*, Hahn, Brañ. *Macroplax fasciata*, H.-S., Brañ., Vigo, Cas. *Tropistethus holosericeus*, Schtz., Pont. *Plinthisus minutissimus*, Fieb., Pont. *Stygnocoris pedestris*, Fall., Vigo. *Aphanus pineti*, H.-S., Cas. *Beosus maritimus*, Scop., Brañ. *Emblethis angustus*, Mont., Cas. *Serenthia læta*, Fall., Brañ. *Dictyonota fuliginosa*, Costa, Vigo; *D. strichnocera*, Fieb., Vigo. *Monanthia humuli*, F., Brañ. *Gerris najas*, De G., Brañ.; *G. gibbifer*, Schm., Brañ. *Harpactor iracundus*, Poda, Brañ., Cas., Vigo; *H. erythropus*, L., Vigo; *H. sanguineus*, F., Brañ., Vigo. *Coranus ægyptius*, F., Vigo. *Nabis ferus*, L., Vigo; *N. rugosus*, L., Vigo; *N. ericetorum*, Schtz., Brañ., Vigo. *Salda cocksi*, Curt., Brañ. *Pithanus mærkeli*, H.-S., Brañ. *Miris calcaratus*, Fall., Brañ. *Lopus sulcatus*, Fieb., Cas.; *L. cingulatus*, F., Vigo. *Monalocoris filicis*, L., Vigo. *Phytocoris tiliæ*, F., Pont.; *P. exoletus*, Costa, Brañ.

Miridius quadrivirgatus, Costa, Vigo. *Calocoris sexguttatus*, F., Cas.; *C. roseomaculatus*, De G., Cas., Pont., Brañ. *Grypidius noualhieri*, Reut., Vigo. *Brachycolcus scriptus*, F., Cas. *Lygus montanus*, Schill., Cas. *Cyphodema instabile*, Luc., Vigo. *Pœciloscytus unifasciatus*, F., Brañ. *Capsus cordiger*, Hahn, Brañ., Cas., Vigo; *C. ruber*, L., Cas., Vigo; *C. scutellaris*, F., Brañ. *Orthocephalus saltator*, Hahn, Vigo. *Strongylocoris obscurus*, Ramb., Cas., Vigo, Pont., Brañ.; *S. cicadifrons*, Costa, Cas., Brañ. *Globiceps sphegiformis*, Rossi, Brañ., Cas.; *C. flavomaculatus*, F., Cas., Barco. *Halticus apterus*, L., Vigo; *H. luteicollis*, Panz., Cas. *Pachyxyphus lineellus*, Muls., Vigo. *Sthenarus ocularis*, M. & R., Cas., Pont.; *S. bicolor*, Muls., Cas. *Pelocoris marginatus*, Latr., Barco.

Explanation of Plates V—XI.

[*See Explanation facing the* Plates]

VIII. *On Some Teratological Specimens.* By T. A. Chapman, M.D., F.Z.S.

[Read March 6th, 1907.]

Plate XII.

Mr. Kenneth J. Morton recently sent me a specimen of *Capnia atra* with a three-fold tarsus on one hind-leg, and Mr. A. Bacot placed in my hands a specimen of *Catocala nupta* with a duplicate tarsus on the fore-leg. It so happens that a more unusual aberration of structure has occurred in a specimen of *Hastula hycrana* amongst those I have recently been rearing. Though the latter has probably nothing in common with the other two, still as all are aberrations of structure they may be noted together. I have illustrated them all in Plate XII; though somewhat diagrammatic, the outlines are fairly accurate in all important points, being from camera sketches.

The specimen of *Hastula hycrana* is a pupa that possesses jaws of the larval pattern. I have never before met with such a specimen, nor read of such an one, but this is possibly due to my defective literary explorations.

It is perhaps necessary to make it clear that these mandibles are pupal structures. We see, and more often hear of, pupæ, and even imagines with larval heads. Of these this description is accurate, the head is a larval head, *i.e.* the head of the larva, not cast at the moult but remaining *in situ* and having within it the pupal and imaginal heads proper.

These mandibles are not a persistence of larval mandibles, but the pupal mandibles, failing to recede to the simple pupal form, but taking on one almost identical with that characteristic of the larva.

On the plate Fig. 1 represents the head parts from the front of a normal pupa. The maxillæ and labial palpi below, the labrum with two hairs basally and the small triangular mandibles (in this and many other species, quadrangular, the apex being truncate), in the angle between the labrum above and the maxillæ below, the apex just touching the labium. Figs. 2 and 3 represent the specimen we are considering. Fig. 2 nearly in profile,

Fig. 3 nearly front view. The mandibles do not lie flat as in Fig. 1, but project nearly at right angles to the surface. Whatever other causes there may be for this position, one is imperative, they are too large in every dimension to occupy the space provided for the normal pupal jaws.

It is the empty pupa case we are examining, so that the hiatus in Fig. 3 between the face and the maxilla is possibly due to opening on dehiscence, but even so, it was rendered easy by the size of the mandible preventing correct apposition. The space seen between this mandible and the labium is however a hollow, into which the mandible ought to have folded down. This hollow existed before dehiscence.

The jaws are conspicuous not only by their projection but also by possessing the black colour, quite dense along the margin, so common in larval jaws. It is indeed more intense than in the larva of *H. hyerana*, in which the darkness is only intense along the teeth and is there only deep brown. They appear to possess precisely the same teeth as those of the larva, viz. five, of which the lower is broad and flat. I say appear, because though the teeth are evident enough, they are somewhat less crisp and sharp than in the larva, and one might count them perhaps as four or six. This is due to the circumstance, that the mandibles are not smooth and polished like those of the larva, but have a finely wrinkled and sculptured surface, similar to the pupal surface generally. They are in no way articulated, but are continuous with the rest of the pupal surface, though they are in a sense well marked off from it. But on closer scrutiny, a definite suture line as in the normal pupa is not easily determined, for example in the figure 2, the near mandible shows a quasi-suture at the base of the blackest piece, this however is followed by a wrinkled base, marked off by a slighter possibly sutural line so that one cannot say certainly which is the one that divides jaw from face.

I awaited the emergence of the moth from this pupa with some interest. It had some difficulty in emerging, it left a portion of one antennæ in the pupa case, and more or less damaged all its wings, I imagine, in struggles to free itself. It succeeded, however, and expanded its wings. These difficulties had no immediate relation to the abnormal pupal jaws, but probably resulted from some defect arising from the same causes, whatever they were, that led to the mandibular aberration. The mouth parts of the imago presented no trace of difference from the ordinary typical specimen.

I have given in Figs. 4 and 5 outlines of the larval jaws, Fig. 4 of the full-grown feeding larva, and Fig. 5 of the æstivating larva, jaws that it uses for no other purpose than to eat the cast skin. The differences between the two jaws of each pair are not altogether due to bad drawing, and not of course to any differences between the jaws of either side, but simply to a difference of angle of the specimens under the camera. It will be noticed that the æstivating jaws are smaller than the feeding ones, and the pupal ones smaller still (all are to same scale, a magnification of 22 diameters).

In the Ent. Mo. Mag., 1896, pp. 54–80, I related some cases of larvæ of *Agrotis comes* that became larvæ with some pupal characters on taking the moult that would normally have been that to pupa. The present is the only case of a similar sort I have since met with. In that case the active cause was some delay of development owing to irregular starvation. In this one I do not know the larval history, but the specimen was the very last to pupate out of some 430 examples. So that, if not starvation, some causes delaying the progress of development must have been active, but produced no visible effects except that on the mandibles and the difficulty of emergence from the pupa, whatever that may have been.

The specimen of *Catocala nupta* was exhibited at the Entomological Society on December 5th by Mr. Bacot. The left fore-leg has a widened and thickened tibia, with one tarsus almost normal and a second of smaller size beside it. When it came into my possession, the supernumerary tarsus had lost the last two joints by some accident, the third joint showing plainly that they had existed and were not absent congenitally. I have restored them conjecturally on the plate. The supernumerary tarsus is more slender than the normal one and of about two-thirds its length.

The specimen of *Capnia atra* is somewhat similar. In this case the tarsus affected is of the posterior leg. The tibia is normal or nearly so, but the first tarsal joint is much widened and carries at its broad extremity three second tarsal joints, each with normal third joints, claws and appendages. I have here placed a normal limb, as with the *C. nupta*, for comparison. The affected joints are apparently fractionally shorter than normal, but perhaps a little wider than the healthy one. The basal joint of course is much broader, and may be regarded as three joints fused side by side.

My experiments in regenerations of limbs, of which I have not yet published a large number, performed some years ago, lead me to believe that these supernumerary limbs are all instances of regeneration, or if not all, at least a large proportion of them ; just as lizards occasionally regenerate two or even three tails.

I picture the group of embryonic cells, which form the regenerative centre, broken up, by the injury by which the limb is lost, into two or more portions ; and each of these portions performs its functions of developing into a new limb without reference to the others. This result, is sufficiently rare to make it probable that injury rarely divides up this no doubt very minute portion of tissue, and that when it does, the divided portions succeed in most cases in reuniting, or all but one of the separated portions are mortally injured.

All three specimens have been placed in the Natural History Museum, South Kensington.

Explanation of Plate XII.

[*See Explanation facing the* Plate.]

IX. *On a remarkable undescribed form of Moth belonging to the family* Tineidæ. By Lieut.-Colonel Charles T. Bingham, F.Z.S., F.E.S.

[Read February 6th, 1907.]

Plate XIII.

Binsitta barrowi, form. nov.

♂. *Upper-side* white with a shining silky gloss. Fore-wing with the following black markings :—a large square spot near the base of the costa, a larger rectangular patch just beyond, that extends transversely from the costa to the median vein, a border along the apical half of the costal margin, continued broadly from the apex of the wing along the anterior three-fourths of the termen and only slightly narrowed posteriorly ; at about two-thirds of the length of the wing from the base this black border is produced downwards in the form of an upper rounded discal patch. Looked at perpendicularly from above, the markings just described appear entirely black, but in a side light the scales, which are remarkably broad, densely packed and partially erect, take on beautiful metallic tints of blue and green of different shades and delicate lilac ; scattered over the medial area of the wing and along the edge of the apical half of the costa are curious erect little tufts of bright ferruginous scales. Hind-wing : apical third shaded with shining bronzy-brown that darkens outwards and changes to metallic purple on the costal margin and apex of wing. *Under-side* white. Fore-wing : the black markings near base of wing somewhat as on the upper-side but more diffuse, no erect or semi-erect scaling; apical half of wing shaded with bronzy dark brown with a purple sheen in certain lights ; the dark shading continued diffusely along the median vein towards the base. Hind-wing : apical third heavily shaded with metallic purplish-black scales. Cilia of the anterior two-thirds of the fore and of the anterior half of the hind-wing black with a metallic sheen, the rest white. Antennæ and the outer sides of the palpi near the base black, the front and inner side of the basal half of the palpi white, the apical half with tufts of bright ferruginous scales ; head, thorax and abdomen silky shining white, the apical segment of the latter black with a tuft of long white hairs ; beneath : the thorax and abdomen silky shining white, the latter with two rows of black spots on each side ; legs black with a few transverse white bars.

Exp. ♂ 78 mm.

Hab. UPPER BURMA: Maymyo, 3000 ft; ? ANDAMANS.

The only other form of the genus *Binsitta* described is *niviferana*, Walker, a much smaller insect (exp. ♂♂ 30–38 mm.) with the hind-wings of a buff-yellow colour, palpi white, and wing-markings which, though similar in character, are different in many ways.

A single unnamed ♂ of a larger form from the Andamans is in the collection of the British Museum. This may possibly be conspecific with *barrowi*, but seems to differ in the colour of the palpi, which are white. The specimen, however, is very much rubbed, though otherwise in good condition.

This very beautiful moth was discovered by Colonel Waller-Barrow, R.A.M.C. The specimen described had just emerged and was seated on the empty shell of the pupa, which was fixed, as shown in the plate, on the twig of a small silk-cotton tree (*Bombax malabarica*, D. C.). Colonel Barrow found two other similar pupæ on other branches of the same tree; one of these had unfortunately been parasitised, but the parasite (*Ichneumon* or *Bracon*) had already matured and escaped. In colour the pupa is yellowish-brown, the head is blunt, and with the thorax and wing-cases broad and flattened. On the ventral side the 4th segment has two closely-approximate tubercles placed transversely, between which is a longitudinal short white streak; 5th to the 12th segments with transverse rows of small conical projections; constrictions between the segments strongly marked; 7th segment with a large conspicuous rounded black tubercle on each side, behind each of which is a larger pale yellow, or in one of the pupæ white, tubercle; on the broad flattened truncated head, dividing the ventral from the dorsal side, is an impressed dark line. The pupa is fixed by its tail end in a semi-erect position to the twig on which it was found, and bears, as can be seen by the illustration, a striking resemblance to the head of a snake and, strange to say, of a bird-eating tree-snake (*Lycodon aulicus*, Linn.) which is far from uncommon in Burma.

At first I was inclined to think that this likeness might be protective, but the fact that the pupæ of Lepidoptera are often curiously, almost fantastically, like other natural objects is well known. I would instance the pupæ of two forms of the little Lycænid butterflies, *Spalgis epius*, Westwood, from India, and *Spalgis s-signata*, Holland, from

West Africa, figured in the Journal of the Bombay Natural History Society, vol. viii, 1893, p. 485. Carefully examined, these pupæ are seen to be absurdly like monkeys' faces, and in these two cases there can be no suggestion that the resemblance is protective, or that birds and lizards would see a likeness and be deterred from attacking them. The real fact is that we are entirely ignorant of the influences in the environment (using the word in its widest sense) that mould the shapes of most natural objects around us, and to call strange resemblances such as those noted above "merely accidental" is only a confession of that ignorance. With regard to what are called "protective resemblances," the only sure test as to whether they are really protective or not seems to me to lie not in experimenting with captured lizards and caged birds, but in patient watching and observations, repeated again and again in the field and in the forest, of the behaviour of bird and lizard—pre-eminent enemies of insects—when confronted in the course of their natural wanderings with cases of what we call protective mimicry.

In conclusion, I have to thank Colonel Waller-Barrow for entrusting me with the specimens of the moth and its pupa described above. These he has now presented to the British Museum. I have also to express my great obligation to Mr. Hugh Main, B.Sc., F.E.S., for the very beautiful photograph of the moth and pupa, from which the plate accompanying this paper has been reproduced.

Explanation of Plate XIII.

[*See Explanation facing the* Plate.]

X. *On the remarkable resemblance between two species of* Molippa. By E. Dukinfield Jones, F.Z.S., F.E.S.

[Read 6th March, 1907.]

Plate XIV.

During the many years I have lived in Brazil I have taken from time to time *Molippa sabina*, Walker, which is a fairly common insect both in São Paulo and Paraná. I found the larva in São Paulo feeding on *Bauhinia*, and in Paraná on *Bauhinia*, *Erythrina* and *Mimosa*.

In 1896 at Castro, Paraná, I took some Saturniid caterpillars on *Mimosa* that were new to me, and to my astonishment they produced moths that were apparently identical with *M. sabina*. On sending specimens of the moth to Mr. W. Schaus, he gave me the species as *M. sabina*, and I came to the conclusion that this moth had a dimorphic larva. This conclusion was strengthened by my finding, on January 27th, 1899, a group of larvæ on *Mimosa*, some of which, just about to change skin (probably 3rd change), were of the normal form and colour, while others that had already changed were of the new form and colour.

Since my return to England in 1902 I have shown the imagines of the two species, of which I have a good series, to several entomologists, and the opinion has invariably been that the two forms were the same species, so close is the resemblance between them.

Last autumn it occurred to me that a comparison of the male genitalia might settle the question. The examination proved satisfactorily that the two species are distinct, the form of the *uncus* being quite sufficient to establish this, all the males bred from what I have called the normal form of larva having the *uncus* as shown in Fig. 2*a*, and in those from the other larvæ as in Fig. 1*a*. The finding of the larvæ of the two species associated in changing skin was fortuitous and misleading.

The two species with dissections of the genitalia and photographs of the larvæ were exhibited at the meeting of the Society on Nov. 7th, 1906.

On examining Walker's type of *sabina* in the British

Museum I found the *uncus* easily visible and agreeing with Fig. 2*a*. The other species I propose to name *M. simillima.* The description of the new species may be left as that of *M. sabina*, Walker, Cat. Lep. Het. B. M. vi, p. 1345 (1855), for though the specimens vary considerably from the type of *M. sabina*, they do not do so more than the individuals of *sabina* do among themselves. The genitalia must be consulted for identifying the species.

It is interesting to find both species of larva feeding on the same food plant at the same season of the year. Both species are gregarious.

The coloration of the larvæ in relation to their habits is worthy of note. *M. sabina* is in the last stage of a dull grey or slightly drab colour with black markings, the spines being grey (Fig. 2*b*), and this larva rests during the day-time near the ground on the trunk of the tree on which it feeds, a cluster of them having a wonderful resemblance to a patch of a mossy lichen that is very common in the woods about Castro. *M. simillima*, on the other hand, rests during the day on the twigs amongst the leaves and flowers of the *Mimosa*, and the colour is yellow with black marblings, the spines being yellow (Fig. 1*b*). This coloration combines so well with the surroundings that the caterpillar, though a brilliant object, is well concealed from its enemies.

Explanation of Plate XIV.

[*See Explanation facing the* Plate.]

June 20th, 1907.

XI. *The Life History of* Tetropium gabrieli, *Ws.* = T. fuscum, *Sharp* = T. crawshayi, *Sharp, etc.* By the Rev. G. A. Crawshay, M.A., F.E.S.

[Read March 6th, 1907.]

Plates XV—XX.

I have already stated (Ent. Mo. Mag., Sec. Ser., Vol. xvi, p. 223) how on comparing any original series of 180 specimens of a *Tetropium*, reared by myself May–June 1905, at Leighton Buzzard with the series of *T. luridum*, L., in the British Museum, I was a little doubtful as to their identity with the latter species.

Accordingly I submitted a specimen to M. Bedel for his opinion, who kindly drew my attention to a new species, *T. gabrieli*, lately described by Herr Weise, as follows:—

Elongatum, nigrum, pedibus fulvis aut ferrugineis, fronte convexiuscula, haud canaliculata, prothorace disco nitido, crebre subtilius punctato, latera versus opaco, creberrime ruguloso-punctato et subtilissime granulato, elytris opacis, elevato-lineatis.

Long. 9·5–14 mm.

Var. *a.* Elytris obscure ferrugineis, femoribus nigris, tibiis tarsisque rufo-piceis.

(Deutsche Ent. Zeitschr., 1905, p. 136.)

With this information I handed over my material to Dr. D. Sharp for determination as he was working at the genus at the time, with the result that he pronounced the Leighton Buzzard insect a new species, naming it *T. crawshayi* and describing it thus:—

Fere angustum, subdepressum, nigrum; antennis, tibiis, tarsisque piceis; vertice in medio haud, vel vix, depresso; prothorace vix transverso, ubique crebre, fere æqualiter punctato (*i.e.* areis lævigatis fere nullis), margine basali obsolete elevata.

Long 12–16 mm.

(Ent. Mo. Mag., Ser. II, Vol. xvi, p. 271.)

Dr. Sharp suggested the possibility of this insect ultimately proving identical with *T. gabrieli*, but, in consideration of the entirely red legs of the single specimen of *T. gabrieli* communicated by Herr Weise, as compared with the black femora constant throughout my long series, together with other slightly different characters, he decided to make the Leighton Buzzard insect distinct.

Two years prior to this Mr. F. Bouskell had discovered a red-legged *Tetropium* in some numbers near Leicester, June 15, 1903 (Ent. Record, 1903, p. 288).

These specimens were erroneously reported to be taken from Spruce Fir (*Picea excelsa*). I had taken *crawshayi* exclusively from *Larix europæa* which is deciduous and bears a very different bark.

Reasonable doubt existing as to whether these two British forms were one and the same species, I made it my object to clear up this point by a series of breeding experiments.

In Nov. 1905 I reared my first few specimens of the red-legged form from a log of *Larix europæa* which contained also the form with black femora (*crawshayi*).

This afforded a probability that they were one species, though as yet there was no proof that two different species had oviposited on this log.

By August 1906 I had succeeded in rearing the form with black femora (*crawshayi*) from two red-legged parents. All intergradations of colour in the femora from ferruginous to black occurred in this series.

Accordingly I was able to pronounce these two, in their extreme forms, different-looking insects to be one species.

Would this prove to be *T. gabrieli*?

To clear up this point I forwarded Herr Weise a long series of *T. crawshayi*, asking him for his opinion on the subject. I have at length heard from him to the effect that he considers *T. crawshayi* a form of *gabrieli* and has kindly communicated his single example of *gabrieli* for my inspection.

I concur with Herr Weise in this opinion.

T. crawshayi then becomes a synonym for *T. gabrieli* and may be allowed to stand for that form which so largely predominates in this country, viz. with black elytra and black femora.

This I propose to name *T. gabrieli*, var. *b.*

I append a description in English of the type form and vars.:—

Type form. Elongate, rather depressed, black; legs and antennæ ferruginous, tawny, pitchy-red; palpi tawny to pitchy-red; apex of abdomen tawny, pitchy-red, black; frons convex, not canaliculate;

thorax, disc shining, closely and rather finely punctured, duller at sides which are punctate-granulate, basal margin obsoletely raised; elytra black, dull, with three more or less raised longitudinal lines, golden or grey pubescence on basal third more or less pronounced: ♂ with joints of front tarsi and femora broader, and antennæ longer than ♀. *T. gabrieli*, Ws.

Long. 10–16 mm.

Var. *a*. Elytra obscurely ferruginous, femora black, tibiæ and tarsi pitchy-red.

Var. *b* (= *T. crawshayi*, Sharp). Elytra black, femora black, tibiæ and tarsi pitchy-red.

In England, *T. gabrieli*, type form, known by its red legs, is in my experience local. Var. *a*, described by Herr Weise as bearing obscurely ferruginous elytra and black femora, has not occurred; and var. *b*, distinguished by its black elytra and black femora, I have found wherever I have searched for it where there has been a reasonable amount of *Larix europæa*.

It seems likely that the species has been widely established in this country since Larch began to be generally planted for its economic value, about a century ago. At the same time, it may have established itself at an earlier date still, for Larch has been grown for ornamental purposes in England for over two centuries.

T. gabrieli may be distinguished from *T. luridum* both by the canaliculate frons of the latter and, as Dr. Sharp has pointed out, the more strongly-raised basal margin of its thorax.

I observe, also, the head and thorax are considerably more shining in *luridum* owing to a more sparing punctuation, especially on the disc of the latter, a good character which has hitherto escaped notice.

In this brightness of the thorax *gabrieli* is intermediate between *fuscum* and *luridum*, *fuscum* being the dullest of the three.

From *fuscum*, *gabrieli* may be known by the dull head and thorax of the former, due to a coarser punctuation, and also to granulation on the disc, which latter character is absent in *gabrieli* and *luridum*.

Also the thorax in *fuscum* is always more coarsely pubescent than in *gabrieli* and *luridum*, and its band of pubescence on the basal third of the elytra nearly always more clearly defined.

Capture and Distribution.—In England *T. gabrieli* has occurred as follows:—

Near Bletchworth, Surrey,	H. Saunders	1901
Esher, Surrey,	G. E. Bryant	1902
Near Leicester,	F. Bouskell	1903*
King's Lynn,	E. A. Atmore	1903
Brockenhurst,	M. A. Sharp	1903
Leighton Buzzard,	Rev. G. A. Crawshay	1905†
Elsfield, Oxon.,	J. J. Walker	1905
Sandy, Beds,	Rev. G. A. Crawshay	1905
Brockenhurst,	Rev. G. A. Crawshay	1905
Fenny Stratford, Bucks,	Rev. G. A. Crawshay	1905‡
Kings Langley, Herts,	Rev. G. A. Crawshay	1906
Enfield, Surrey,	C. T. C. Pool	1906
Near Romsey, Hants,	Rev. G. A. Crawshay	1906
Reading District,	Dr. Norman Joy	1906

Mr. G. C. Champion has communicated specimens taken by himself in 1899, "Simplon, Switzerland"; and another labelled: "Mendel Pass, Austr. Tyrol, R.W.L., 1896."

The insect will doubtless occur in older collections confused with *T. luridum.*

I first saw *T. gabrieli*, var. *b*, at Leighton Buzzard, Bedfordshire, on May 25th, 1905, a single example crawling outside a timber-yard.

On searching the yard on the following day I observed a second example on the wing. It settled on a log of ash and I secured it. I then traced these specimens to a log of *Larix europæa* which had been felled in a neighbouring plantation the year before and now lay in the timber-yard.

In the bark lay a considerable number of imagines and a few pupæ. No larvæ occurred, and subsequent search only revealed two backward ones in the whole log. I had all the bark stripped off and portions of it laid in boxes covered with perforated zinc and partly also with glass, that I might observe the insects.

A good number soon emerged, about 180 in all, including those I had taken in the timber-yard. They paired readily. On the chance of getting them to oviposit, and, in order to secure the breed, I had

* The earliest occurrence, in England, of the species, type form, in the tree.

† The earliest occurrence, in England, of var. *b* in the tree.

‡ An abnormally large tree, from which I estimate some 6000 or 7000 individuals must have been reared.

a larch tree felled, by the kindness of a friend, and delivered to me in the early morning before *Tetropium* was on the move. The tree was a perfectly healthy one, and therefore was not likely to have been infected by the beetle before it was felled, and certainly not in transit.

On an 8-ft. length of this I sleeved about 12 ♀♀ and a few ♂♂ early in June. I watched oviposition take place, and from this log eventually I took, in all, about 300 larvæ and imagines of the form with black femora exclusively, the only form known to me at the time. The larvæ mostly established themselves in their pupa-cells by the following October, and emerged the following May and June.

HABITAT.—*Larix europæa exclusively in my experience in the wild state.* Mulsant gives, as the habitat of the kindred species *T. luridum*, L.: "Pins, sapins, chêne" (Hist. Nat. Col. de France, Longicornes, p. 115). It would be interesting to know if this species affects *Larix*. Mulsant's silence as to *Larix* does not necessarily exclude this conifer from the food-plants of *T. luridum* which he is enumerating. According to some modern classification of the Coniferæ (Veitch, Man. Conif.), the tribe *ABIETINÆ* is divided into the sub-tribes:—

(1) *Pineæ* or Pines, including our familiar *Scots Pine*, etc.
(2) *Lariceæ*, including the common European *Larch*, etc.
(3) *Sapineæ* or Firs, including the well-known *Spruce Fir*, etc.

Probably Mulsant adopted the old classification which would include the Larches in *Sapineæ* or "*Sapins*."

Desirous to ascertain whether the larva of *T. gabrieli* would feed in any other species of conifer than *Larix europæa*, and if so whether this would affect its coloration, in May 1906 I tested my beetles with a log of *Pinus laricio*, var. *nigricans*, Par.,* enclosing many ♀♀ on it with muslin. Contrary to expectation, the log subsequently produced a small number of larvæ.

As *Tetropium* was at this time reported, though in error, to have occurred in *Picea* (Spruce Fir), I tested my beetles with a log of *Picea excelsa*, Link, fully expecting that they would not lay on it, or if they did, that the larvæ would not live in it. The log subsequently produced a considerable number of larvæ.

I was greatly surprised at this, for I have repeatedly found standing *Larix* inhabited by *T. gabrieli* mingled with sickly, dying

* So returned to me from the Royal Botanic Gardens, Kew, by the courtesy of the Director.

and dead *Picea* and other firs, and these latter trees have always been untouched by the beetle.

In timber-yards also I have observed piles of *Larix*, many of which contained the beetle, with *Picea* close by infested by *Sirex* and other insects, but free from any trace of *Tetropium*, and both trees coming from the same plantation.

In the same way I have always found the species avoid *Pinus sylvestris*, Linn. I have examined hundreds of this conifer dying and dead in *Tetropium* localities and found them unaffected by *Tetropium*, though the work of *Criocephalus*, *Asemum* and *Rhagium* was visible.

The ♀♀ which I enclosed on *Picea* and *Pinus* were restless and tried to eat their way through the muslin, while those enclosed on *Larix* settled down at once and oviposited freely, the larvæ hatching out and spreading over the entire surface of the log.

In confinement then, and under compulsion, *T. gabrieli* is capable of living in *Pinus* and *Picea*, but prefers *Larix europæa*, multiplying in this tree so fast that the second brood will completely kill a dying tree of average dimensions, using up all the inner bark.

Life Cycle.—The egg is laid in the outer bark. The larva consumes the soft bast, the cambium layer itself, and sometimes grazes superficially the youngest sapwood. Thus destroying the vital juices it soon kills completely a sickly tree.

When full fed it either excavates a pupa-cell under the surface of the outer bark, or burrows in the wood and pupates there.

The life cycle occupies a year. Appended are data concerning this (p. 189).

The Imago.—In a hot temperature the beetles are very active in their movements, running rapidly over the surface of the bark, chasing each other, or lying quite flat to it, basking in the sunshine.

They have also a peculiar habit of standing motionless, almost on tiptoe, with the body well away from the bark. The hind-legs being longer than the fore-legs, that part of the body is slightly tilted up in the air.

More generally they creep under the plates of the bark and hide themselves entirely. Pairs secrete themselves under the laminæ of the bark *in cop.* The species is, on the whole, fond of seclusion, and doubtless this is why it has escaped notice so long. There may be many imagos on a tree but very few visible at a time. I have placed as many as a dozen on a foot of 9-in. larch-pole and it has been difficult to find one at times.

They appear to be exclusively diurnal in their habits. I have kept numbers in large boxes and flower-pots out of doors, covered

(1) A Normal Life Cycle.

Years.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1905					†	†̣ †̣ – –	– – – –	– – – –	┐┐┐Δ	ΔΔΔΔ	ΔΔΔΔ	ΔΔΔΔ
1906	ΔΔΔΔ	ΔΔΔΔ	ΔΔΔΔ	ΔΔ○○	○●●†							

(2) Abnormal Life Cycle shortened to Three Months by High Temperature, though without Artificial Heat.

Year.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1906					† • •	• • • •	• – • •	• †				

(3) Four Successive Generations produced by Abnormally High Temperature, though without Artificial Heat, within a Period of less than Sixteen Months.

Years.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1905					†	†̣ †̣ • •	• • • •	• • • •	┐┐┐Δ	ΔΔΔΔ	ΔΔΔΔ	ΔΔΔΔ
1906	ΔΔΔΔ	ΔΔΔΔ	ΔΔΔΔ	• • • •	†̣ †̣ • •	• • – –	– – • •	• • †̣ †	– – – –			

Explanation.

†̣ = Egg stage.
– = Larval stage passed in tender bast.
┐ = Full-fed larva excavating burrow in wood cylinder.
Δ = Larva established in pupa-cell in wood or bark.*
○ = Pupal stage.
● = Immature beetle resting in cell.
† = Mature beetle emerged.
• = Unobserved.

* A considerable number of larvæ are not full fed by the autumn following oviposition, in which case they hibernate in the position in which the winter overtakes them feeding, and establish themselves in their pupa-cells in the following spring, attaining the perfect state a little later than the rest.

with muslin, perforated zinc and glass, and, about sunset, in a warm temperature they have all crept down and hidden themselves under the broken pieces of bark. On uncovered logs I have observed the same. They creep under the scales and remain in hiding till the morning.

It is not a question of the lower temperature but the darkness that keeps them quiescent at night, for beetles which I have forced in the winter, placed in a warm temperature over a fire-place in a bright gas-light, have exhibited the same activity at midnight as in any June sunshine, darting about over the surface of the bark or even flying, as far as space allowed, in the large glass jam jars in which I kept them.

In these jars these winter-bred imagines have lived the full span of their perfect existence when supplied with a little moisture—namely, about three weeks. I have watched them gnawing the bark, apparently eating part and rejecting the rest, where there has been no need of removing the bark to free themselves from too close quarters.

They begin to emerge early in June under normal conditions, and, in my experience, are mostly dead by the end of the first week in July. The latest date I have seen one alive in the wild state was July 5th, 1906. They emerge earlier from felled timber which has lain from the time of oviposition in a spot exposed to an unusual degree of sunshine, as may occur in timber-yards, fences, etc.

Thus, as early as May 4th, 1906, I was surprised to see a few holes of the first imagos of the season's brood in the bark of logs which had stood in my garden in an unusually warm aspect for the greater part of the time since oviposition the previous June.

With this stock I made some remarkable experiments.* On May 13th I enclosed some of these imagos with muslin on logs of *Larix europæa.* The logs were placed in a still hotter situation than that of the previous summer. The imagines paired at once and duly oviposited. I expected that the larvæ would feed up, as those of the previous year, and establish themselves in their pupa-cells for the

* In the case of all logs used for breeding experiments due precaution was taken to keep them isolated from the time of felling, and thus beyond the reach of oviposition from unexpected quarters. At the time of felling, this timber was perfectly healthy and such as *Tetropium* never, in my experience, affects.

winter, without transforming to pupæ. To my surprise, on August 10th I observed holes in the bark where the first of this second brood of the season had emerged, probably a few days previously, *i. e.* within three months of the parent stock being put down on these logs. The ♀♀ of this second brood coupled and oviposited from August 10th onwards, and of the next generation of larvæ found in this log in October following some had already moulted four times.

I had doubts whether these very small larvæ would get through the winter, some being so near the surface of the bark, but I found them, in March following, after a severe winter, at different depths in the bark, in all stages of development from the first to fourth moults.

The above-mentioned rate of development is probably the most rapid possible without running the risk of death from too high a temperature, for in some of these logs where the bark was not of considerable thickness some of the larvæ had from time to time been scorched to death by the fierce July heat to which they had been exposed, the bark being very hot to the touch.

The temperature may, of course, be so high as to impede development, for I observe that, subject to a very high temperature, the larvæ which are not killed lie limp, faint and prostrate during the warm hours of the day and cannot continue feeding. The breathing and fluctuations which are normally visible through the delicate transparent skin are suspended, and it takes some hours to revive the larva and restore its organs to their proper functions. On the other hand, after a night's hard frost in the depth of winter, by applying warmth I have caused them to resume feeding in a couple of hours.

The imagos also I have found killed by the heat in their cells in the bark. The days when this happened were remarkable for their high temperature, which ranged between 90°–96° Fahr. in the shade. The logs were exposed to the fierce heat of the midday sun.

I found that to cover the logs with a sheet and water occasionally moderated the heat sufficiently to admit of a safe though rapid development of the insect in all its stages.

Oviposition.—I have observed pairs remain coupled for about a day and a half and the ♀ ♀ oviposit about a day and a half later, both ♂ and ♀ living on for about three weeks.

The beetle deposits her eggs in the bark, in numbers varying from a single one to batches of five or six in the same spot. She then moves on to another spot. I have not found more than six ova together.

These are put away under the plates, the beetle backing in as far as she can and then extending her ovipositor a considerable distance further to the junction of the plates with the surface of the bark from which they are peeling. Or they are inserted in any convenient fissure in the tender bark.

Where this is superficial and the whole of the ovipositor is not buried, the operation may be closely watched without the beetle being disturbed.

I have observed the ova, under the lens, passing, one by one, down the ovipositor, forced, a small distance at a time, with a fluctuating motion.

By dissection I have found a healthy ♀ to contain as many as 130 well-formed ova.

A ♀ confined in a glass jar scattered about 30 ova in the wood-dust at the bottom of the jar, and on being supplied with a piece of bark, laid about 70 more in it before she died.

I have watched oviposition in the wild state once only, when I came on a solitary ♀ on a newly-sawn strip of larch ovipositing on the narrow edge of bark in close company with *Sirex gigas*, who was occupied in the same way.

In confinement, *Tetropium* has laid on a very small piece of bark held in my fingers and watched under the lens. They will also, in confinement, oviposit on dead and exhausted bark which could not support life in the larvæ.

The earliest date I have known oviposition take place under almost natural conditions was on May 17th, in the case of imagos which had emerged prematurely from a log that had stood out of doors in a warm aspect.

Under ordinary conditions they lay early in June and onwards for a month. Under abnormal conditions I have obtained ova as late as the first week in September 1906, from a second brood reared out of doors.

These autumn-emerged beetles, reared under such abnormal conditions as above mentioned, did not lay so freely as the June broods, as a rule, and many of the ova did not contain a healthy embryo, but shrivelled up in a few days.

Of the autumn broods, ova continued to hatch out till the third week in September.*

I also obtained ova in November 1905 by artificial heat, from imagines of another second brood forced in their latter stages over a fire-place in a high temperature.

In the latter case the beetles laid with great effort, dragging the extended ovipositor over the bark for days, but only laying a few eggs, though they lived their whole span of life. These ova did not hatch out.

In breeding *Tetropium* a good way to obtain eggs is to enclose several laying ♀♀ on not more than a foot of small larch wood enclosed loosely in muslin. On removing the laminæ of bark with a penknife the ova will be found to occur frequently over this small area, and thus much time be saved in searching for them.

To date ova, enclose ♀♀ on a log for a day, removing them each day to another log, dating each log and enclosing it again in muslin to prevent any further oviposition from other quarters.

Great care should be taken each day to remove all the ♀♀ that were put on the log.

Though one may mark the spot where a ♀ is laying on a tree, on searching for the ova it is not easy to find them, so securely are they hidden away as a rule.

They are not sealed over, as I have observed is the case, for instance, with *Metœcus paradoxus.*

The egg is $1\frac{1}{4}$–$1\frac{1}{2}$ mm. long, elongate, subcylindrical, sometimes slightly broader at one end, milky white.

Another good way of obtaining ova is to place the fertile ♀ in a large glass jar with wide neck, covered with muslin or the metal top perforated, with a good-sized piece of bark in it and small chips at the bottom to ensure a foothold, placing the jar in the open air, though taking care not to allow the direct rays of the sun to fall on it during the hot hours of the day, nor the rain.

Hatching.—In a warm June or July temperature the ova hatch out in 14–16 days from the time of oviposition. From the eighth day, approximately, the larva may be seen slowly forming within the shell. Cloudy rings of the different segments appear ; a yellowish tinge at the larger end where the head is forming ; then ferruginous, passing to brown, specks for the mandibles, which, for a few days prior to

* The perfect insects emerged the following July.

hatching, may be seen opening and closing within the shell, and the larva projecting its segments up and down within the little space at its disposal.

A good way to hatch out the eggs is to remove them, in their batches on very small portions of the bark to which they are attached, with a penknife. Place them on a plate and cover them over with a flower-pot, moistened occasionally if the weather is very hot and dry. The pot should not be exposed to any fierce heat. With the aid of the lens the young larvæ may easily be seen when they hatch out, and each day's hatch gathered up with a fine brush and placed on their food.

Should ova become detached from the bark they may be reattached by very slightly moistening the bark with a weak solution of gum arabic and laying the ova on it. I have found these hatch out as well as others if they are very lightly touched.

Left loose at the bottom of the jar they hatch out equally well. On one day in September 1906 I took upwards of 40 healthy young larvæ from the bottom of a jam jar, where the ♀ had laid them in some wood-dust which adhered to the glass, the ova, with hardly an exception, hatching out successfully, a very unusual thing for late autumn eggs of a second brood.

The Larva (Plate XX, fig. 1).—Fleshy, susceptible; scantily clothed throughout with short hairs: with legs small and slightly corneous: scansorial prominences present on ventral surface of abdominal segments.

Widest in front, a little wider than $\frac{1}{4}$ of whole length. Prothoracic segment bearing scutum widest of all, capable of receiving the rather large head, which for the most part is retracted into it. Tapering from the prothoracic segment to the 6th abdominal: 7th and 8th explanate below the spiracles. Prothoracic segment slightly corneous above, equal in length to meso- and metathoracic segments together. First four abdominal segments subequal: 5th to 8th the longest. Spiracles present on mesothoracic and first eight abdominal segments as in *Asemum* and *Criocephalus ferus*. Mandibles longer, in proportion to their size, and narrower on the biting surface than in *Asemum*. Two blunt corneous tubercles on the dorsal surface of the 9th abdominal segment, set closer together than the corresponding spines in *Criocephalus* and *Asemum*, and inclined slightly inwards (Plate XX, fig. 4). In a single instance only I have known these absent in a full-fed larva. In this case the larva had been buried in a stump in the earth soon after hatching, and had remained so for six months.

Colour white, pinkish white, or dirty white, according to food-supply. White before moulting, when it has evacuated all back food and ceased temporarily to feed, or when excavating wood. Yellowish prior to transforming to a pupa.

Long. 10–24 mm.

The newly-hatched larva is 1–1¼ mm. long, subparallel, the prothoracic segment being slightly the widest.

The most striking character at this early stage is that of the legs which are produced into long setæ, bent inwards and slightly hooked at the tip, very soft and flexible (Plate XX, fig. 3). These would possibly give the larva a better hold on the surface of the bark, always slightly sticky from the presence of exuded resin, until it enters it by its burrow. These setæ are exchanged, at the first moult, for the usual short terminal claw. The body is sparingly clothed with long setæ, which are shortened at the first moult.

The larva moves with almost the same facility as the more active newly-hatched Lepidopterous larvæ, as I have observed in *Rhagium*, and as is possibly the case with all Longicorn larvæ of similar habits of life. I have seen it climb up and down bark or the surface of glass perpendicularly without falling.

At this stage there is no sign of the corneous tubercles which are present in the mature larva on the dorsal surface of the last segment, but, from the egg, slight fleshy prominences take their place.

On the first moult the larva assumes its final shape, becoming considerably wider in front. Directly after the moult the head stands out prominently (Plate IV, fig. *d*), but, in a few hours, it is for the most part withdrawn into the prothoracic segment and under the scutum, giving the larva, especially when full fed, the appearance of having a very small head for so destructive a work.

It does not call for further notice till after the 3rd moult, when signs of the corneous tubercles appear. This is a useful character, distinguishing it from its near ally *Asemum* and from *Criocephalus*, in both which the abdomen terminates in two spines, as has been pointed out by Dr. D. Sharp ("The Genus *Criocephalus*," Trans. Ent. Soc. Lond., May 20th, 1905).

The newly-hatched larva at once makes its way into the tender surface flakes of young bark, which it excavates superficially, not burrowing down at once into the inner and wettest bast, where it would be suffocated, except in the case of a dying tree containing little sap. It first moults two or three times and attains some size. In the case of trees recently felled, and healthy at the time of felling, I have not known the young larva penetrate entirely the inner bark and reach the surface of the wood-cylinder (Plate XV, fig. A.A.A.) under three weeks. It will then be found, for the rest of its life, feeding on this wettest part of the tree, consuming the soft bast, the cambium layer, and sometimes grazing superficially the youngest sapwood (Plate XV), though never excavating this as deeply or as clean as *Callidium*, L.

As it excavates it keeps its burrow clear, for a short distance in front, throwing back the rejected bitten wood-fibre and ramming it, together with the excrementa mingled, into a solid cake with which it fills up the entire burrow behind it as it advances. It allows very little bitten fibre to accumulate at a time in front, but is continually cleaning up.

For some time prior to, and especially during the excavation of the pupa-cavities in the bark a curious ticking sound proceeds from the tree, caused doubtless by the action of the mandibles, faint at first, but later becoming clearly audible at a distance of 15–20 paces on a calm day, when the larva is excavating dead bark immediately under the surface of the outer plates.

I have detected the presence of larvæ in a standing tree by this sound alone early in August 1906. In a small tree where the brood is very numerous the ticking proceeds from the whole surface of the infected bark continuously. It is a double and sometimes a treble tick. As to the cause of this, it may be that the mandibles, having passed through the particle of dead bark which the larva is biting away, the resistance suddenly removed, meet with a snap, overlap, and, in overlapping, the margin of the innermost mandible passes across one or more of the ridges on the inner surface of the overlapping one, thus causing another "tick" or two to be heard.

When the larva is feeding in the soft bast I observe no ticking sound but rather a squashy sound, from which I infer that it is only the greater force needed to bite through the more dead and dry bark of the outer plates which gives rise to the sound in question.

Some pupate in the bark, while others prefer the wood. In the latter case, the larva, having bitten the surface of the wood heavily for a short distance, enters it suddenly by an elliptical hole, the ellipse lying perpendicularly to the circumference of the tree (Plate XV, B.B.). I have observed but few exceptions to this rule of the vertical ellipse in some thousands of holes examined. In these the ellipse was situated only slightly out of the perpendicular. In the case of *Callidium* (*violaceum*, L., and *variabile*, L.) and other Longicornia I have observed the elliptical entrances to the burrows lie at all angles. In 6 ft. of a 7-in. wood-cylinder, in 240 holes of *Tetropium* examined, the ellipse, in three instances only, lay very slightly out of the perpendicular without any bend in the grain to influence the larva.

I can assign no certain cause for this habit, unless it be a matter of convenience, which the arrangement of the wood-cells may account for.

In *Larix* the latter are "elongate, fusiform, with ends dovetailed between one another" (Veitch, Man. Conif., p. 82), and lie vertically to the circumference of the tree. From their formation the small bundles of these cells should be more easily picked up by the mandibles endwise than across. If this is so the larva must needs work them in such an attitude as to cause the elliptical hole of entrance to lie vertically to the circumference of the tree.

But this is not the case in the second and downward part of the burrow (Plate XVI, *b*, *c*, *d*), in excavating which the larva clearly lays hold of the wood-cells across.

It may be that, having penetrated sufficiently far into the wood horizontally for its purpose, by the easiest method of biting the wood, at this point the strong instinct which impels the larva to pupate standing erect on the apex of the abdomen, necessitating the completion of the burrow and pupa-cell vertically to the circumference, or simply the greater convenience of a downward course, prevails, and the larva is content to lay hold of the wood-cells any way.

It is interesting to note that in the only piece of wood (Scots Pine) by me at the time of writing infected by *Criocephalus* I observe that the elliptical holes of exit of the larva in the surface lie vertically to the circumference as the holes of entrance of *Tetropium*.

The normal burrow of *Tetropium* runs into the wood horizontally, or almost so, for about 1–2½ in. (Plate XVI, *b*), with generally a curve to the right or left or occasionally sinuating. It then takes a sharp turn downwards (Plate XVI, *b*), never upwards, for a distance of 1–2½ in.

At the bottom of this burrow is the pupa-cell. In the case of a tree which has been felled and is lying in a horizontal position at the time of the larva burrowing in the wood, the second part of the burrow may run to the right or left (Plate XVI, *a*), or the entire burrow may run into the wood with a curve.

The excavated wood-fibre the larva brings to the surface and with it fills in the remainder of the burrow in the bark, where it fed, up to the hole of entrance in the wood-cylinder.

The work of excavation is carried on in the following way as I have observed under glass:—

Biting away the wood-fibre before it, the larva sweeps it to one side with its mouth parts till a certain amount has accumulated, when, forming the first few segments into a curve J-shape, in which with the help of the side of the burrow it holds the wood-fibre (Plate XVIII, *b*—larva on extreme left), it backs along the burrow, drawing the wood-fibre with it.

Having thus hooked the wood-refuse up the perpendicular and along the horizontal parts of the burrow, the larva backs out of the hole into the burrow in the bark, still drawing the wood-fibre with it, and, by successive loads, fills up the burrow to the point of the hole of entrance in the wood, reversing its position and ramming the wood-refuse with its head. In other cases, when the larva has excavated a sufficient quantity to remove, it reverses its position in the bottom of the burrow at once and pushes all before it, advancing up the burrow head first.

The burrow completed, the larva then excavates the bark opposite the hole in the wood-cylinder almost to the surface, leaving the imago very little to eat through to make its escape, and descends the burrow for the last time to pupate.

While in process of excavating the wood, the larva swallows a certain portion of the wood-fibre, but it derives little if any nourishment from it, as is evidenced by the fact that if a larva which is not full fed be taken from its bark food and inserted in wood, it continues excavating restlessly and dissatisfied, till it wastes away and dies or makes a much-dwarfed imago.

The burrow at this stage is clear from the entrance hole to the bottom. The larva then widens the bottom into a pupa-cavity about twice its own width and a little more than its length, using the excavated fibre to fill in the burrow behind with a good wad for about $\frac{3}{4}$ in. Having bitten very smooth the walls of the cell it settles down, standing erect on the apex of the abdomen, and, with head pointing towards the future way of exit, now filled in, it awaits pupation (Plate XVI, *b*).

Normally, the imago takes about 10 days to mature in the pupa-cell after transforming. It then bites away the stopping of wood-fibre before it, scrapes it behind it with its fore and intermediate tarsi and treads it firmly into the bottom of the pupa-cavity with its hind tarsi. This obstacle removed, the beetle advances along the burrow to the opening, eats through the thin layer of outer bark and makes its escape.

In the event of it choosing the bark to pupate in, it makes its way from the wet bast to the dead and drier outer bark, excavates a pupa-cell upwards and slightly outwards, reverses its position, fills in the hole beneath, reverses its position again, and, standing on its tail, transforms thus.

As to the selection of wood or bark in which to pupate, Ratzeburg (Die Forst Insekt., vol. i, p. 237) says of the kindred species *Cerambyx luridus*, Fabr. (= *T. luridum*, L.), *that it pupates either in the bark in summer, or burrows (if compelled to hibernate) in the wood* ("Und verpuppen sich entweder (in Sommer) auch in derselben, oder graben sich (wenn sie uberwintern müssen in das Holz"). It is probable that he was mistaken here, for in *T. gabrieli* the pupating larva is not influenced in its choice of wood or bark by the season.

In the case of a brood reared from eggs laid in May, pupating in July and emerging in August, some of the larvæ chose the wood and others the bark in which to pupate. Here the question of hibernation was not involved, the weather being hot throughout from the time of oviposition to the time of emergence of the perfect insect. Moreover a large proportion of the larvæ may always be found established in their pupa-cells close to the surface of the outer bark during the winter, and others, not full fed, resting in the position in which the winter overtook them while feeding in the bast.

Whether in wood or bark the larva excavates the pupa-cell in such a way as to admit of its always pupating standing erect on the extremity of the abdomen, or, in a few cases, nearly so. In this position, after it has stiffened for pupation and also after it has transformed to a pupa, it is given to spinning round and round in the cell.

Neither pupa nor imago has room to reverse its position in the pupa-cell, nor has the imago sufficient endurance to excavate more than a very little hard wood, so the beetle depends on the instinct of the larva to provide for its safe exit by facing in the right direction before transforming. I have not known this instinct fail in the standing tree in hundreds of burrows I have examined.

The larvæ mutilate each other when they are very numerous in the bark. I have frequently found dead ones where the burrows cross each other much. On one occasion

I took two dead larvæ from under bark with apparently their mandibles locked together.

This would account for a given surface of bark not producing more than a limited number of imagos, however many laying ♀♀ were deposited on it. It is not that they run short of food, but they run foul of each other in their wanderings and inflict mortal wounds on the tender integument.

On the other hand, when burrowing in wood to pupate they will alter their course to avoid contact with each other, and their galleries run alongside each other with only the thinnest possible partition of wood-fibre between through which I have seen daylight.

Under glass they show that they are fully conscious of their close proximity to each other, and neither will broach the partition. I have known three larvæ enter the wood within a $\frac{1}{4}$ in. of each other and shape their respective courses so as to keep clear of each other, completing their burrows and all three emerging perfect insects.

I have counted as many as 59 holes of burrows in the surface of 1 ft. of a 7-in. larchwood-cylinder, and probably 15 more pupated in the bark. This was a portion of a log oviposited on in confinement by about a dozen fertile ♀♀, 6 ft. of this wood yielding about 300 full-fed larvæ, pupæ and imagos.

In thick bark I have found as many as three pupa-cells occupied, with a very thin layer of bark separating them.

When the tree is large and the bark thick the majority prefer pupating in the bark to excavating the wood.

THE MOULTS.—The larva moults seven or eight times before transforming to a pupa, the moults occurring at intervals of 8–14 days. It ceases to feed about two days before the change, and the soonest I have known it resume feeding after a moult was 12 hours, by which time a very warm temperature had sufficiently restored it to activity. But the usual time is a day. Before each moult the larva carefully smoothes the walls of the burrow.

Appended are data of moults of larvæ reared from the egg (p. 201).

Extreme care and the closest attention were necessary to obtain these results.

Unfortunately I failed to bring any of them through to the pupa state. I attribute this to the unwholesome fumes arising from the gas over which they were placed for forcing, for want of better accommodation, from the beginning of October when the necessary

DATA OF MOULTS OF LARVÆ REARED FROM THE EGG IN *LARIX EUROPÆA*, 1906.

	Hatched	1st moult	2nd moult	3rd moult	4th moult	5th moult	6th moult	7th moult	8th moult	
No. 1.	July 7th	July 21st	July 30th	Aug. 8th	Aug. 20th	Sept. 1st	Sept. 14th	Oct. 7th	—	Died
No. 2.	„ 11th	„ 22nd	Aug. 2nd	„ 11th	„ 23rd	„ 5th	„ 18th	„ 11th	—	Died
No. 3.	„ 13th	„ 24th	Aug. 2nd or 3rd	„ 15th	„ 27th	„ 7th	„ 19th	—	—	Died
No. 4.	„ 13th	„ 23rd	July 31st	„ 11th	„ 23rd	„ 4th	„ 17th	„ 14th	—	Died
No. 5.	„ 14th	„ 24th	Aug. 3rd or 4th	„ 16th	„ 26th	„ 7th	„ 19th	„ 11th	Nov. 9th	Died
No. 6.	„ 10th	„ 20th	July 30th							
No. 7.	„ 7th	„ 20th	Aug. 1st	Killed	accidentally					
No. 8.	„ 13th	„ 23rd								

temperature failed out of doors, to the middle of November when the last one died. Up to the point of bringing them indoors they were very healthy.

No. 5, the only one that moulted eight times, had attained an unusual size, and had established itself in the outer bark for pupation before it died, from which it would seem that eight moults is the limit in this species. At the same time I cannot be sure that in some instances they exceed seven. I brought four only through the 7th moult. The long intervals between the 6th, 7th and 8th moults were due to a lowered temperature and asphyxiating atmosphere.

Light has no injurious effect on larva or pupa, which thrive equally whether exposed to the full light of day or buried in the darkness in the tree. I have reared numbers exposed to light under glass.

THE PUPA (Plate XX, fig. 2).—The whole dorsal surface, the ventral surface of abdomen and apex of femora sparingly furnished with short spines which, on the dorsal surface of the abdominal segments, are arranged chiefly in small groups, one on either side of the median line. Apical segment of abdomen terminating in two strong spines curved inwards (Plate XX, figs. 5, 6). These provide the pupa with a firm hold on the wood and admit of an active rotatory movement as it lies vertically in its cell.

The sexes may be distinguished by the length of the antennæ, which, in the ♂, extend beyond the intermediate tibiæ further than in the ♀ by about a joint and a half: also by the formation of the under-side of the last segment of the abdomen which, in the ♀, bears, close to one another, a pair of compound fleshy tubercles of considerable size (Plate XX, fig. 6). These, as I have ascertained, are rudiments of the appendices in the imago (Plate XX, fig. 7), which extend laterally from two small apical prolongations of the ovipositor. They are, I believe, sensory organs, for with them I have observed the imago, under the lens, feeling the bark when searching for a suitable spot in which to deposit her eggs. They are furnished with long setæ, and are soft and apparently sensitive.

In the pupa these and other parts of the genitalia attain their perfect development outside what will become, in the imago, the apical margin of the last segment of the abdomen, the partially-developed tergite and sternite of this segment in the pupa gaping wide (Plate XX, A.A.A.A.), and the organs in question protruding in a compact body (Plate XX, B.B.B.B.). As these organs develop in the pupa they gradually recede, and, by the time the pupa throws off its skin, have been entirely drawn up into the abdomen and the tergite and sternite of the last segment closed over them.

I found it very difficult to verify what was, for some time, conjecture, the parts in question being so delicate and liable, at the touch of a needle, to become dissipated; but ultimately I succeeded in removing the loose skin from the pupa and exposing to view the underlying organs while yet they protruded a little.

The ♂ pupa also bears vestiges of these tubercles (Plate XX, fig. 5), but they are so small as to be almost imperceptible, and are differently situated, nor have I had time or material at the last moment to ascertain exactly what part, if any, of the genitalia they become.

A most interesting feature in the transformation to the pupal state is the manner in which the antennæ assume their final position in the pupa.

Immediately on the head and thorax being freed from the larval skin the antennæ curl forward somewhat after the fashion of a ram's horns, though not so much curled. When they are full grown the pupa revolves on the extremity of its abdomen first in one direction, and, with the help of the sides of the cell, rubs one antenna into its place behind the projecting femora; then, revolving in the other direction, similarly arranges the other and rests (Plate XVIII, *e*, *f*).

Variation: (1) in Size.—This is marked. In accounting for it some have suggested that large and small races of this *Tetropium* exist locally. This is not the case. The condition of the tree governs the size of the generation subsisting in it.

If it be of luxuriant growth at the time of felling, with a thick covering of juicy inner bark, and if ova should be deposited on it at the most favourable time, *i. e.* within a few months of being felled, and not too thickly, abnormally large larvæ and pupæ will occur (Plate XVIII).

If, on the other hand, the tree is small and the bark thin, and if the eggs should be laid thickly; or if the bark has been previously partially exhausted by another generation; or the tree felled so long that much of the sap has dried, the occupants will be small.

A very healthy tree, lately felled and oviposited on soon afterwards, affords more favourable conditions of nutriment for the larva than the natural sickly tree standing in a plantation, in which the sap must have been gradually failing before the insect will attack it.

The reason for this is that, in a tree of luxuriant growth, recently felled, the bark is full of sap, which, because it has ceased to flow, admits of the larva advancing in it without being smothered and so thriving.

I have never found abnormally large individuals in a standing tree, but in a few instances in felled timber I have known the larva attain the size of 24 mm. and the brood average only a little less, while, under less favourable conditions, they frequently occur as small as 10 mm.

VARIATION: (2) IN COLOUR.—This is marked in the femora especially, some series in my possession embracing all intergradations of colour from red to black. What governs the variation I have failed to discover.

At first I was inclined to seek the causes in the condition of the food-supply. It seemed possible that abundant and sappy bast might account for the black colour, and the scanty and drier food the red. This supposition was based on the fact of a very long series exclusively of the black form having been bred in sappy food. However, experiment disproved this so far as any visible change taking place in the imago in one generation, for I subsequently reared series of the black form from logs in which the sap had been exhausted by a previous brood.

Nor does temperature account for the variation, for, in the same glass tube and subject to the same temperature, I have reared both forms at the same time.

Where the red-legged form comes from; whether it is gradually asserting itself over the black, which, at present, largely predominates in Britain, or the black over the red, are interesting problems which will repay investigation. The following data bear on this subject.

(1) Two ♂♂ and two ♀♀, type form, taken from their pupa cells in *Larix europæa* containing imagines with femora of all intergradations of colour from red to black, mingled, were isolated on a 4-ft. log of the same conifer on May 13th and 24th, 1906, and produced between August 13th, 1906, and May 1907, 65 of the type form and 31 var. *b*.

(2) Two ♂♂, type form, and two ♀♀, var. *b*, selected and treated the same way, May 13th and 25th, 1906, produced between August 13th, 1906, and May 1907, 69 type form and 71 var. *b*.

(3) Several ♀♀ and ♂♂, var. *b*, selected and treated the same way, May 13th, 1906, produced between August 10th and September 6th, 1906, 123 imagines, all of var. *b*, except two individuals in which the reddish tinge in the femora was so obscure as to be hardly perceptible.

(4) A similar experiment in another log produced 60 individuals of var. *b*.

(5) I have besides reared three successive generations from var. *b* stock, each numbering about 200 individuals, without a single instance of the type form occurring, and only one or two at most in each generation in which the reddish tinge in femora was so obscure as to be hardly perceptible.

(6) I have reared hundreds of other imagos from var. *b* stock taken from different localities with the same result. I conjecture from this that the type form (with red femora), is not likely to be produced from var. *b* stock (with black femora) in *Larix europæa*. And yet, as I have shown above, the most intense black form was in two different experiments produced from the brightest red parents. No instance of the fulvous-ferruginous elytra, visible in varieties of *T. fuscum* and *T. luridum*, have occurred in *T. gabrieli* in my experience, as might have been expected.

(7) From my single log of *Picea excelsa*, on which ova were deposited by var. *b* stock June 1906, I reared about 15 imagos of the var. *b*.

(8) From my single log of *Pinus laricio*, var. *nigricans*, oviposited on by var. *b* stock March 1906, I reared only one imago, and that of the var. *b* form. Unfortunately the rest of the larvæ perished in forcing over gas. From these latter food-plants I had rather anticipated obtaining, in some degree at least, the fulvous-ferruginous elytra of *T. fuscum* and *T. luridum*, or the pitchy red of *Asemum striatum*, var. *agreste*.

(3) Structural and Sculptural Variation.—Marked. Mulsant's description of *Cerambyx luridus*, L. (= *T. luridum*, L.), in respect of this applies in every detail to *T. gabrieli*:—

"Le prothorax offre des différences sensibles sous le rapport de son développement en longeur et en largeur; de sa forme; de son rétrécissement plus ou moins sensible dans sa seconde moitié; de la profondeur de son sillon; de sa ponctuation. L'écusson est ordinairement canaliculé; d'autres fois il le pairaît a peine. Les nervures des élytres sont plus ou moins prononcées."

Ratzeburg has excellently illustrated the life habits of this latter kindred species in his "Die Forst Insekten." They appear similar to those of *T. gabrieli*, with the one exception above mentioned (ante, p. 199). The pupa figured there differs in no respect from that of *T. gabrieli*, unless it be in the more pronounced spines on the femora and ventral surface of the abdomen.

Parasitism.—Though I have examined hundreds of larvæ and pupæ taken from trees infected in plantations and hundreds of burrows and pupa-cells besides, I have never observed any insect parasitic on this species.

I have, however, once come on a full-fed larva of *Malachius bipustulatus*, L., in a pupa-cell of *T. gabrieli* with a half-eaten pupa beside it. This individual pupated and duly emerged under observation. At about the same time I took an imago of this beetle on the bark of the same log.

The Hymenopteron, *Trypoxylon figulus*, Linn., with its parasite, *Stenodontus marginellus*, Grav., kindly named for me by Col. Bingham, very commonly frequents the vacated burrows of *T. gabrieli* both in bark and wood in the Leighton Buzzard district, as also do many other species of Hymenoptera. Found in the pupal chambers of *gabrieli* at the bottom of the burrows, these might at first be mistaken for parasites on the beetle larva by some.

Disease.—Small black specks and patches occur irregularly in the cuticle of the larva and pupa, indicating disease in these regions. Larvæ so affected do not always die. I marked one to ascertain this point. In this instance I effected a rapid transformation by increased temperature, with the result that the larva threw off the black patches in the exuviæ and became a clear white pupa, which duly emerged a perfect insect. In most cases, however, they die.

In affected areas an asphalte-coloured chitinous substance forms. Sometimes a wound opens, or the affected area throws out a fleshy seta-like excrescence. In some cases the affection appears in the skin and spreads internally. In others a discoloured area is visible underneath an apparently healthy skin. I have been unable to trace the cause of this. The fact that it has occurred in larvæ reared by myself from the egg under glass excludes the possibility of injury by any but the most minute insect parasites.

Mr. A. Gepp of the British Museum, in conjunction with Miss Lorraine Smith, has very kindly examined microscopic preparations made from an affected larva communicated by me, and informs me that, in the single instance before them, there does not appear to be any fungal parasite. They incline to the opinion that the affection is due to malnutrition and subsequent ulceration, or to bacterial action.

The affection has been most prevalent under the abnormal and unhealthy conditions of forcing over gas in a warm damp atmosphere. I have also observed it in larvæ taken from under bark of trees where the burrows were mildewed and several larvæ had died. I have observed what is apparently the same disease in larvæ of *Siricidæ* affecting larch and willow.

Propagation.—In timber-yards the species is propagated to a large extent, the beetles emerging and laying on adjacent timber felled in the current year. Much of this is cut up before the following summer, and a great many of the larvæ and pupæ perish in passing through the saw-mills. But a large number remain in the slabs and posts, etc., after the logs are cut up.

In cutting up timber of any considerable size, slabs are removed first from the logs, either one or more according to what the timber is required for. These slabs consist of bark and sapwood, and are sufficiently thick to take in many of the burrows containing pupating larvæ (November–April).

In these slabs and in smaller timber sawn in two or quartered for posts, the insect is transported in all directions to emerge in new districts and establish itself in the nearest plantation containing this conifer.

This doubtless has been a potent factor in the spread of the beetle throughout the country ; but it is probable that it has been spread in a still greater degree in incoming timber, infected in the plantations and brought from long distances to the saw-mills.

I have seen such logs brought in containing hundreds of larvæ, and, where there is sickly *Larix* in the neighbourhood of these saw-mills, little of it escapes oviposition and the species becomes abundant there.

A large percentage of larvæ remain in the timber-yard in uncut logs till the summer, when the perfect insects emerge and lay their eggs on incoming timber freely. To raise the bark of logs in timber-yards between September and the following summer is to find a large proportion of it affected.

The larch canker, the larch aphis (*Chermes laricis*, Hartig.), and unsuitable environment multiplying the number of sickly and dying trees * lend themselves to the

* I am indebted to Mr. G. Massee of the Royal Gardens, Kew, for this information.

propagation of the insect. Another very important factor is the remarkably short life cycle.

While one brood of the slower-developing Longicorns such as *Criocephalus* is being perfected, many generations of *Tetropium* will have emerged and spread among sickly trees, which they will quickly kill and desert.

The GREEN WOODPECKER, *Gecinus viridis*, renders affected trees very unsightly by hammering innumerable large holes in the bark with its bill to extract the larvæ and pupæ.

DAMAGE TO TIMBER.—It is quite certain that the species cannot injure healthy trees. Whether it lays upon these through lack of discrimination or not I cannot say. In the event of its doing so the newly-hatched larva must inevitably be smothered in its minute burrow by the flow of sap on eating into the surface of the tender bark. I have only found the larva in failing trees.

From a commercial point of view the species injures the wood to a certain extent, but considerably less than *Criocephalus* and *Sirex*, which feed in the wood itself, excavating it more deeply and to a much greater extent.

METHODS OF REARING THE LARVA.—The methods I adopted were as follow:—

As the habit of the larva is to feed over the smooth, sappy surface of the wood cylinder and upon the innermost lining of bast adjacent to it, it occurred to me to substitute glass for the wood surface, and, placing the inner surface of the tender and pliable bark against it, insert the newly-hatched larva between them. It might thus be induced to feed next the glass and admit of being observed continually.

No. 1.—Accordingly I fitted a ring of fresh, tender bast, separated from the outer dead bark and therefore pliable, firmly and closely to the inner surface of a $\frac{3}{4}$-in. corked glass tube of equal dimensions from the rim throughout (such as appear in Plate XIX, *a*, *b*, *c*, *d*), and inserted the larva in a fine groove, little more than a pin-scratch, made by drawing the head of a small pin down the bark, and extending an inch or more downwards from the rim of the tube. A V-shaped opening to this tiny groove was made at the rim, to start the larva in, for it cannot be inserted in the very small groove itself without injury, but must make its way in. The cylinder of bark had previously been pressed tightly to the glass by filling in the empty space in the middle of the tube with wads of tissue paper. If the groove was not made too deep for the larva it would follow it in its excavations readily, feeding along it, and thus be kept in sight. If made too deep the larva buried itself in the bark.

The tube must not be with a neck and metal cap such as those used by Mr. G. Smith in rearing *Criocephalus* and *Asemum* in their advanced stages (Plate XIX, *e, f*), for the neck being narrower than the body does not admit of the cylinder of bark being inserted close enough to the glass to keep the minute larva in the groove, and is in other respects impracticable.

This corked glass tube method was fairly successful, and by it I brought larvæ through their first moult with considerable trouble. But the chief objection to it was the difficulty of removing the ring of bark from the tube, when changing the larva, without rubbing the latter against the glass and crushing it.

No. 2.—Having thus lost several larvæ, I devised the better plan of 2-in. squares of flat glass laid on to the inner surface of bark taken entire from the log and bound tightly to it with string, the larva, as before, being inserted between (Plate XVII). This answered admirably.

Care, of course, must be taken (1) that too much moisture does not condense on the glass and drown the minute larva, and (2) that the bark is changed, at least, every third day to avoid mildew.

Under the lens I have observed newly-hatched larvæ consume the threadlets of freshly-formed mildew when excavating against the glass, but if they do so to any extent they become unhealthy and die.

It is well to place the pieces of bark containing the larvæ in a tin out of doors, covered over with a damp cloth to ensure their not drying up entirely. They must be kept from the direct rays of the sun and from the rain, but be given all the ventilation possible.

In the late autumn, if it is desired to force them indoors, it is a good and simple plan to place them on a mantelpiece over the warmest fire-place accessible in a tin with a few holes in the lid to admit of a little ventilation and at the same time to retain sufficient moisture in the pieces of bark. They do best in a temperature of 80°–90° Fahr. A hothouse would probably answer the purpose as well. Prior to adopting these two methods of rearing the young larva

I had tried various others without success, and had little hope of ascertaining the number of moults the larva undergoes. I had, moreover, exhausted all my ova with the exception of one late batch, for I did not then contemplate a second brood of beetles emerging and ovipositing as late as September.

Early in July 1906 with eighteen newly-hatched larvæ I made my last experiment, by the flat glass method, and of these I only succeeded in bringing six over the 3rd moult, four over the 7th, one over the 8th, and none to perfection (ante, p. 201).

Hitherto I have dealt with the feeding up of the larva in bark. When full fed it is advisable to transfer them to wood. In November 1905 following the June of that year when I first discovered this beetle I was confronted with a number of larvæ apparently full fed in a tree on which my females had laid in June. Some of these appeared to me, in this incredibly short time for a Longicorn larva, to have actually established themselves in their pupa-cells and seemingly would hibernate thus.

No. 3.—Accordingly I devised a method of bringing these through to perfection quickly in wood. In this way I obtained imagines almost at once, and was able to watch, for the first time, the transformation to the pupal and perfect states under glass.

I used the $\frac{3}{4}$-in. corked glass tube for the first time. Let into these were solid cylinders of fresh larchwood turned on a lathe exactly to fit the tube, leaving no space for mildew (Plate XIX, *a*, *b*, *c*, *d*). In the top of each piece of wood with a $\frac{1}{4}$-in. gouge I made grooves in the outer surface $1\frac{1}{2}$ in. long, extending downwards, large enough comfortably to take the larva and leave it space for packing away its rejected wood-fibre in forming the pupa-cell here.

Placed in these grooves the larvæ smooths down the interior walls, shaping them to its liking, and forming a pupa-cavity, as in the normal tree, except that the glass is used for one side. Sometimes it continues the burrow downwards, thus affording an excellent opportunity of observing the mode of excavation and the ramming process that takes place in the natural tree.

In each tube four to five larvæ were fitted up in adjacent grooves, and every movement could be observed through the glass.

I had, at times, as many as four dozen tubes occupied, and have reared as many as five imagos in one tube at the same time.

The tubes were placed over a fire-place in a temperature of 76°–90° Fahr. In this temperature development was rapid, the pupal state only lasting seven or eight days in some instances.

The cork should fit close down on the top of the wood to prevent the larvæ wandering and invading each other's cells. A very small groove may be cut down the side of the cork with a penknife, communicating with each larva to admit of ventilation and the escape of excessive moisture.

Should too great moisture condense on the glass in the cells the cork must be removed for a while. The reason for using wood instead of bark for the final stages of the insect is that it is less liable to become mildewed.

Mildew renders it almost impossible to bring a full-fed larva through to a healthy imago in tubes or bottles of bark, unless the larva be allowed to bury itself entirely in a thick piece and wad itself in, in which case, of course, it cannot be observed.

After rearing one feeble beetle in bark in a metal-capped tube, inserted when pupating (Plate XIX, *c*, *f*), I renounced the plan and used cylinders of wood with great success.

Nor is it possible to bring them through healthily in bark by the flat glass method (No. 2) used for feeding up the larvæ. Wood is, in all cases, the safest after the larva is full fed.

No. 4.—Where turned wood-cylinders for the tubes are not procurable another method has suggested itself to me which answers well. It consists in substituting wood for bark in method No. 2. Small blocks of wood, about 2 in. square, by 1 in., must be cut with even surface, and pieces of glass to fit them (Plate XVIII, *a*, *b*, *c*, *d*). Insert the larva or pupa in grooves cut on the surface of the wood with ¼-in. gouge (Plate XVIII, *a*), then apply the piece of glass and bind tight with string. Stand the pieces up on end so that the grooves lie perpendicularly with the openings above and do as in No. 2. In this case, as there is no cork to contain the larva in the groove when first inserted, put in a small stopper of cotton wool.

I know of no other method by which the excavations of the larva in the wood, the establishment in the pupa-cell, the transformations to the pupal and perfect state and the manner of emergence of the imago from the cell may be observed continuously and accurate knowledge arrived at.

No. 5.—Where it is not desired to watch the insect in its latter stages very closely under glass the following method will be found useful. Split a piece of wood and with a $\frac{1}{4}$-in. gouge make small hollows on the surface of one piece resembling pupa cells. Place the full-fed larvæ or pupæ in these, replace the counterpart and bind tightly with string. The string can be untied and the progress of the insects watched as often as is desired. The wood must be moistened if it gets very dry. Wood with sap in should be used, and the pieces of wood placed in tins to preserve the moisture so far as possible.

In conclusion I would express my thanks to Mr. C. J. Gahan for his always ready assistance in connection with the subject of this paper; to my brother Mr. L. R. Crawshay for his well-executed drawings on Plate XX, and also to Messrs. T. E. and W. R. Roland of Fenny Stratford for kindly affording me every facility for the observation of the species in their extensive saw-mills.

Explanation of Plates XV—XX.

[*See Explanation facing the* Plates.]

XII. *Studies of the* Tetriginæ (Orthoptera) *in the Oxford University Museum.* By J. L. Hancock, M.D., F.E.S. (Chicago).

[Read 28th March, 1907.]

Plate XXI.

The following notes and descriptions relating to Orthoptera are based on the collection of *Tetriginæ* contained in the Hope Department of Zoology, University Museum, Oxford, England. The writer is indebted to Mr. R. Shelford, who generously supplied for determination the present collection. Besides this material, the writer has drawn upon some examples of these insects in his own collection, which have not hitherto been recorded.

This article forms a sequel to various published contributions by the writer bearing on the *Tetriginæ*, the last of which appeared in " Genera Insectorum."*

Section TRIPETALOCERÆ, Bolivar.

Genus Tripetalocera, Westwood.

1. *T. ferruginea*, Westwood, Zool. Journ., vol. v, p 444, Pl. xxii, f. 3.

One male example from Kuching, N.W. Borneo, Dyak coll., R. Shelford; Oxford Museum.

Section DISCOTETTIGIÆ, Hancock.

Genus Discotettix, Costa.

1. *D. belzebuth*, Serville, Hist. Nat. Ins. Orthoptera, p. 759, 1839.

Five examples from Kuching, N.W. Borneo, Dyak. coll., R. Shelford. One of these, an immature specimen, presented by the Sarawak Museum; Oxford Museum.

* Genera Insectorum, 48me Fascicule, Orthoptera, Fam. *Acridiidæ*, Subfam. *Tetriginæ*, 4 Plates (P. Wytsman), pp. 79, 1906.

2. *D. shelfordi*, sp. nov.

Cinereous or fuscous, body rugose, conspersed with coarse granulations; superior ocelli placed between the middle of the eyes. Antennæ inserted little below and anterior to the ventro-anterior margin of the eyes, not at all serrulate, from the sixth to the eighth articles moderately compresso-dilated, the sixth only a little so modified, the ninth oval, the two apical articles very small, the apex of last joint acute. Frontal costa distinctly protuberant between the antennæ, and advanced much further than the eyes. Pronotum truncate anteriorly, the two prozonal carinæ behind the anterior margin parallel, dorsum rugose-subnodulose, strongly flattened, presenting sulcations anteriorly: humeral angles little produced laterally, behind the shoulders subfossulate, and subgibbose, with a pair of gibbose tubercles posteriorly about midway between the humeral angles and base of process; the course of median carina serrulate, indistinctly and irregularly subtuberculose; lateral marginal carinæ often bearing a number of small shining, somewhat obtuse tubercles, each humeral angle presenting one at the apices; pronotal process rather stout, little depressed, lengthily extended beyond the apex of posterior femora; lateral lobes little laminate outwards, the posterior angle excavato-truncate and angulate subacute, not at all serrulate or spinose. Elytra moderately large, distinctly acuminate towards the apices; wings fully explicate, as long as the process. Femora elongate, margins minutely serrulate; anterior femora above somewhat subbilobate; middle femora above subtrilobate, the posterior tibiæ serrulate, but not at all spinose. Length of male and female, entire, 17·5–19 mm.; pronotum 16–18·5 mm.; posterior femora 6–8·5 mm.

Three examples from Kuching, N.W. Borneo, Dyak coll., R. Shelford; Oxford Museum.

A very distinct species resembling, perhaps, *D. scabridus*, Stal, more than any other member of the genus.*

Genus PHÆSTUS, Bolivar.

1. *P. insularis*, sp. nov.

Stature small, cinereo-fuscus. Body somewhat smoothly granulate. Head not at all exserted; vertex narrowed forward, nearly equal in front to one of the eyes, anteriorly subtruncate, transversely lightly carinate, advanced about as far as the anterior fourth of the eyes,

* Named in honour of Mr. R. Shelford, whose interest in the Oxford Museum is shown by the large series of Orthopteran specimens bearing his name as the donor.

fossulate on each side of the feeble, abbreviated, median carina; frontal costa strongly protuberant between the antennæ and rather narrowly sulcate; superior ocelli placed between the submedian part of the eyes, visible in profile; antennæ inserted little anterior to and scarcely below the ventro anterior margin of the eyes, filiform, but the fifth and sixth articles little compresso-expanded, the seventh to ninth distinctly compresso-dilated, the two apical articles minute, the apices acute. Pronotum anteriorly little rounded produced, posteriorly acuminate, extended little beyond the apices of the posterior femora; anterior prozonal carinæ behind the anterior margin wanting, median carina little acute, percurrent, in profile substraight; anterior sulci subobsolete, humeral angles wanting, the humero-apical carinæ percurrent backward, and forward extended as far as the point opposite and above the inferior sinus; lateral lobes turned down, the posterior angles obtuse. Elytra small elongate, sublanceolate; wings fully explicate, extended to or little beyond the apex of pronotal process. Anterior and middle femora elongate, the margins straight, entire; the posterior femora little incrassate, the superior margin arcuate, minutely serrulate, posterior tibiæ plurispinose and minutely serrulate, the inner fourth part toward the apices unarmed, the three pulvilli of the first article of posterior tarsi equal in length, subacute. Length of body, female entire, 9·5–10 mm.; posterior femora 5–5·5 mm.

Three examples from Kuching, N.W. Borneo; two of these from the Sarawak Museum, No. 337 and 357, and the other Dyak coll., R. Shelford; Oxford Museum.

The antennæ in this species are more compressed than in *P. mellerborgi*, Stål, and the facial frontal costa is more narrowly sulcate.

Section CLADONOTÆ, Bolivar.

Genus DELTONOTUS, Hancock.

1. *D. tectiformus*, Hancock, Spolia Zeylanica, vol. ii, p. 111–112, Pl. I, figs. 2–2*a*, 1904.

Two examples from Pundaluoya, Ceylon; Oxford Museum.

These specimens have the pronotum less produced anteriorly than the type examples in the author's collection, from the same locality, and are provisionally considered immature. It is however possible that they are distinct from *tectiformus,* and two in my collection from Hantane, Ceylon, bear the label "*D. cristatus,* sp. nov.," awaiting study of a larger series to settle the matter.

Genus Potua, Bolivar.

1. *P. coronata,* Bolivar, Ann. Soc. Ent. Belg., vol. xxxi, p. 208, Pl. I, fig. 9, 1887.

Four examples from Kuching, N.W. Borneo, R. Shelford; Oxford Museum.

Genus Epitettix, nov.

Stature small, body somewhat smooth but densely punctate. Vertex broad, little narrowed forward, much wider than one of the eyes, anteriorly not at all transversely carinate but on each side with a very small, though distinct elongate longitudinal carina, front margin convex, with an abbreviated somewhat thickened and produced median carina ; face oblique ; superior ocelli placed between the lower third of the eyes ; the face together with the crown of head forming an obtuse angulate profile, frontal scutellum not divided above the posterior ocelli, triangular, and the margins but little elevated, not produced in profile ; antennæ inserted little forward and below the ventro-anterior margins of the eyes, the distance between them much wider than that to the eyes. Pronotum anteriorly truncate, posteriorly cuneate, with subacute apex, not extended backward to the apices of the posterior femora ; median carina percurrent, distinct, and substraight, dorsum subtectiform, punctate, prozonal carinæ behind the anterior border somewhat indistinct ; humeral angles almost wanting ; lateral lobes little reflexed outwards, the posterior angles obliquely truncate behind. Elytra and wings wanting ; margins of anterior and middle femora entire, posterior femora little incrassate and of ordinary form, the margins of posterior tibiæ plurispinose, and minutely serrulate, the first articles of the posterior tarsi strongly larger than the third, the three pulvilli about equal in length. Resembling *Diotarus,* Stål.* Type, *Epitettix punctatus.*

1. *E. punctatus,* sp. nov. (Plate XXI, fig. 1.)

Fuscous, with the posterior half of dorsum and upper distal half of hind femora flavo-ferruginous, the anterior and middle tibiæ

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* This genus may be assigned to my Subsection II, under *Cladonotæ,* and next to *Diotarus,* Stål, as given in my key in Genera Insectorum. Vide p. 9, 10, 48me Fasc. Orthop. Subfam. *Tetriginæ,* 1906.

light, annulate with fuscous. Apical articles of maxillary palpi little dilated, oval. Length of body entire, male, 10 mm. ; pronotum 7 mm. ; posterior femora 5 mm.

One example from Kuching, N. Borneo, R. Shelford; Oxford Museum.

Genus CLADORAMUS, nov.

This genus differs from *Pantelia*, which it most resembles, in the anterior margin of pronotum being profoundly produced forward over the head, forming a process, in the sulcation of the forward dorsal margin of crest, the presence of strongly carinate-crenulate humeral angles which are little produced outwards, and in the lateral lobes of pronotum bearing a superior or elytral sinus for the reception of the elytra, the latter being of ordinary form.

1. *C. crenulatus*, sp. nov. (Plate XXI, fig. 2.)

Greyish, body strongly rugose, somewhat sparingly provided with small subspiniform tubercles. Face nearly vertical, viewed in profile wholly denticulate ; vertex very broad, on each side forward adjoining the eyes armed with an obliquely produced spine, the middle backward denticulate, and forward strongly armed with produced denticles between the eyes ; frontal scutellum with convex sides, the margins denticulate produced, the facial median carina below as well as face on each side denticulate ; eyes small and subsessile ; the three apical articles of the maxillary palpi compresso-dilated ; antennæ inserted far below the eyes, the distance between them and that to the eyes nearly equal. Pronotum rugose, strongly tectiform and cristate, anteriorly profoundly produced beyond the head, in the form of a sublongitudinal process, posteriorly extended only little beyond the apices of the posterior femora ; the anterior process viewed from above presenting a strongly spinose margin below on each side, the apex bifid and the upper dorsal margin distinctly sulcate ; viewed in profile the whole dorsal crest little elevated somewhat horizontally, but the anterior half undulato-crenulate, the process anteriorly little arcuate above, at the middle behind the shoulders somewhat angulate ; from here backwards strongly sinuato-dentate, the apex very little turned downward behind ; humeral angles strongly carinate, little produced outwards, and strongly crenulate ; lateral lobes of pronotum posteriorly bisinuate, below widely laminate outwards subhorizontally, arcuate anteriorly, posteriorly often armed with three obtuse denticles or crenulate. Elytra of moderate size, elongate sublanceolate, where they rest at the sides, the inferior lateral margin of pronotum little arcuato-excavate for their reception; wings wanting. Anterior femora strongly compresso-foliate, scarcely longer than wide, the superior margin sinuate, below coarsely crenulate; anterior tibiæ strongly compresso-ampliate behind the middle, above canaliculate, with a spur midway on the margins, behind the inner margin toward the distal extremity armed with acute spines (about five), middle femora externally tuberculose, margin above strongly acute-sinuate and denticulate, below lobato-crenulate, middle tibiæ ampliate at the middle, the superior inner margin furnished with denticulate lobes; hind femora externally strongly rugose and armed with spinous tubercles, the outer carina below, as viewed from above bearing strongly denticulate lobes at the middle, and at the apical fourth similarly armed, though not so pronounced, knees denticulate on the sides and above, the lower margin of hind femora strongly lobato-denticulate, the posterior tibiæ rather stout, the canthi crenulate and plurispinose, the inner canthus regularly spined, the third pulvilli of the posterior tarsi little longer than the first or second articles, straight below. Length of the body entire, female, 11 mm.; pronotum 12·8 mm.; anterior process of pronotum 2·5 mm.; posterior femora 5·5 mm.

One female example from Rhodesia, East Loangwa, Africa, S. A. Neave; Oxford Museum.

Section SCELIMENÆ, Bolivar.

Genus Scelimena, Serville.

1. *S. producta*, Serville, Hist. Nat. Ins. Orthopt., p. 762, 1837.

One example from East, and three from West Java, H. Fruhstorfer; Oxford Museum.

2. *S. sanguinolenta* (Krauss), Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 216–217, 1887.

One example from East, and three from West Java; Oxford Museum.

3. *S. logani*, Hancock, Spolia Zeylanica, vol. ii, p. 120–122, figs. 5–5*c*, Pl. I, 1904.

Two examples from Kelawaewa, N.C. Province, Ceylon; Oxford Museum.

4. *S. gavialis*, Saussure, Ann. Soc. Ent. France, p. 485, 1860.

Three examples. One from Pundoluoya, and two from Kandy, Ceylon; Oxford Museum.

5. *S. india*, sp. nov.

Resembling *S. producta* but slightly stouter in stature. Body fuscous, pale variegated, the carinæ of dorsum flavo-maculate, the tibiæ with pale annuli. Vertex subequal in width to one of the eyes, the frontal carinæ on each side little compressed and subacute. Pronotum anteriorly somewhat subangulate, posteriorly extended beyond the knees of the hind femora about as far as the tibial apices, but not so lengthily attenuate as in *producta;* dorsum conspersed with granules; depressed and uneven, between the sulci forwards subfossulate on each side, between the shoulders bearing subelevated longitudinal costate protuberances, humeral angles unarmed, behind the shoulders bifossulate, and presenting a pair of rounded subelevated nodules, again another pair somewhat fused together appear posteriorly opposite the middle of the hind femora which are indistinct; posterior process stout at the base and acuminate toward the apex; median carina rather incrassate, unevenly undulate, anteriorly at the margin little protuberant and subtuberculate: lateral lobes at the anterior margin armed with small tubercles, the posterior margin little laminate outwards, and armed with a distinct, acute spine on each side, directed transversely but little curved forward. The posterior femoral margins entire, the posterior tibiæ armed with minute denticles, the margins dilated towards the apices; the first article of the posterior tarsi dilated but not so widely as in *producta*. Length of body entire, male, 19·5 mm.; pronotum 18 mm.; posterior femora 7 mm.

Two examples from Cherrapunji, Assam; Oxford Museum.

Genus CHTHONOTETTIX, Hancock.*

1. *C. palpatus*, Stål, Ofv. Vet. Akad. Forh., p. 57, 1877. = *Chthonius palpatus*, Bolivar. (Plate XXI, fig. 3.)

Body sparingly granulose, fuscous, obscurely variegated with flavous. Vertex distinctly narrower than one of the eyes, the anterior carinæ rounded oblique; eyes globose; frontal costa roundly protuberant between the antennæ, narrowly sulcate and divided little above the posterior ocelli, the latter situated between the lower third of the eyes, conspicuous in profile; antennæ inserted scarcely

* The name *Chthonotettix* was proposed by the present author (*vide* Genera Insectorum, 48me Fasc. Orthoptera, Subfam. *Tetriginæ*, p. 26, 1906) to replace Bolivar's preoccupied genus *Chthonius*.

below and anterior to the ventro-anterior border of the eyes. Pronotum truncate anteriorly, posteriorly lengthily extended beyond the knees of the hind femora; median carina often interrupted, disappearing anteriorly behind the frontal margin and posteriorly on the apical process, in profile little gibbulous between the shoulders, posteriorly sinuate; dorsum depressed, with abbreviate costa between the humeral angles, strongly fossulate behind the humeral angles, subnodulose in single order posteriorly, and the process toward the extremity smooth and cylindrical; lateral lobes little laminate, the posterior angles armed with distinct transverse spine on each side, acute. Elytra moderately large, elongate sublanceolate; wings fully explicate but not quite reaching to the pronotal apex. Femoral margins entire, anterior and middle femora very slender, nearly equal in length; margins of posterior tibiæ moderately dilated, sparingly armed with small denticles, the inner canthus unarmed at the distal fourth; the first articles of the posterior tarsi not at all dilated, the three pulvilli equal in length and straight below. Length of body entire, female, 22 mm.; pronotum 20·5 mm.; posterior femora 8·5 mm.

One example, No. 2772, from Luzon, Manilla, Philippines, E. L. Meyer; Oxford Museum.

Genus Gavialidium, Saussure.

1. *G. crocodilus*, Saussure, Ann. Soc. Ent. France, p. 481, 1860.

Four examples from Pundaluoya, Ceylon. Oxford Museum.

Genus Oxynotus, Hancock.

1. *O. hastatus*, Hancock, Occas. Mem. Chicago Ent. Soc., vol. i, No. 1, p. 12, 13, Pl. I, figs. 3–3*a*, 1900.

One example from N.E. Madagascar, Bay of Antongil, Mocquerys; Oxford Museum.

Genus Criotettix, Bolivar.

C. tricarinatus, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 224, 1887.

Eleven examples from Pundaluoya, and other points in Ceylon; Oxford Museum.

2. *C. flavopictus*, Bolivar, Ann. Soc. Ent. France, vol. lxx, p. 582, 1902.

Two examples from Cherrapunji, Assam; Oxford Museum.

3. *C. oculatus magnus*, var. nov.

This form nearly resembles the Sumatran species *oculatus*, Bolivar, but differs in being larger in stature.

Length of body entire, male and female, 15–18 mm.; pronotum 14–17·5 mm.; posterior femora 5·5–7 mm.

Five examples from West and Mid Java; Oxford Museum; numerous examples in the author's collection.

Genus ACANTHALOBUS, Hancock.

1. *A. rugosus*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 228, 1887.

Five examples are referable to this species, they are from Kuching, N.W. Borneo, R. Shelford; Oxford Museum.

2. *A. saginatus*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 225, 1887.

Seven examples, including specimens from Java and China; Oxford Museum.

3. *A. longinotus*, sp. nov.

This species is closely allied to *A. rugosus*, Bolivar, and might possibly be the long-winged form of the latter. It differs principally in the pronotum being strongly extended backward beyond the femoral apices, and in the body being somewhat stouter. It bears moreover a near resemblance to *nexuosus* also, but it is smaller in stature. Ferruginous or tending to fuscous. Vertex wider than one of the eyes, very little narrowed forward, very slightly marginate on each side anterior to the lateral supraocular lobes, median carina abbreviated; frontal costa very sparingly compresso-elevated between the antennæ, in profile scarcely sinuate below the median ocellus, above declivous. Pronotum anteriorly truncate, posteriorly lengthily extended beyond the femoral knees; dorsum convex between the shoulders, subbifossulate behind them, the surface rugose, irregularly furnished with abbreviated rugæ and tubercles, posterior angle of the lateral lobes triangular, somewhat acute, but not spinose. Wings little longer than pronotum in the female. Anterior and middle femora margins subentire, the posterior femoral margins minutely serrulate. Length of body entire, male and female, 16·5–19 mm.: pronotom 16–17·5 mm.; posterior femora 6·5–7·6 mm.

Seven examples from N.W. Borneo, R. Shelford; Oxford Museum.

4. *A. fuscus*, sp. nov. (or var.?).

Similar in stature to *longinotus*, but entirely fuscous (as in *nexuosus*), the vertex wide, and the frontal costa more roundly produced between the antennæ, and sinuate below the median ocellus, the lateral margin of vertex with distinct lobes and marginate on each side forward. Dorsum of pronotum very strongly rugose, plentifully furnished with abbreviated rugæ, and tubercles irregularly disposed; in profile the median carina of pronotum strongly sinuate, little subnodulose forward, and distinctly depressed behind the shoulders; lateral lobes little more reflexed outwards, the triangular posterior angle little more acute and somewhat spinose. Length of body entire, female, 18 mm.; pronotum 16·8 mm.; posterior femora 8 mm.

One example from N.W. Borneo, R. Shelford; Oxford Museum.

5. *A. miliarius*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 226, 1887.

Two examples from Pundaluoya, Ceylon; Oxford Museum.

6. *A. miliarius cuneatus*, Hancock, Spolia Zeylanica ii, part vii, p. 133, 1904.

Three examples from Ceylon; Oxford Museum.

7. *A. robustus*, sp. nov.

A stouter form than either *longinotus* or *rugosus*, and like the latter having abbreviated wings and pronotal process not at all or very little extended beyond the knees of the hind femora; dorsum between the shoulders rather broader; colour ferrugineous or fuscous; the vertex distinctly wider than one of the eyes; lateral lobes of pronotum decidedly reflexed outwards, the posterior angles triangular but not at all spinose; dorsum of pronotum strongly rugose and tuberculose; the third articles of the posterior tarsi (in the female) little longer than the first or the second. Length of body entire, male and female, 13·8–15·4 mm.; pronotum 13–14 mm.; posterior femora 7–9 mm.

Two examples from Kuching, N.W. Borneo. One of these from the Sarawak Museum, the other from R. Shelford; Oxford Museum.

8. *A. bispinosus*, Dalman, Vet. Akad. Hand., p. 77, 1818.

One example from Penang, Malacca, E. L. Meyer; Oxford Museum, No. 3452.

Genus Loxilobus, Hancock.

1. *L. assamus*, sp. nov.

A small form, with abbreviated wings and pronotal process. Cinereous or ferruginous, often infuscate on the sides and legs; vertex subequal in width to one of the eyes, advanced as far as the eyes, narrowed forward, distinctly longitudinally sulcate on each side; frontal costa in profile convex. Pronotum anteriorly truncate, posteriorly cuneate, extended backward as far as the hind femoral knees; dorsum tuberculose, subcostate between the shoulders, and here somewhat convex, deplanate posteriorly; median carina of pronotum sinuate in profile, sometimes little elevated forward, before the shoulders; lateral lobes little laminate outwards and subtriangular, obliquely truncate; margins of anterior and middle femora entire, the third articles of the posterior tarsi, with the third pulvilli longest, the apices of the first and second acute. Elytra elongate, with rounded apices; wings abbreviated, little shorter than the pronotal process.

Three examples from Cherrapunji, Assam; Oxford Museum.

2. *L. truncatus*, sp. nov.

Resembling *acutus*, but having the lateral lobes of pronotum little dilated, and obliquely truncate behind, the posterior angles distinct, but not acute, the dorsum of pronotum lightly rugose, but without distinct lineate rugæ or tubercles; wings fully explicate and extended backward as far as the pronotal process. Length of body entire, female, 14 mm.; pronotum 13 mm.; posterior femora 6·2 mm.

One example from Kuching, N.W. Borneo, Dyak coll., R. Shelford; Oxford Museum.

3. *L. insidiosus*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 228, 1887. (*Criotettix insidiosus* of Bolivar.)

One example from Kuching, N.W. Borneo, R. Shelford; Oxford Museum.

Genus Bolotettix, nov.

Body conspersed with granules or somewhat punctate. Vertex strongly narrower than one of the eyes, subacuminate forward and little ascendant, subsulcate on each side of the feeble median carina, the lateral margins anteriorly provided with suboblique carinæ open in front, and bear small indistinct supraocular lobes; frontal costa in profile little compresso-elevated between the antennæ, viewed in front narrowly compressed and sulcate little above the posterior ocelli, the rami below moderately divergent toward the median ocellus; eyes large and strongly globose, somewhat prominently elevated; posterior ocelli placed near the lower third of the eyes; palpi with the apical articles little compresso-dilated; antennæ filiform and very slender, inserted scarcely below the antero-ventral border of the eyes. Pronotum anteriorly truncate, posteriorly subulate, often extended little beyond the hind femoral apices; dorsum anteriorly cylindrical, the prozonal and lateral carinæ before the shoulders wanting; between the shoulders backward deplanate, and behind the shoulders often subbifossulate; median carina forward behind the anterior margin wanting, in front of the shoulders somewhat compresso-arcuate; lateral lobes of pronotum posteriorly bisinuate, the posterior angles moderately laminate, and on each side strongly armed with a transversely produced spine, or rarely little produced. Elytra very small and lanceolate; wings fully explicate, not extended so far as the apex of pronotal process or about as far. Anterior and middle femora narrow, elongate, carinæ entire, posterior femoral margins serrulate, the genicular denticles moderately distinct, posterior tibiæ scarcely at all ampliate toward the apices, with the canthi compressed, spinose, and minutely serrulate, the first and third articles of the posterior tarsi subequal or the first little longest. Type *Bolotettix validispinus.*

This genus is readily distinguished from *Criotettix*, which it most resembles, in the very narrow subacuminate vertex, the absence of the anterior prozonal and lateral carinæ on the dorsum of pronotum, the cylindrical character of the forward part of the pronotum, the strongly-produced spines arming the posterior angles of the lateral lobes, the very small elytra, and the insertion of the antennæ barely below the eyes.

1. *B. validispinus*, sp. nov. (Plate XXI, fig. 5.)

Dark ferruginous, the face and legs lighter, the lateral thoracic spines and borders of pronotum rufescent, posterior femora externally below longitudinally striated with fuscous, posterior tibiæ and under parts of body fuscous. Face oblique; vertex ascendant forward, in front reduced to nearly one-half the width of one of the prominent and globose eyes, anteriorly subobliquely marginate on each side, in profile not at all produced, middle feebly carinate, very little longitudinally sulcate on each side, supraocular lobes indistinct; frontal costa little compresso-elevated between the antennæ. Pronotum anteriorly cylindrical, subulate posteriorly, little concave backwards, and extended beyond the knees of the hind femora and slightly beyond the wings, the apical process little upturned at the tip, dorsum of pronotum nearly smooth, conspersed with granules, little bifossulate behind the shoulders; median carina in profile undulate, before the shoulders compresso-arcuate, and forward behind the anterior margin obliterated, but distinct posteriorly; lateral carinæ of pronotum wanting: the lateral margins of pronotum just above the elytra at sides longitudinally sulcate; lateral lobes with the posterior angles strongly produced outward on each side in a transverse acute spine, stout, and triangular. Elytra small and lanceolate; wings largely concealed by the pronotum posteriorly. Anterior and middle femora rather slender, the margins entire; the apical denticles of posterior knees subacute, the ante-genicular denticles moderately distinct; the first articles of the posterior tarsi having the first pulvilli smallest and acute, the third barely longer than the second, subflattened below. Length of body entire, female, 15 mm.; pronotum 14·5 mm.; posterior femora 7 mm.

One example from (Kuching?) N.W. Borneo; Sarawak Museum, No. 344; Oxford Museum.

2. *B. planus*, sp. nov.

Greyish fuscous, the face similarly coloured, but the legs lighter, the posterior femora externally light above, striated with fuscous below, posterior tibiæ fuscous. Vertex very narrow, in front barely more than half the width of one of the globose eyes, ascendant forward; frontal costa barely compresso-elevated between the antennæ, face oblique, scarcely sinuate. Pronotum anteriorly cylindrical, the prozonal carinæ very indistinctly indicated, posteriorly subulate and extended little beyond the knees of the hind femora; the dorsum interspersed with coarse granulations, subpunctate posteriorly, between the shoulders bearing indistinct, abbreviated, secondary costa; median carina subincrassate, but low, obliterated behind the anterior border, posteriorly straight, but little compresso-arcuate forward before the shoulders; lateral lobes with the posterior angles on each side bearing a transverse spine, strongly narrowed acute. Elytra small, lanceolate, and black; wings fully explicate but extended only as far backward as apex of pronotal process, coloured black or fuscous. Anterior and middle femora elongate, narrow, margins entire; posterior femora externally bearing strongly expressed oblique costæ; the first and second pulvilli of posterior tarsi equal in length, acute, the third longer and flattened below. Length of body entire, female, 12 mm.; pronotum 11 mm.; posterior femora 5·7 mm.

One example from Mt. Matang, 3000 feet, near Kuching, N.W. Borneo; Sarawak Museum, No. 342; Oxford Museum.

This species is readily distinguished from *validispinus*, by the smaller stature, being narrower between the shoulders, in the more coarsely granulate pronotum, the more slender thoracic spines, the less extended and straighter pronotum, and the black elytra and wings.

3. *B. perminutus*, Bolivar, Ann., Soc. Ent. Belg. xxxi, p. 227, 228, 1887.

This species occurs in the Philippines, and was described by Bolivar under the caption *Criotettix*. It was inadvertently omitted from my list of the species of *Criotettix* in my article in Genera Insectorum (48me Fasc. Orthoptera, Subfam. *Tetriginæ*, p. 28, 1906), but it is referred to there in a foot-note. Attention was called to the species as belonging to a new subgenus. I find it falls naturally under the new genus *Bolotettix* above described.

4. It is quite likely that *Criotettix nigellus* (Bolivar, Ann. Soc. Ent. Belg., p. 225, xxxi, 1887) belongs here also. It is from Gaboon (Bolivar).

Genus OCYTETTIX, nov.

Recalling *Charagotettix*, to which it bears a near resemblance. Body strongly rugose ; vertex wide, transverse, imperfectly carinate forward, on each side bearing a small compresso-acute carina, inwardly interrupted, fossulate on each side of the small median carina ; eyes small ; face moderately oblique, strongly sinuate ; frontal costa roundly compresso-produced between the antennæ, viewed in front sulcate little above the posterior ocelli, below the rami moderately subparallel to the median ocellus ; posterior ocelli placed between the lower third of the eyes ; antennæ inserted distinctly before the eyes ; maxillary palpi little compresso-ampliate apically. Pronotum anteriorly truncate, middle of the anterior margin often excavate, posteriorly acuminate, the apex spinose, often upturned and not extended backward beyond the knees of the hind femora ; dorsum strongly depressed, often unigibbose forward and transversely fossulate between the shoulders, backwards often quadrinodulose ; the humeral angles produced outwards laterally and strongly carinate, the lateral margins just before and behind the shoulders strongly elevated ; the lateral carinæ profoundly compresso-sinuate ; median carina strongly compresso-gibbose in front of the shoulders, depressed and indistinct behind the anterior margin, anterior prozonal carinæ strongly expressed, fossulate between them, lateral scapular area at the sides wide ; lateral lobes at the interior border often bearing a tubercle on each side, the posteror angles widely laminate, produced outwards and triangular acute, obliquely truncate behind. Elytra and wings wanting. Anterior femora elongate, lobate ; posterior femora above externally bearing a series of large subrounded tubercles, and at the middle bituberculate, margins serrulate, the genicular and antegenicular denticles stout, subtriangular, posterior tibæ little ampliate towards the apices, the canthi plurispinose and minutely serrulate.

1. *O. latihumerus*, sp. nov. (Plate XXI, fig. 4.)

Body obscure ferruginous, infuscated, legs fuscous and pale annulate. Pronotum dilated between the humeral angles, the dorsum having the anterior gibbosity distinctly elevated, convex forward and declivous backward, posteriorly provided with two pairs of low subacute nodules ; the posterior angles of the lateral lobes having the margin behind the thoracic spines somewhat serrulate. Anterior femoral margins above subbilobate, with a median denticle below ; the posterior femora having the first denticle situated at the middle of the external pagina little produced, the second smaller. Length of body entire, female, 12·5 ; pronotum 10 mm. ; posterior femora 7 mm.

One example from N.E. Madagascar, Bay of Antongil, Mocquerys ; Oxford Museum.

Section METRODORÆ, Bolivar.

Genus SYSTOLEDERUS, Bolivar.

1. *S. greeni*, Bolivar, Ann. Soc. Ent. France, vol. lxx, p. 584, 1901.

Six examples from Pundaluoya, Ceylon; Oxford Museum.

2. *S. parvus*, sp. nov.

A small species, smoothly granulate ; cinero-ferruginous, with black wings. Head little exserted ; eyes globose and strongly approximate : vertex narrowly accuminate; frontal costa between the eyes vertically declivous, not at all sinuate; antennæ inserted distinctly before the eyes; posterior ocelli placed on a plane with the antero-ventral border of the eyes. Pronotum smoothly granulate, anteriorly truncate, cylindrical forward, and behind the anterior margin slightly ascendant, posteriorly subulate; median carina of pronotum very thin, low, and indistinct; the posterior angles of the lateral lobes turned down, subobtuse. Elytra light, elongate, margins above substraight, below curvate, acuminate forward and apically, the external surface very lightly punctate; wings fully explicate. Legs light ferruginous, margins of anterior and middle femora little compressed, entire. Length of the body entire, female, 11 mm.; pronotum 10·2 mm.

One example from Kuching, N.W. Borneo; Sarawak Museum, No. 358; Oxford Museum.

Genus RHYNCHOTETTIX, nov.

Body smoothly punctate; face profoundly retreating; vertex strongly rostrate, viewed from above the rostrum very much longer than the length of one of the narrow eyes, the apex distinctly rounded, the middle longitudinally carinate; frontal costa very narrowly sulcate, the carina above compressed, percurrent forward underneath the process to the apex; eyes viewed from above narrowly subelliptical, in profile compresso-conoidal; superior ocelli placed on a plane with the lower third of the eyes; the median ocellus placed far below the eyes; antennæ inserted little before (below) the antero-ventral border of the eyes. Pronotum truncate anteriorly, the margin little convex produced, posteriorly acuminate, but not spinose, toward the apex little concave and extended backward little beyond the posterior femoral knees; dorsum narrow between the shoulders, cylindrical forward, the prozonal carinæ here obliterated; median carina low deplanate forward, but little elevated and distinct posteriorly; lateral carinæ low; lateral lobes with the anterior margin below obliquely excised, the posterior angles of the lateral lobes little laminate outwards, distinctly produced in an acute spine on each side. Elytra and wings wanting. Middle femora elongate, margins little compressed entire; genicular and antegenicular denticles moderately stout; the posterior tibiæ little ampliate toward the apices, the canthi spinose, the first article of the posterior tarsi distinctly longer than the third. Type *Rhynchotettix rostratus*.*

1. *R. rostratus*, sp. nov. (Plate XXI, fig. 7.)

Fusco-ferrugineous, with lighter longitudinal striation on each side of dorsum, posterior femora with the external faces below striated with fuscous. Rostrum triquetrous, strongly produced and when viewed from above about one and a half times longer than the length of one of the narrow eyes, the base of process subequal in width to one of the eyes; frontal costa viewed in profile roundly excavate opposite the eyes, and below very slightly sinuate, between

* This genus belongs to the second subsection under *Metrodoræ*, as given in my article *Tetriginæ*, Genera Insectorum, p. 32, 1906.

the antennæ very slightly compresso-elevated. Pronotum with the dorsum finely punctate, frontal margin rounded-truncate, posteriorly acuminate, the apical process extended little beyond the knees of the hind femora, and little longitudinally concave; posterior angles of the lateral lobes armed on each side with an acutely-produced spine, obliquely truncate behind; the pulvilli of the posterior tarsi distinctly flattened below, the first smallest, the second and third equal in length, and longer than the first. Length of body entire, female, 14·8 mm.; pronotum 11·8 mm.; posterior femora 6 mm.

One example from N.E. Madagascar, Bay of Antongil, Mocquerys; Oxford Museum.

Genus MITRITETTIX, Hancock.*

1. *M. processus*, sp. nov. (Plate XXI, fig. 8.)

Stature little larger than *phyllocera*, which it nearest resembles. Body finely punctate, granulate; grayish ferruginous. Vertex rostrate, flattened above, subnarrowed forward, horizontally produced, about twice the length of one of the eyes, and at the base nearly twice the width of one of the eyes; viewed from above the first half of the process with the sides subparallel, at the middle of the rostral margins angularly excavate on each side; the apical half of process being little narrower than the first half, and little dilated at about the middle, forward the sides converge forming an obtuse angle in front, middle carinate, slightly longitudinally sulcate on each side; head viewed in profile little convex above, the rostrum often little bent downward, face oblique; frontal costa somewhat widely sulcate, dividing above the posterior ocelli, the carina above passing forward on the underside of the rostrum strongly compresso-elevated; posterior ocelli placed between the submiddle part of the eyes, a little in advance of them; median ocellus situated far below the eyes; maxillary palpi with the apical articles dilated; antennæ short, inserted scarcely below the antero-ventral border of the eyes; maxillary palpi with the apical articles dilated. Pronotum anteriorly truncate, little angulate produced at the middle of the front margin, posteriorly strongly acuminately produced beyond the knees of the hind femora, the process stout; dorsum deplanate, smoothly punctate, sometimes slightly rugulose, narrow between the shoulders; prozonal carinæ parallel, humeral angles widely obtuse; median carina compressed, elevated before the shoulders subtectiform,

* The name *Mitritettix* was proposed by the writer for Bolivar's *Mitraria*, the latter name being preoccupied. Vide article in Genera Insectorum, 48me Fasc., p. 51, 1906.

depressed between the shoulders and distinct behind the shoulders backward ; lateral carinæ indistinct, granulate ; lateral margins just above the elytra sulcate ; lateral lobes of pronotum little reflexed outwards, slightly laminato-rectangulate. Elytra small, elongate, rather narrow, subacuminate towards the apices ; wings fully explicate, not quite reaching to the apex of the pronotal process. Femoral margins minutely serrulate, anterior femora compressed, the superior carina distinctly compresso-arcuate ; middle femoral margins little compressed, in the male distinctly ampliate toward the base ; hind femora narrow elongate, the genicular and antegenicular denticles rather stout, acute ; posterior tibiæ with the canthi minutely serrulate, plurispinose, and scarcely at all ampliate toward the apices ; the first and third articles of the posterior tarsi equal in length, the three pulvilli equal in length, somewhat flattened below. Length of body entire, male and female, 19–21·5 mm. ; pronotum 16–19 mm. ; posterior femora 6·8–7·5 mm.

Four examples from Kuching, N.W. Borneo. One from the Sarawak Museum, No. 340, the others from R. Shelford ; Oxford Museum.

Genus TETTICERUS, Hancock.

1. *T. bigibbosus*, Hancock, Occasional Mem. Chicago Ent. Soc., vol. i, No. 1, p. 5, Pl. I, figs. 1–1*b*, 1900.

Four examples from N.E. Madagascar, Bay of Antongil, Mocquerys ; Oxford Museum.

Genus CRYPTOTETTIX, Hancock.

1. *C. spinilobus*, Hancock, Occasional Mem. Chicago Ent. Soc., vol. i, No. 1, p. 14, 15, Pl. I, figs. 6–6*b*, 1900.

Two examples from N.E. Madagascar, Bay of Antongil, Mocquerys ; Oxford Museum.

Genus MAZARREDIA, Bolivar.

1. *M. insularis*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 240, 1887.

Four examples from Pundaluoya, Ceylon ; Oxford Museum.

2. *M. centrosa*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 242, 1887.

Two examples from Kuching, N.W. Borneo, Sarawak Museum, Nos. 352 and 355 ; Oxford Museum.

3. *M. planitarsus*, sp. nov.

Resembling *sculpta*; stature rather slender; grayish fuscous; head not at all exserted; vertex flattened, slightly wider than one of the eyes, little narrowed forward, on either side with oblique carina, the middle carina obscure, indistinctly sloping forward; frontal costa viewed in profile compresso-protuberant between the antennæ, the face strongly sinuate below; eyes globose, sessile, not higher than the dorsum. Pronotum gibbose forward, rather narrow between the shoulders, very strongly produced backwards equal to the length of the hind femora beyond the femoral apices; median carina elevated gibbose between the shoulders, abruptly declivous posteriorly and behind the shoulders depressed, posteriorly straight; dorsum behind the prozonal carinæ forward at the sulci constricted, humeral angles widely obtuse, bicarinate; lateral carinæ on process posteriorly serrulate; anterior prozonal carinæ distinctly expressed, rather short and little divergent backward; dorsum on each side bearing an abbreviated costa scarcely in front of the shoulders, and a pair of lineate tubercles or protuberances above the middle of the posterior femora; lateral lobes little reflexed outwards, produced angulate. Elytra moderately large, oval, little narrowed toward the apices, externally strongly punctate; wings fully explicate, extended backward as far as the pronotal apex. Anterior and middle femora elongate, the margins little compressed undulate, the superior carina of the anterior femora noticeably compressed; the canthi of posterior tibiæ minutely spinose and serrulate; the first articles of the posterior tarsi very slender, longer than the third, the pulvilli strongly deplanate below and almost obliterated, the apical pulvillus very small acute. Length of body entire, male and female, 14·8–16·5 mm.; pronotum 14–15·5 mm.; posterior femora 5–5·8 mm.

Four examples from Kuching, N.W. Borneo. One of these specimens from Sarawak Museum, No. 347, the others from R. Shelford; Oxford Museum.

Genus Xistra, Bolivar.

1. *X. stylata*, sp. nov.

Ferruginous. Head compresso-elevated, in profile sinuate. Vertex cornute, strongly concavely depressed forward, on each side the oblique carinula strongly elevated and formed into an acute, vertically-produced, cylindrical spine, which curves a little forward, extended above the eyes, equal to about four-fifths the height of one of the eyes; eyes elevated and conico-rotundate, substylate; posterior ocelli placed barely below the eyes; antennæ inserted far below the eyes; the frontal costa rather widely sulcate, evenly divergent forward to the median ocellus, little compresso-elevated between the antennæ. Pronotum granulate, posteriorly lengthily subulate, extended beyond the hind femoral apices; dorsum little ascendant near the anterior margin, between the shoulders elevated, compresso-cristate, the top of crest subdentate, before and behind the crest the median carina often little compresso-dentate; median carina low forward just behind the anterior margin and posteriorly on the process; humeral angles widely obtuse, the lateral carinæ continuous forward on the shoulders; the anterior prozonal carinæ parallel; posterior angles of the lateral lobes subangulate, slightly reflexed, subrounded-truncate. Elytra elongate, apices narrowly rounded, externally punctate, fuscous with light apices; wings fully explicate, barely extended beyond the pronotal apex; anterior and middle femora elongate, the carinæ distinctly compressed, undulate, the superior carinæ of the middle femora produced in an apical spine; posterior femora elongate, genicular spine acute, little produced; the three pulvilli of the first tarsal articles equal in length. Length of the body entire, female, 16·2 mm.; pronotum 15 mm.; posterior femora 5·9 mm.

One example from Putlam, Ceylon, in the Oxford Museum.

This species is nearly allied to *Xystra corniculata*, Stål.

Genus Notocerus, Hancock.

1. *N. cornutus*, Hancock, Occasional Mem. Chicago Ent. Soc., vol. i, No. 1, p. 5, 6, figs. 2, 2*a*, 1900.

Three examples from N.E. Madagascar, Mocquerys; Oxford Museum.

1a. *Var.*

Similar to *cornutus*, but of smaller stature, the male and female measuring as follows: entire length 16–16·5 mm.; pronotum 14–15·4 mm.; posterior femora 6–7 mm. In the male the wings extend beyond the pronotal apex, and in this sex the pronotum between the elevated humeral angles is transversely convex and little tumose; the median carina here being low, but in the female little compressed, otherwise similar to *cornutus*.

Two examples from the same locality as the preceding.

Genus Hybotettix, Hancock.

1. *H. humeralis*, Hancock, Occasional Mem. Chicago Ent. Soc., vol. i, No. 1, p. 9, 10, fig. 4, Pl. I, 1900.

One female example which measures as follows: entire length 18 mm.; pronotum 17 mm.; posterior femora 8 mm. From N.E Madagascar, Bay of Antongil, Mocquerys; Oxford Museum.

Genus Camelotettix, nov

Resembling *Notocerus* and *Hybotettix*, but differing in the vertex bearing more perceptibly compresso-marginate carinæ laterally before the supraocular lobes, and distinctly fossulate on each side of the feeble median carina; the frontal costa but very little compresso-elevated between the antennæ, the rami evenly divergent forward tc the median ocellus; the eyes in profile globose instead of ovoid; the pronotum at the shoulders slightly dilated, in profile the lateral carinated margins widely arcuato-elevated above the articulation of the hind femora, the dorsum smoothly deplanate, but transversely plurifossulate; the lateral lobes of pronotum with the elytral sinus nearly as pronounced as the inferior one below. Type *Camelotettix curvinotus.*

1. *C. curvinotus*, sp. nov. (Plate XXI, fig. 6.)

Grayish-ferruginous; body smoothly granulate, quadrate in section or in front view; vertex transverse, but not transversely carinate, flattened, anteriorly convex, nearly twice the width of one of the eyes, laterally compresso-marginate forward of the supraocular lobes, strongly fossulate on each side of the feeble median carina; eyes sessile, not higher than the dorsum; posterior ocelli placed between the submiddle plane of the eyes; antennæ inserted barely before the ventro-anterior border of the eyes; apical articles of maxillary palpi little dilated. Pronotum anteriorly truncate, the dorsal front margin somewhat roundly excavate, posteriorly acuminate, extended backward beyond the knees of the hind femora, the shoulders widely rounded, carinate, and viewed in profile strongly arcuately elevated; dorsum transversely trifossulate, sloping backward; the median carina strongly sinuate; before the shoulders bearing an abbreviated parallel costa on each side; prozonal carinæ granulate, little convergent backward; lateral lobes with the posterior angles little laminate, subacute produced, obliquely truncate behind: the lateral carinæ on each side of the pronotum between the shoulders and elytra formed in a wide arc far above the elytra (in *Hybotettix* it is sulcate). Elytra of moderate size; wings fully explicate, extended backward nearly to the pronotal apex. Femora elongate, margins entire, the antegenicular spines small, acute, the genicular spine little acute produced; posterior tibiæ somewhat curvate, little ampliate toward the apices, the canthi armed with stout spines; the first and third tarsal articles equal in length, the three pulvilli of the first tarsal articles equal in length, but the first more rounded below than the rest. Length of body entire, female, 16·5 mm.; pronotum 15·5 mm.; width between the shoulders 3·5 mm.; posterior femora 7 mm.

One example from Bali, Doherty; Oxford Museum.

Genus Dasyleurotettix, Rehn.

1. *D. curriei*, Rehn, Proc. Acad. Nat. Science, Philadelphia, p. 658, 1904.

One example, a male, differs from the type in being less rugose on the pronotum, and in the frontal costa being narrower. From Natal, Africa; Oxford Museum.

Note.—This genus was formerly placed in the section *Cladonotæ*, but an examination of type specimens, recently acquired, convinces me that it belongs in the section *Tetrigiæ*, taking a place near *Tetrix*. Indeed this species recalls *Tetrix depressus*, Bris., as its nearest relative.

Genus Allotettix, Hancock.

1. *A. americanus*, sp. nov.

Ferruginous. Vertex little ascendant forward and distinctly narrowed, strongly narrower than one of the eyes, tricarinate; frontal costa sulcate above the posterior ocelli, the rami moderately divergent forward to the median ocellus, in profile roundly compresso-elevated, produced, between the antennæ; eyes roundly conoidal in profile, little elevated above the dorsum of pronotum; posterior ocelli rather conspicuously showing in advance of the eyes on a plane little below the middle; antennæ inserted distinctly before (below) the eyes, the articles strongly elongate, the first articles grossly compressed. Pronotum depressed, rugose, convex between the shoulders and somewhat narrow, the shoulders bicarinate, widely obtuse, posteriorly lengthily subulate, extended backward beyond the knees of the hind femora; median carina little compressed, lightly sinuate, little excavate behind the anterior margin; anterior prozonal carinæ distinctly expressed, slightly convex; lateral lobes with the posterior angles turned downward, obtuse. Elytra narrow and somewhat acuminate posteriorly; wings fully explicate, extended backward beyond the pronotal apex. Anterior and middle femoral margins entire; hind femora of ordinary form, the hind tibiæ rather stout, distinctly ampliate toward the apices, the margins armed with stout spines; the first articles of the posterior tarsi stout and scarcely shorter than the third, the first two pulvilli of the first tarsal articles short and acute, the third pulvilli longer and somewhat flattened below but acute.

One example from Cachabi, Ecuador, S. America; Rosenberg; Oxford Museum.

Readily distinguished from the other members of this genus by the narrowed vertex, which is strongly narrower than one of the eyes and tricarinate, and also by the extended wings which pass beyond the pronotal apex.

Genus OTUMBA, Morse.

1. *O. quadrata*, sp. nov.

Somewhat resembling *scapularis*. Pale ferruginous; head little exserted, face oblique; vertex ascendant forward but very little narrowed, convex, advanced nearly as far as the eyes, the carinæ laterally little roundly compressed, at the front almost as wide as one of the eyes, middle carinate, sulcate on each side; frontal costa declivous above, between the antennæ little compresso-elevated, and sinuate below, between the posterior ocelli narrowly sulcate, evenly divergent forward to the median ocellus; eyes roundly conoidal, higher than the dorsum of pronotum; posterior ocelli placed between the lower third of the eyes; antennæ inserted distinctly before the ventro-anterior border of the eyes. Pronotum rugose or often rugulose, depressed, deplanate between the shoulders; median carina very low and indistinctly sinuate, almost straight posteriorly and lengthily acuminate, extended beyond the knees of the hind femora; prozonal carinæ distinct and parallel; humeral angles obtuse, bicarinate; lateral lobes with the posterior angles strongly reflexed outwards, rectangulate, but convexo-truncate behind. Elytra small, acuminate toward the apices; wings fully explicate reaching just beyond the pronotal process. Margins of anterior and middle femora little compresso-undulate; the posterior femora bearing a series of large tumose tubercles above on the outer faces, the antegenicular spine acute, but the genicular spine nearly wanting, posterior tibiæ very little ampliate toward the apices, the canthi sparingly spinose; the first and second pulvilli of the first tarsal articles equal in length; subacute, the third pulvilli little longer and more flattened below, Length of body entire, male and female, 12–13 mm.; pronotum 11–12 mm.; posterior femora 5–6 mm.

Five examples from Cachabi, Ecuador, S. America. Rosenberg; Oxford Museum.

Section TETRIGIÆ, Bolivar.

Genus PARATETTIX, Bolivar.

I recognize four Bornean species of *Paratettix*, which may be distinguished by the following key*—

1. Pronotum somewhat broad between the shoulders; the lateral lobes conspicuously reflected outwards, triangular and acute; first two basal pulvilli of the first tarsal articles spiculate . . . . . *variabilis*, Bol.
2. Pronotum narrower between the shoulders; the lateral lobes little produced outwards, and angulate-subacute; the first two basal pulvilli of first tarsal articles not spiculate *angulobus*, sp. nov.
3. Posterior angles of the lateral lobes of pronotum narrowly rounded; vertex of head strongly narrower than one of the eyes; length of pronotum from 9 to 12 mm. . *histricus*? Stål.
4. Posterior angles of lateral lobes subtriangular, indistinctly turned outward; vertex of head narrowed forward, subequal or little narrower than one of the eyes; pronotal process often extended as far as the wings; length of pronotum from 12 to 15 mm. . *lineatus*, sp. nov.

1. *P. variabilis*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 276, 1887.

Three examples from Kuching, N.W. Borneo, R. Shelford; Oxford Museum.

2. *P. angulobus*, sp. nov.

A very slender-bodied species, with prominent globose eyes, fusco- or grayish-ferruginous; vertex ascendant forward, strongly narrowed, tricarinate, at the front much narrower than one of the eyes, occiput behind the eyes exposed; eyes higher than the dorsum of pronotum; frontal costa rather roundly compresso-elevated between the antennæ, not at all sinuate; apical articles of maxillary palpi oval; the antennæ inserted almost between the inferior border of the eyes. Pronotum often lightly rugulose, depressed, little ascendant behind the anterior margin, subdeplanate between the shoulders and bearing

* One of the common species of *Tetriginæ* in Borneo is *Paratettix contractus* of Bolivar. This species is considered a *Tetrix* here, and will be so treated further on under that heading.

an abbreviated costa on each side; the shoulders indistinctly bicarinate; median carina forward little sinuate, horizontally straight posteriorly, process lengthily acuminate, strongly extended beyond the knees of the hind femora; posterior angles of lateral lobes reflexed outwards and angulate-acute. Elytra oval; wings fully explicate, extended beyond the pronotal apex, caudate. The first and third articles of the posterior tarsi equal in length, the three pulvilli of the first tarsal articles nearly equal in length. Length of body entire, male and female, 13–14 mm.; pronotum 11–12 mm.; posterior femora 4·6–5 mm.

Five examples from Kuching, N.W. Borneo; Oxford Museum. Two of these specimens from the Sarawak Museum, Nos. 353 and 351, the others from R. Shelford.

3. *P. histricus*? Stål, Freg. Eüg. resa. Ins. Orthopt., p. 347, 1860.

One example from Kuching, N.W. Borneo; R. Shelford, Oxford Museum.

4. *P. lineatus*, sp. nov.

Ferruginous, legs lighter. Head not at all exserted; vertex narrowed forward, subequal in width to one of the eyes; the frontal costa arcuate; eyes moderately small, globose; posterior ocelli unusually large and conspicuously showing just in advance of the middle of the eyes. Pronotum lengthily subulate, rather smooth, bicarinate at the shoulders, the dorsum convex between the shoulders and bearing abbreviated costa on each side forward; lateral lobes not at all reflexed outwards, truncate; elytra oblong; wings fully explicate, extended backward just beyond the pronotal apex. Femoral carinæ entire; the first tarsal articles having the second pulvilli very little smaller than the first and third, all the pulvilli flattened below, not spiculate. Length of body entire, male and female, 13·5–16 mm.; pronotum 12–15 mm.; posterior femora 5–6 mm.

Six examples from Kuching, N.W. Borneo. One of these specimens from Sarawak Museum, No. 345, the rest from R. Shelford; Oxford Museum.

This species may possibly be a *Coptotettix*.

Genus Apotettix, Hancock.

1. *A. proximus*, sp. nov.

A South American form of rather small stature, with subquadrate vertex, resembling *Paratettix frey-gessneri*, and dimorphic in wing-length. Greyish, the tibiæ and tarsi fusco-annulate. Vertex little wider than one of the eyes, longitudinally fossulate on each side of the distinct median carina, the front margin subtruncate ; frontal costa rather widely sulcate, in profile little arcuate produced between the antennæ, subsinuate above and below ; eyes of moderate size. Pronotum little rugose granulate, somewhat deplanate between the shoulders, acuminate posteriorly and extended to or beyond the knees of the hind femora ; median carina percurrent, compresso-arcuate forward before the shoulders, little lowered and often subsinuate backward, but straight on the process ; lateral lobes little reflexed outwards, the posterior angles distinctly rounded or obtuse. Elytra oblong ; wings fully explicate, abbreviated and not extended to the apices of the posterior femoral knees, or passing beyond the apex of pronotal process or even caudate. The first tarsal articles with the first and second pulvilli small and spiculate, the third much longer and flattened below. Length of body entire, male and female (short-winged form), 7·5–9 mm. ; pronotum 7–7·8 mm. ; posterior femora 4·5–5 mm. Long-winged form, male, 10 mm. ; pronotum 8 mm. ; posterior femora 4·5 mm.

Five examples, from Cachabi and Paramba, Ecuador, S. America ; Rosenberg.

Genus EUPARATETTIX, Hancock.

1. *E. personatus*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 278, 1887.

One example from West Java ; H. Fruhstorfer. Two examples from N.C. Province, Ceylon ; Oxford Museum.

2. *E. mimus*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 278, 1887.

One example from Penang Island, E. L. Meyer, coll.; Oxford Museum, No. 3451.

3. *E. indicus*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 281, 1887.

Four examples from (Assam ?) India ; Oxford Museum.

4. *E. similis*, sp. nov.

A rather small form, with the head little exserted. Vertex hardly narrowed forward, nearly equal or subnarrower than one of the globose eyes, little ascendant forward ; median carina distinct, sulcate on each side ; the frontal costa slightly compresso-arcuate between the antennæ, declivous above ; eyes barely higher than the dorsum. Pronotum lengthily acuminate posteriorly, little rugose, without supernumerary costa, convex between the shoulders, the humeral angles distinct and carinate; the anterior prozonal carinæ very small, subobsolete; median carina percurrent, slightly incrassate, little compresso-elevated forward and there often subundulate, but straight posteriorly; pronotal process strongly extended backward beyond the hind femoral knees; lateral lobes distinctly turned down, the posterior angles narrowly rounded. Elytra oval; wings caudate. Anterior and middle femoral margins entire; posterior femoral carinæ above arcuate; the first and third articles of the posterior tarsi equal in length, the first tarsal articles having the first and second pulvilli spiculate, the third nearly as long as the first and second united and flat below. Length of body entire, male and female, 11–12 mm.; pronotum 9–10 mm.; posterior femora 4–4·7 mm.

Six examples from Banguay, and one from Kina Balu-Borneo, in the author's collection. Examples are in the Oxford Museum from the Philippines, Nos. 2769 and 2770, and from Kuching, N.W. Borneo, R. Shelford.

Genus Tetrix, Latreille.

1. *T. contractus,* Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 281, 1887.

Numerous examples in the collection of the Oxford Museum, from Kuching, N.W. Borneo, R. Shelford.

This species seems nearer to *Tetrix* than *Paratettix.* The vertex is subwider than one of the eyes and rounded, not truncate; the frontal costa being distinctly sinuate, excavate between the eyes. It is apparently one of the commonest species in Borneo. This species was placed in the genus *Paratettix* by Bolivar.

2. *T. atypicalis,* Hancock, Spolia Zeylanica ii, p. 143, 144, 1904.

Two examples from Pundaluoya, Ceylon; Oxford Museum.

3. *T. a. ceylonus,* Hancock, Spolia Zeylanica ii, p. 143, 144, 1904.

Two examples from Pundaluoya, Ceylon; Oxford Museum.

4. *T. cuspidatus,* sp. nov.

Resembling *Tetrix contractus.* Greyish, with the dorsum behind the shoulders often fusco-maculate. Vertex little depressed, not at all narrowed forward, anteriorly convex, tricuspidate, subequal in width to one of the eyes, the fronto-marginal carinæ laterally little compresso-elevated and acute, viewed in profile the cusps often little elevated above the eyes, lateral margins of vertex not at all sinuate, median carina produced, in profile protuberant; frontal costa in profile strongly sinuate, excavate between the eyes, little compresso-elevated between the antennæ and excavate below, the rami moderately and evenly divergent to the median ocellus. Pronotum depressed, between the shoulders convexo-deplanate, the humeral angles distinct, carinate, and slightly produced laterally; median carina percurrent but sinuate, little compresso-elevated before shoulders and little excavate just behind the anterior border, pronotal process strongly extended backward beyond the apices of the posterior femora; posterior angles of the lateral lobes rounded, the inferior margins little reflexed outwards. Elytra oblong or somewhat oval with the apices subacuminately rounded; wings caudate. Anterior and middle femoral margins distinctly compressed, the superior margins of the anterior femora distinctly compresso-elevated, the carinæ undulato-arcuate; middle femoral carinæ above and below undulate; the external paginæ of the posterior femora rugose, the oblique costa strongly expressed and rugose-granulate; the first and third articles of the posterior tarsi about equal in length, the first and second pulvilli subacute, the third nearly as long as the first and second united and flat below. Length of body entire, male and female, 12·5–13 mm.; pronotum 10·5–11 mm.; posterior femora 4–4·5 mm.

Four examples from West Java, Pengalengan, 4000 ft.; Oxford Museum.

Genus HEDOTETTIX, Bolivar.

1. *H. gracilis*, Haan, Bijdr. Orthopt., p. 169 (= *festivus*).

Six examples from Java, H. Fruhstorfer; Oxford Museum. Four examples from Ceylon and one from Chenapungi, also in Oxford Museum.

2. *H. guibelondoi*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 285, 1887.

One example referable to this species, from the Philippines, in the Oxford Museum, No. 2771.

3. *H. burri*, Hancock, Occas. Memoirs Chicago Ent. Soc., vol. i, No. 1, p. 10, 11, 1900.

Originally described from a male example from Madagascar under the genus *Telmatettix*. A second specimen in the Oxford Museum from the same locality, being a female, allows me opportunity of revising my opinion of this species. This species resembles *Paratettix scaber* from Africa, and it may be quite possible that it is this species. The antennæ are inserted between the inferior part of the eyes, as in *Hedotettix*.

4. *H. celebicus*, sp. nov.

A very slender-bodied species; greyish-cinereous or flavous, variegated with fuscous. Head little exserted; vertex scarcely narrowed forward, narrower than one of the eyes, sulcate on each side of the median carina, not at all ampliate toward the front; frontal costa slightly arcuate, the face in profile not at all sinuate, rami divided distinctly above the posterior ocelli, moderately sulcate. Pronotum truncate anteriorly, subtectiform between the shoulders, posteriorly lengthily acuminate, the process extending beyond the femoral apices; median carina percurrent, somewhat acute, little elevated between the shoulders; dorsum granulate; the prozonal carinæ parallel; posterior angles of the lateral lobes turned down and narrowly rounded. Elytra with the apices somewhat widely rounded; wings strongly caudate. Anterior femoral carinæ straight; intermediate femora, in the male, little ampliate toward the bases, in the female, subnarrowed; the first tarsal articles with the first and second pulvilli acute-spiculate, the third much longer than the second, and straight below, the apices acute. Length of body entire, male and female, 11–14 mm.; pronotum 9–10 mm.; posterior femora 4–5 mm.

Three examples from Macassar, Celebes, Doherty; Oxford Museum.

Genus Coptotettix, Bolivar.

1. *C. tuberculatus*, Bolivar, Ann. Soc. Ent. Belg. xxxi, p. 117, 1887.

Three examples from Kuching, N.W. Borneo, R. Shelford; Oxford Museum.

2. *C. rotundatus*, sp. nov.

Fuscous, the legs sometimes flavous or fusco-variegated; vertex not produced beyond the eyes, strongly narrowed forward, about equal in width to one of the eyes, fossulate on each side, in profile little roundly elevated above the eyes; the frontal costa strongly roundly produced in advance of the eyes, the rami dividing above the posterior ocelli, moderately divergent forward to the median ocellus; the posterior ocelli placed in advance of the upper third of the eyes. Pronotum lengthily subulate, the dorsum rugose, often conspersed with very slightly elevated and elongated rugæ and coarsely granulate; median carina undulate, here and there slightly incrassate, but the other carinæ low and thin, the anterior prozonal carinæ very indistinct, granulate, and convergent backward; posterior angles of the lateral lobes narrowed and rounded. Elytra oval, the apices rounded; wings fully explicate and passing the pronotal apex. Anterior and intermediate femora elongate, the carinæ entire; the first articles of the posterior tarsi distinctly longer than the third, the first and second pulvilli of the first tarsal articles more acute than the third, the third being flat and longer than the second. Length of the body entire, male and female, 13–14·5 mm.; pronotum 11·5–13 mm.; posterior femora 5·5–6·5 mm.

Four examples from Kina Balu in the author's collection, and one from Kuching, N.W. Borneo, R. Shelford; Oxford Museum.

In this species the antennæ are inserted between the lower third or fourth of the eyes. The specific name *rotundatus* refers to the facial costa.

3. *C. parvus*, sp. nov.

This may be the short-winged form of *Coptotettix tuberculatus*. It is a small form with abbreviated wings and pronotum; the posterior angles of the lateral lobes turned down, and slightly more obtuse; the dorsum of pronotum rugose and bearing tubercles, some of which are abbreviated linear in form. The vertex resembles that of *tuberculatus*. Length of body entire, male, 8 mm.; pronotum 7 mm.; posterior femora 5·5 mm.

One example from Kuching, N.W. Borneo, R. Shelford; Oxford Museum.

4. *C. inflatus*, Krauss, Denkschr. Naturw. Ges. Jena Bd. 8, 1903, vol. iv, p. 745, Pl. LXVII, fig. 10, 1902.

Six examples from Java; Oxford Museum.

Section BATRACHIDEÆ, Bolivar.

Genus PHLŒONOTUS, Bolivar.

1. *P. sinuatus*, sp. nov.

Similar to *natalensis*; greyish, fusco-variegated. Vertex wide, completely covered, strongly produced; face in profile arcuate;

frontal costa strongly advanced beyond the eyes, the rami somewhat widely sulcate, divided above the posterior ocelli near the vertex, and slightly divergent forward. Pronotum anteriorly produced scarcely beyond the head, the front margin on each side straight, convergent forward, angulate, but with obtuse apex; dorsum strongly compresso-cristate ; the median carina forward between the shoulders strongly sinuate, posteriorly acuminate, extended little beyond the hind femoral apices. Elytra rather wide, oval, bearing a large black macula transversely intersected by a light fascia near the apices ; wings fully explicate and extended beyond the pronotal apex. Posterior femora somewhat incrassate ; the first and third articles of the posterior tarsi subequal in length, the three pulvilli of the first tarsal articles nearly equal in length. Length of body entire, male, 14 mm.; pronotum 12·5 mm.; posterior femora 7 mm.

One example from Natal or Orange River Colony, F. N. Brown ; Oxford Museum, No. 3356.

Genus TETTIGIDEA, Scudder.

1. *T. planus*, sp. nov.

This species has no spine at the termination of the superior carina of the middle femora, and the elytra are plainly coloured without macula ; it resembles Scudder's species *Tettigidea cuspidata*.

Body granulate ; ferruginous, often fusco-variegated. Vertex distinctly wider than one of the eyes, somewhat depressed and smooth, narrowed forward, the supraocular lobes small, the front margin advanced about as far as the eyes, the median carina absent, the frontal carinulæ on each side very little compressed, little rounded-concave ; frontal costa narrowly sulcate, little compresso-elevated between the antennæ ; maxillary palpi yellow, widely compresso-dilated at the apices, the apical articles oval. Pronotum anteriorly acute spiniform produced nearly as far as the front of vertex, the spine nearly straight, the front margin on each side of the spine strongly concave ; posteriorly cuneate, extended backward nearly to the apices of the hind femoral knees ; dorsum granulate, between the shoulders somewhat tectiform ; median carina little incrassate, subundulate, nearly horizontal, little compressed and percurrent. Elytra elongate, acuminate toward the bases and apices, the external faces plain coloured and granulate ; wings abbreviated. Hind femora elongate; the tibiæ fuscous with pale annulation near the bases, the first and third articles of the posterior tarsi subequal, the first, second and third pulvilli respectively gradually increasing in length and subflattened below, not acute. Length of body entire, female, 12·8 mm.; pronotum 11·5 mm.; posterior femora 7·6 mm.

One example from Paramba, Ecuador; Rosenberg.

Genus Scaria, Bolivar.

1. *S. fasciata*, sp. nov.

This is a remarkably graceful species, narrow between the shoulders, and having the pronotum anteriorly only little ascendant. Body granulate, flavo-ferrugineous, on either side bearing a broad, black, longitudinal fascia, the face, lower part of lateral lobes of pronotum and sides flavous, legs flavous, often tinged with fuscous. Eyes strongly globose; face oblique; vertex subtruncate, nearly equal in width to one of the eyes, scarcely advanced so far as the eyes, little narrowed forward and smooth, the median carina wanting; the frontal costa starting at the vertex little lower than the eyes, divides between the posterior ocelli and is arcuately protuberant forward between the eyes; superior ocelli large, conspicuously showing in profile just in advance of the middle of the eyes. Pronotum anteriorly acute spiniform produced, the antero-dorsal margin on either side of the spine roundly excavate, posteriorly lengthily extended beyond the apices of the hind femoral knees; dorsum between the shoulders convex, narrow; humeral angles bicarinate; anterior prozonal carinæ only little expressed, slightly divergent backward; median carina somewhat undulate, often little compresso-elevated forward between the shoulders, nearly horizontal, and forward at the front margin with the spine little ascendant and uncinate. Elytra oblong, with a pale spot near the apices varying in intensity and size; wings fully explicate, extended beyond the pronotal apex. Posterior femora elongate, knees black, the superior carinæ forward black, with pale spots; tibiæ black but pale annulate toward the base and the apices, the canthi serrulate and rather feebly plurispinose; the three pulvilli of the first tarsal articles equal in length. Length of the body entire, male and female, 13–15 mm.; pronotum 11–14 mm.; posterior femora 5·5–6·3 mm.

A number of examples from Cachabi, Ecuador, Rosenberg; Oxford Museum, and in the author's collection.

Explanation of Plate XXI.

[*See Explanation facing the* Plate.]

XIII. *The life-history of* Spindasis lohita, *Horsf.* By JOHN C. W. KERSHAW, F.Z.S.

[Read March 20th, 1907.]

PLATE XXII.

THIS pretty Lycænid, also known as *S. zebrinus*, Moore, is common in many localities near Macao and Hongkong, and no doubt occurs all over South China, within the range of the food-plants of the larva. It is on the wing from about March to November inclusive, sometimes appearing in dozens at the flowers of certain trees and shrubs, though it does not seem to care about other flowers. It has an exceedingly swift, erratic flight, and when settled, frequently head downwards, is continually working the large anal lobes of the hind-wings, hollowing and smoothing them, by rubbing the hind-wings together with a see-saw motion as it sits with closed wings. It frequents the outskirts of woods and open, bushy ground, where the food-plants of the larva grow, and where the trees are in flower which attract the butterfly.

The larval state is the most interesting and singular part of the life-history of this Lycænid, and judging from that it would seem to be very nearly allied to the Australian genus *Ogyris*, a very interesting paper on which genus, entitled "A Monograph of the genus *Ogyris*," appeared in the Trans. Ent. Soc. for 1905. Much of the information therein regarding the larval habits of species of *Ogyris* would apply without alteration to the larva of *Spindasis lohita*.

The egg is hemispherical or domed, flattened on the under-side, strongly reticulated or honeycombed on the upper surface. It is laid singly, during the day, into the joints of bracts, stems or leaves of the food-plants of the larva, or even on adjacent parts of the host-plants. The usual food-plant is *Henslowia frutescens*, Champ. (Nat. Ord. *Santalaceæ*) a very common trailing or half-climbing shrub in this part of Kwangtung, a parasite on the roots of other vegetation. The larva also feeds on *Loranthus chinensis*, D.C., and *Viscum orientale*, Willd., both Nat. Ord. *Loranthaceæ;* the former a common bushy parasite on many trees, the latter not unlike the familiar British mistletoe, and of the same parasitic habits on various trees and shrubs, but it is not very common here.

The general colour of the upper-side of the full-grown larva in the wet season is yellowish, with a double, interrupted dorsal line of dark brown. Most of the third segment is dark brown. An indistinct transverse dorsal reddish bar on each segment, each side, surrounded with dark brown. Below these markings uniform greenish-yellow, the whole body irrorated with light and dark specks, the whitish ones chiefly due to extremely short hairs or stubble. The second segment is covered with a dark brown shiny, chitinous shield, as is the last segment. On the twelfth segment are two dark brown chitinous tubulures, one each side, with a few hairs on the edges of the openings. From these tubulures the larva when irritated extrudes a white gland or stout filament which it vibrates rapidly and quickly withdraws again. The body is fringed laterally just above the legs with stiff white hairs.* Legs, prolegs, and under-side glaucous-green. Head nearly black. During the dry season the larvæ are very dark in general colouring, chiefly various shades of brown, with the wet season markings very obscure.

When feeding, the larvæ often secure two leaves slightly together with silk, forming a shelter but not entirely hiding the larvæ. The first lot of larvæ I reared, bred from eggs or captured between their leaf-shelters on the food-plants (where they occasionally seem to remain all day) arrived safely at full growth, ready to pupate, when though much distended they seemed soft and flabby, and burst at the lightest touch; perhaps from the lack of ants to suck away superfluous juices; they all died, as I had kept no ants with them. But later I discovered larvæ actually inside the nests of the ants, as well as pupæ, and thereafter kept ants with the larvæ, which were successfully reared. They are, however, liable to a fungoid growth which kills many, especially in the dry season, where the larval stage lasts a long time and the larvæ feed very slowly.

Apparently only one species of ant attends on the larvæ, at least in this district; small, and very dark red in colour, almost brown; but all three plants mentioned before swarm

* All bristles on the larva are roughened, or minutely spined up the stems.

with several kinds of ants, and are attractive to many other creatures, notably spiders. During the day the larvæ either remain in their leaf-shelters, as observed before, or more frequently in the ant-nests; especially in the latter, it would appear, in the dry season, when in January and February there is often much really cold weather. Some of these ant-nests are a fair size, but most of them very small; often made of one leaf with the edges turned up and roofed over with felted material; or two or three leaves are employed. Very often a succession of small nests encircle a slender branch, especially at the junctions of twigs; or they envelop a stalk and leaf or berry of the mistletoe—each little nest containing some aphides and ants, and occasionally a larva or two larvæ of *Spindasis*. The ant-nests are built of masticated vegetable matter, rather like the "paper" of a wasps' nest, but the material is much thicker and coarser. The ants seem to make use of anything handy, however, as my attention was once drawn to the peculiar blue tint of some nests; but an old blue rag torn from some coolie's raiment was hanging close by in the shrub, which had been chewed up and used in the construction of the nests.

The larvæ issue forth from their shelters at night to feed, and are constantly attended by some of the ants, who often stand on the back of a larva, apparently caressing it with their antennæ, and seeming to extract some juice from between the joints of the chitinous shields and the soft parts of the body; but chiefly they excite or irritate the larva by touching the tubulures with antennæ and fore-legs, till the larva puts forth the filaments from the tubes, and the ants then seem to lick up some moisture left by the filaments on the edges of the openings.* The larva can extrude the filaments either together or independently. Just before pupation the ants seem to tap the larva almost continuously, and the latter puts forth the filaments frequently and withdraws them more slowly than usual. The ants often crowd on the larva when the latter is feeding, and it is rarely left unattended for more than a few moments, even proceeding to its feeding-ground and returning home with ants on its back.

And thus the larvæ spend their time till they pupate,

* If the larva at first refuses to oblige the ant, the latter redoubles its attentions with its antennæ, and strikes on the back of the larva with one of its feet.

which they generally do in a deserted leaf-nest of the ants; or perhaps the latter kindly vacate their premises on purpose.* The nests used for pupation always seem quite new, though I have not found any ants actually inside the nests containing the pupæ; they may make occasional visits, however, though my butterflies emerge in good condition when the pupæ are isolated from ants. No doubt the safety of the pupa is well assured from the fact of its being concealed in what to all appearance is an inhabited ants' nest; few creatures would willingly disturb it, except woodpeckers and some few habitual feeders on ants. There is but one fairly common species of woodpecker here, and considering the abundance of large ants' nests everywhere, it is not probable that these birds trouble about the small leaf and twig nests occupied by *Spindasis.* The only other animals here, so far as I know, which feed largely on ants are the Pangolin or Scaly Anteater, and the Hoopoe, the former scarce and probably feeding only on the ground, and the bird being of rare occurrence here.

The pupa is dark shiny brown and yellow-brown, the tip of the abdomen blunt and rounded, and on the under-side is a roughened sub-circular patch, furnished with microscopic bristles, which aid the adhesion of the silk by which the pupa is affixed to one of the walls of the leaf-nest. There is no girdle round the middle. The tubulures of the larva are represented by two slight scars in the pupa.

The tubulures are really more distinct or conspicuous in the young than in the full-grown larvæ. The young larvæ generally eat away the under-side of the leaves in patches, leaving the thin upper skin.

* Sometimes, if the larva can find a suitable leaf shrivelled into a small tube (as the thick, fleshy leaves of the food-plants often are), it lines the tube with a loose-textured web and makes its own shelter.

Explanation of Plate XXII.

[*See Explanation facing the* Plate.]

XIV. *On the egg-cases and early stages of some South China* Cassididæ. By J. C. Kershaw and Frederick Muir.

[Read March 20th, 1907.]

The four beetles mentioned in the following paper are all common in Macao. As their egg-cases or larvæ have not been previously figured or described, the following short description of the plate may be of interest to Coleopterists. Dr. David Sharp has kindly identified them for us.

1.—*Coptocycla circumdata*, Herbst.

The eggs of this species are laid singly, generally on the under-side of the leaf of its food-plant, a species of *Ipomœa*. The egg, attached to a membrane similar in shape and texture to the egg-membrane of *Aspidomorpha puncticosta*, is fixed to the leaf, and the lower part of the membrane is turned back over the egg and pressed down. The edges of the membrane adhere to the surface of the leaf, and the shape and green colour of the egg can be distinctly seen through it. A double keel runs down the centre of the membrane, giving the egg-case the appearance of a double-keeled boat turned over.

An examination of the lower oothecal plate shows that the thickening of the membrane forming the double keel corresponds to two indentations on the posterior edge of the plate. In *Basipta stolida* the V-shaped membrane with a central keel, and in *A. puncticosta* the thickening of the lateral edges, corresponds to the shape of the oothecal plates; the thickening of the lateral edges of the latter being due to the oothecal plates not quite meeting at this point.

For these reasons we consider that the shape of the membranes of a Cassidid egg-case is determined by the shape of the oothecal plate.

Sometimes in captivity a second egg is laid overlapping the side of the first. The egg-case is never covered with excremental matter.

This species carries its cast skins during its larval and pupal life on a pair of long posterior spikes, in a similar manner to *A. puncticosta*, and does not attach any excremental matter to them, thus falling into the same series as the African species *A. puncticosta* and *confinis*. The bare egg-case also places it with these species, but its simple nature and the absence of any eggless membrane to act as attachment to the leaf indicate an affinity to the genera *Cassida* and *Laccoptera*.

The larva and imago generally feed on the under-side of the leaves. If the pupæ be kept in a light-proof box the bright or metallic colours do not appear in the imago.

2.—*Aspidomorpha micans*, Fab.

This species generally lays its eggs in batches of two, but sometimes three and even four eggs are placed together. Each egg is attached to the usual shaped Cassidid egg-membrane which has a slight thickening longitudinally, a midrib, and is doubled back over the egg. In captivity the first egg is sometimes attached direct to the leaf, but more often an eggless membrane is first attached to the leaf and the eggs laid in it. The second egg is placed to one side—*i. e.* the right—of the first, the third is placed upon and between the first and second, and the fourth, if present, to the leaf of the first. In captivity the egg-case is sometimes partly covered with excrement, but we have never found one so covered in the field.

During the larval and pupal life the skins are carried on the long posterior spikes, but no excremental matter is attached to them; occasionally during the first instar small pieces of excrement are carried at the end of these posterior spikes.

A pair *in cop.* at 10 a.m on the 5th September produced two egg-cases by 4 p.m. These remained in the egg state seven days, in the larval state nineteen days, and in the pupal state six days.

Both by the egg-case and larval appendage this species falls into the African *Aspidomorpha* group.

3.—*Laccoptera chinensis*, Fab.

The egg-cases of this species contain two, three and sometimes four eggs, and are generally, but not invariably, covered with excremental matter. This covering is variable in size, sometimes covering the entire case, at other times being only a small patch in the middle of the membrane. The first egg is attached direct to the leaf and the membrane turned back in the usual way.

Soon after the larva hatches it attaches a small piece of excrement to the tip of each of the long posterior spikes, a telescopic movement of the last two segments of the body enabling it to perform this operation. As its size increases these pieces of excrement coalesce and form a roughly triangular lump. The cast skins are worked into the mass and held to form the "shield." Up to the last instar the larva is yellow, then it changes to black, the white sporacles showing up distinctly. The size of the shield varies: sometimes it entirely covers the larva, at other times it leaves it half exposed.

Both by egg-case and larval "shield" this species falls into the same division as the African genera *Cassida* and *Laccoptera*.

4.—*Cassida obtusata*, Boh.

The egg-cases of this species contain two eggs attached to the ordinary-shaped Cassidid egg-membranes. The case is bare, no excremental matter being placed upon it. The imago feeds upon *Citrus* trees and injures them considerably.

Unfortunately we were not able to observe the larva, so cannot state the shape and nature of its appendages, but we anticipate that it is similar to *Coptocycla circumdata*.

The study of these interesting egg-cases and larval appendages naturally suggests the questions as to their origin and use. That they are a protection to egg and larva brought about by natural selection is the first solution that suggests itself. Were *A. puncticosta* the only species under consideration this might appear an adequate explanation, but after studying several African* and these China forms the authors are not satisfied with it.

In *A. puncticosta*, where the egg-case is carried to its highest perfection, the eggs are as heavily parasitised as any that we have observed, and in Mozambique, ants eat into the case and destroy the eggs. In a similar manner ants destroy the eggs of *Mantidæ*. It is not an absolute protection that we look for, but only a relative one. To argue that this species would be exterminated were its egg-case less perfect appears illogical, for other species are just as abundant although their egg-cases are much less perfect. The wide range of this species we consider due to the, practically, uninterrupted growth of its food-plant, *Ipomæa pes-capreæ*, along the African coast. It is

* Trans. Ent. Soc., 1904, pp. 1-19.

possible that this ootheca may serve as a protection to dampness or drought, to spray or sand, in its exposed habitat, but in China *Coptocycla circumdata* live upon the same food-plant and is exposed to the same conditions. It appears to be immaterial to the hatching of the larva of *Laccoptera chinensis* whether the egg-case be partly or wholly covered with excrement or left entirely uncovered.

The larva and pupa of *A. puncticosta*, *B. stolida* and *Laccoptera excavata* have each a distinct style of larval appendages, and each is as heavily attacked by parasites as many beetles' larvæ not protected in such manner.

As eggs and larvæ are scarce during October and November in Macao we were unable to collect enough material in the field to discover what parasites attack the species mentioned above and in what proportion. Several adults and larvæ were found killed by a fungus growth.

Until the structure of the egg-cases and larval appendages of more species have been described, and the death factors that keep these beetles in check are better known, it were better not to insist that protection against enemies or drought is the "raison d'être" of the development.

XV. *Life-history of* Tessaratoma papillosa, *Thunberg.* By J. C. Kershaw, F.Z.S. With *Notes on the stridulating organ and stink-glands* by Frederick Muir, F.E.S.

[Read March 20th, 1907.]

Plate XXIII.

As the early stages of the life-history of this Pentatomid have not been described, so Mr. G. W. Kirkaldy kindly informs me, it may be of interest to give a fairly complete account of the metamorphoses. The mature nymph, however, says Mr. Kirkaldy, was figured by Gray in Griffiths' "Cuvier's Animal Kingdom," xv, Plate XCIII, fig. 1 (1832). This bug is distributed from India to China, and is exceedingly common in South China, where it might well be called the "longan bug," for it particularly infects the longan and lichee trees, and seems to do them much damage, for the leaves of these fruit trees are to a great extent shrivelled, blackened and otherwise injured, as shown in the plate. No doubt part of this is due to other causes, but fungus probably attacks sooner or later the minute punctures made by the setæ of the bug, and I believe the greater part of the injuries are caused by this insect; it swarms on the trees all through the summer or wet season, tainting the air in the neighbourhood with its nauseous smell; and many may be found in a semi-torpid condition clinging on the foliage in the winter or dry season.

On June 15th a ♂ and ♀ were taken in the morning and put into a breeding-cage on a spray of longan. In the evening about 6 p.m. they were *in cop.* They separated before 7 a.m. on the 16th. By 9 a.m. on the 21st the ♀ had laid six green eggs on the under-side of a leaf (the usual locality for eggs of this bug) close together or actually touching one another. As each egg was deposited the bug took a step forward and felt with the tip of the abdomen where to place the next egg. By 10.15 a.m. it had laid fourteen eggs, and it then shifted slightly to one side of the batch and remained motionless for several days. The eggs hatched on the 30th, so that, roughly speaking, they hatch in about ten days. Some little time after the eggs are laid they turn ochreous, and just before hatching become pink or purplish. Just emerged, the nymphs have the middle of the upper-side light green, the rest (including legs and antennæ) light pink. In the next stage the general colour of the upper-side is pink, with blackish margins and a broad blackish marking in form of a cross; the antennæ and legs are also nearly black. Like the adults, the nymphs in their youngest stages vibrate the antennæ if disturbed, but apparently have not the power of using the stink-glands, even if they are developed in these stages. However, bugs in the third stage, shown at Fig. 4, have these dorsal glands quite distinct. This figure shows a specimen just after the first moult from the condition of Fig. 3. This stage continues the same in shape and colouring, though increasing in size and moulting several times, till the stage shown at Fig. 5 is reached. This figure shows a specimen just before the moult to the condition of Fig. 6, so that it will be seen that there is a great increase in size from the first to the final moult of the stage shown at Fig. 4, but no change in shape or colouring till the stage shown at Fig. 5 is reached; in this stage also there are several moults and much increase in size to that of the specimen figured, but no change of shape or colouring till the stage shown at Fig. 6 is attained. In all the stages thus far, the head and thorax are practically in the same plane with the abdomen, whilst the whole insect is very flat and thin in section.

In the next stage, Fig. 6, the abdomen becomes more convex, and after the last moult the head and thorax deflect or bend downwards, the elytra come unsoldered and the wings appear, emerging in a folded and soft condition from beneath the elytra. For an hour or more after this final moult the insect is chiefly of a pale green and pink, and it remains in a soft state for about two days (apparently incapable of using the stink-glands), though gradually becoming harder. Finally, its colour is a beautiful purple-brown, but one or two days' exposure brings the customary ochreous coloration seen in Fig. 8, the sexes scarcely differing. The bugs remain stationary for several days before each moult. The final moult to the adult condition is accomplished in about an hour, the whole insect being light green as it works its way gradually out of the old skin, but it almost immediately becomes variegated with pinkish-ochreous.

On opening the wings of the adult as soon as the moult is accomplished and exposing the dorsal surface of the abdomen, the stink-glands appear to have atrophied. If the cast skin is examined these glands will be found as two yellow, soft masses enveloped by a thin membrane, and full of a clear yellowish fluid which has the characteristic smell if the little bags are ruptured. In the moulted skin these glands are on the under-side of the dorsal integument of the abdomen. The bug in the stage shown at Fig. 5, whether large or small, has the power of ejecting the spray of strong, evil-smelling fluid from the dorsal glands of the abdomen to a distance of several inches ; if received in the eye by mischance the smarting is almost intolerable. This liquid stains the skin yellow, much like a cigarette. In the adult bug the fluid is ejected from two glands near the third pair of coxæ ; but a jet of liquid is also often shot from the anus ; this liquid is of a darkish yellow-brown colour and appears to be scentless. The fluid ejected from the coxal glands is clear yellowish ; it immediately permeates (probably by capillary attraction) the abdominal articulations and spreads under the elytra on the dorsal surface.

The adult bugs, both ♂ and ♀, are capable of stridulating if annoyed, but it seems probable they may use it as a means of signalling to each other. The under-side and legs of the adults become covered by degrees with a white, flocculent substance which becomes thicker with age. Those bugs which hatch late in the summer appear to winter in the stage shown at Fig. 5.

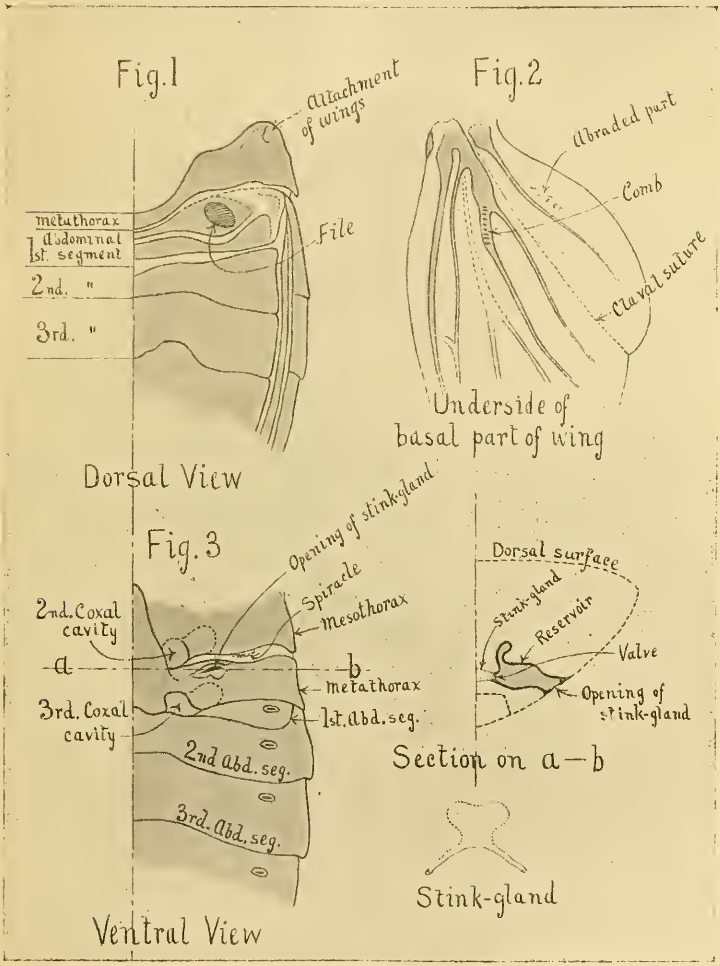
The eggs of *Tessaratoma papillosa* are much parasitised by a Chalcid, and many batches of eggs may be found, each with the small round hole made by the exit of this parasite, which seems to be the main check on the increase of this already too numerous bug.

Notes on the stridulating organ and stink-glands of Tessaratoma papillosa, *Thunb.* By FREDERICK MUIR, F.E.S.

The sound-producing organs of this insect are situated on the anterior dorsal part of the abdomen and upon the under-side of the wings, and consist of a movable striated surface, the file, which passes across strong chitinous teeth, the comb. A sclerite, spatulate at each end, runs across the abdomen between the metathorax and the first abdominal segment. Situated at each end of this sclerite, upon the spatulate part, is a round, convex and highly-chitinous spot finely striated transversely, the file. A strong muscular system is attached to the edge of this sclerite by means of which it is enabled to move backward and forward over an arc of about 35 degrees, having an imaginary axis passing from side to side of the abdomen; the whole sclerite moves at once, so that the files act in unison and cannot move independently. This rotatory movement of the files makes it necessary that they should have a convex surface to keep them in contact with the comb situated upon the wing. The folding under of the wing along the claval suture brings the membrane between the file and the comb, and this membrane is often abraded at that spot, especially in old specimens. This membrane does not affect the sound at all, for it is of equal volume whether the membrane be cut off or not. If the wings be cut off and the insect irritated the files move rapidly, but of course no sound is produced; the same thing happens if a female be placed near a male and watched for a little time. Figs. 1 and 2 show the position of these organs.

In the later nymphal stages of this bug there are four stink-glands opening at the posterior margin of the second, third, fourth and fifth segments; the first and fourth of these glands are functionless. I cannot state if all four glands exist in the earliest stages as I have not been able to procure specimens, but it is interesting to note that they are not able to secrete obnoxious fluid during these stages. This is not what I should have expected, as the presumably protective value of this fluid would be most valuable to the young.

In the adult the dorsal glands atrophise and a ventral gland arises with two openings near the anterior edge of the metathorax lateral of the coxal cavity. The ducts



leading from this gland, after passing between chitinous processes for the attachment of muscles, open into chambers, or reservoirs, with strong muscular walls. A valve is situated at the juncture of the duct and reservoirs. It is by the sudden contraction of the walls of these chambers, when full of fluid, that the insect is enabled to eject its obnoxious fluid six to ten inches. Fig. 3 shows the position of gland and the section gives a diagram of reservoir.

Explanation of Plate XXIII.

[*See Explanation facing the* Plate.]

XVI. *The structure and life-history of the Holly-fly.* By PROFESSOR L. C. MIALL, F.R.S., and T. H. TAYLOR.

[Read March 20th, 1907.]

I. INTRODUCTION.

Occurrence.—Holly-leaves are often infested by a small Dipterous larva, which forms discoloured blisters upon them. When opened with a needle the blisters are found to contain yellowish-white larvæ with black heads and tails. In particular localities a large proportion of the leaves may be disfigured in this way, and it was the abundance of the insect near Leeds which caused us to undertake its investigation.

Goureau * has published a slight notice of the holly-fly, to which he gave the name of *Phytomyza aquifolii.* We have not attended to the classification of Phytomyza, and express no opinion upon the validity of the species.†

Summary of Life-history.—The life of the holly-fly occupies about a year, and extends from one June to the next. In June the young leaves of the tree are expanding, and the eggs are laid in the midrib while it is still tender. The larva soon hatches out, and remains in the midrib for about two months, boring its way along the central vessel (fig. 1). Then it turns aside, and enters the blade of the leaf, feeding on the green cells beneath the upper epidermis, and producing a blister of irregular shape, which at first takes a pale colour in consequence of the contained air. More than one larva may attack the same leaf, and their blisters sometimes run together. The cuticle is too opaque for the larva to show through it, but it can be felt by gentle pressure with the finger-tip. When feeding it lies on either its right or left side, and mows down the cells with its mouth-hooks, leaving a track which, while fresh, is visible from without, and reminds one of the path made

* Ann. Soc. Ent. France, vol. ii, p. 143 (1851).

† There is a brief notice of the holly-fly in Réaumur's "Histoire des Insectes," vol. iii, mém. 1 (1737).

by the radula of a pond-snail among the microscopic algæ of an aquarium. About the end of March the larva is full fed, and turns to a pupa, which, unlike that of many other leaf-miners, remains within the leaf. The flies appear about the end of May, and may be seen throughout

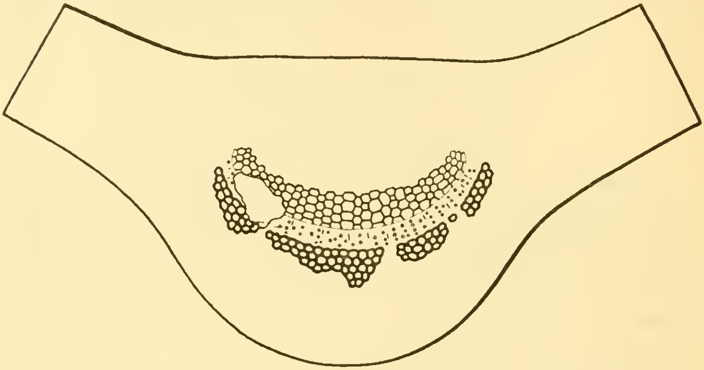


FIG. 1.

Transverse section of midrib of holly-leaf showing larval mine in central vein. (× 50.)

June on infected holly-trees, usually alighting on the young green shoots. We have not met with them except on the holly, nor have we seen them fly except from one leaf to another.

II. THE STRUCTURE OF THE LARVA.

We shall begin by describing the larva in its first stage, and then notice the points of difference which mark the full-grown larva.

The Exoskeleton. The body (fig. 2) consists of a head succeeded by three thoracic and nine abdominal segments, the two last of which are distinguished with difficulty.* Transverse bands of minute hooks make the junctions of the segments obvious, except where the 11th and 12th segments meet. The first band is restricted to the dorsal surface; the second is interrupted laterally; all the bands are interrupted along the mid-dorsal and mid-ventral lines.

* Twelve is the usual number of post-cephalic segments in Muscid and Nemoceran larvæ. In one species of Chironomus we have found faint indications of a subdivision of the 12th larval segment, the part behind the bunches of setæ being constricted off.

The head is sunk into the thorax so deeply that only

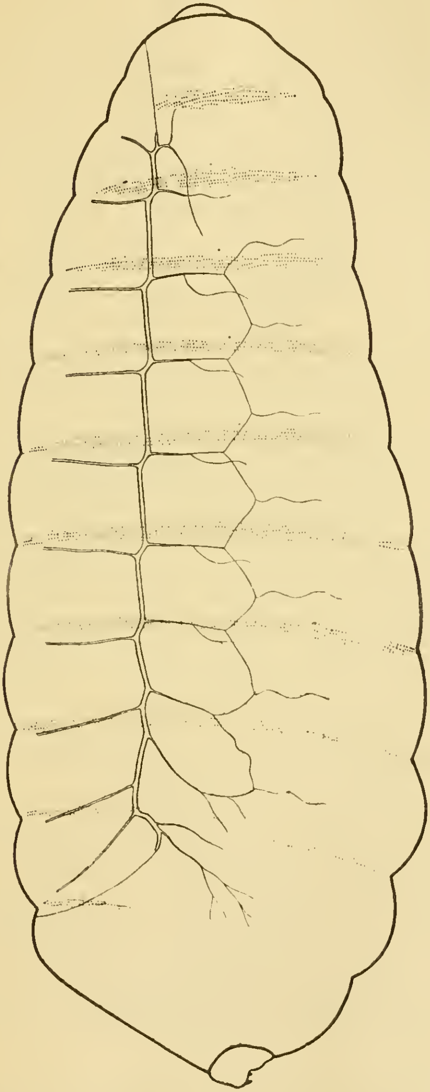


Fig. 2.

Larva of first stage, lateral view, showing external features and tracheal system. The longitudinal tracheal trunk terminates anteriorly and posteriorly in an initial thread which is connected with a closed spiracle; the dorsal commissures are continuous with those of the other side. (× 145.)

the extreme fore-end is exposed. It is long and narrow, and reaches as far back as the metathorax. The ventral surface of the exposed part is strongly chitinised, and serves for the prehension of food. In the young larva it is armed with three hook-like teeth, one median and of larger size, the other two smaller and further back. This chitinised ventral plate, which, although it is deeply cleft behind, is apparently single, is replaced in older larvæ by two unequal oral plates, enclosing the mouth-opening between them, and each carrying two hook-like projections. Muscles pass from the body-wall to the oral plate or plates, and effect the movements necessary to mastication. In young larvæ, but not in older ones, a pair of curved chitinous struts, standing off on either side at right angles, probably serve to hold the plate in position (they are omitted from fig. 3). The upper-surface of the head is almost entirely concealed; on the minute exposed part are several small oblique sunk rods of chitin, of unknown function. The head-capsule, which answers to the wall of the head in more normal insects, consists of a delicate cuticle, lined by an epidermis. It is continuous with the oral plates, but otherwise completely immersed; nothing can be seen of an invagination-cavity. Muscles pass from the body-wall to the head-capsule. There is also an endocranium, which we suppose to have originated in chitinous apodemes; it consists of an anterior median piece, deeply grooved on its upper-surface, and a posterior forked piece, divided into right and left halves, each of which gives off dorsal and ventral arms. The groove on the median piece lodges the pharynx.

The Nervous System.—The central nervous system (fig. 3) is lodged in the thorax and the fore-part of the abdomen; it consists of cerebral ganglia and a ventral complex. From the latter paired nerves are given off to the head (three pairs), to all the thoracic segments, and to the first eight abdominal segments. A pair of large ganglia in front of the cerebral ganglia may represent the optic lobes of the blow-fly larva. The prothoracic and mesothoracic nerves have ganglia at their roots. No sense-organs have been clearly made out in the young larva, though in older larvæ minute structures, which are probably sensory, appear on the exposed surface of the head (fig. 5).

The Alimentary Canal.—The mouth-opening leads into a small buccal cavity, which lies within the oral plate. The fore-part of the pharynx is strongly chitinised, and connects the oral plate with the endocranium; the hinder-

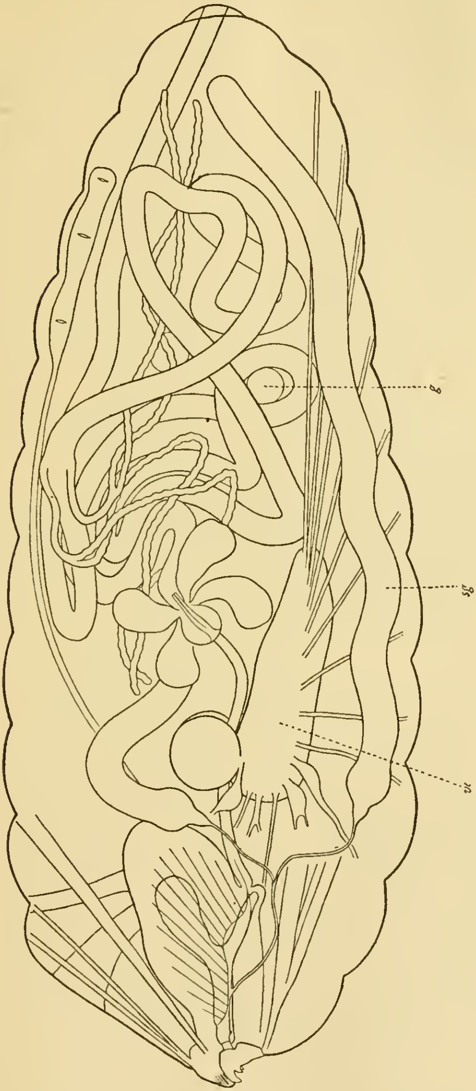


FIG. 3.

Larva of first stage, showing internal anatomy. *g*, gonad; *sg*, left salivary gland (the anterior end only of the right gland is shown); *vc*, ventral complex of nervous system. (× 145.)

part lies in the concave median piece of the endocranium, and behind this in the space between the diverging ventral arms. A series of muscles, which are inserted into the dorsal wall of the pharynx, probably serve to dilate the cavity; when a live larva is placed in water charged with finely-powdered carmine the particles can be seen to enter the mouth at each contraction of the muscles. The œsophagus (fig. 3) passes between the cerebral ganglia. There is a cardiac chamber, with four cæca and an œsophageal valve. The stomach is long and convoluted. Two Malpighian tubules, each bifurcate, enter the beginning of the intestine. The whole alimentary canal is about five or six times as long as the body. The salivary-glands reach to the hinder-end of the body; they are slightly dilated in front. Their ducts unite into a single tube, which opens into the floor of the pharynx, perforating the median piece of the endocranium in order to do so; they show the usual cross-marking. It is hard to explain the large size of the salivary-glands, but as no pupal cocoon has to be made, their function is probably strictly alimentary.

The Tracheal System.—A pair of longitudinal tracheal trunks run nearly the whole length of the larva (fig. 2). These trunks are connected with each other by transverse dorsal commissures, and give off segmental branches. Adjacent segmental branches are united by longitudinal connectives, from each of which arises a ventral trachea. There are ten pairs of closed spiracles, two thoracic and eight abdominal. The first and the last pairs occur respectively in the 1st thoracic and the 8th (spiracular) abdominal segment, and are placed near the mid-dorsal line; the remaining spiracles are lateral in position, each being placed close behind one of the bands of segmental hooks. The anterior and posterior spiracles are often unusually large in Dipterous larvæ; in the holly-fly they are closed like the rest in the young larva, but become functional in the later larval stages. The tracheal junctions which divide the longitudinal trunks into segmental systems are evident in the last larval stage.

The Dorsal Vessel.—The dorsal vessel or heart (fig. 3) is three-chambered, each chamber being provided with a pair of ostia. The fore-end of the dorsal vessel reaches the head-capsule and is attached to it, but actually opens into the thorax.

The Fat-body.—Between the coiled strings of the fat-body are found bright refractive bodies of large size (fig. 4), which are calcareous concretions, each enclosed within a nucleated cell. They present a rough surface, and an internal concentric lamination resembling that of a starch-grain. Similar concretions are found in the proglottides of a tape-worm.

The fate of the concretions of the holly-fly larva is interesting. They persist throughout the larval stage, gradually increasing in size, but disappear soon after pupation. In an old puparium the internal tissues are devoid of lime-salts, but the cuticle effervesces strongly as soon as its inner surface is touched with acid. It seems likely that the substance of the concretions is absorbed and re-deposited in the cuticle.* Occasionally a few concretions persist and are carried over into the fly.

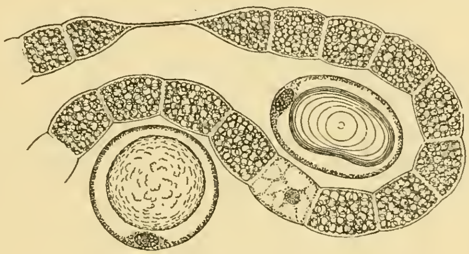


FIG. 4.

Cells of the fat-body. Two calcareous corpuscles are shown, one in surface-view, the other in optical section; the fat-globules have been omitted from one cell. (× 625.)

The Gonads.—Two spherical bodies (fig. 3) lying between the coils of the intestine are the gonads; they remain practically unchanged throughout the larval period.

Larval Stages.—The larva of the holly-fly moults twice before pupation; there are thus three larval stages. The first lasts from July to December; the second from December to February, and the third from February to the middle or end of March. At times of moult the skin splits along the *ventral* side, which is unusual in insects. At pupation the larva is 3·5–4 mm. long.

The peculiar features of later Larvæ.—A larva of the second or third stage differs from the larva which has just

* A similar transference probably occurs in other Dipterous leaf-miners, *e.g.* in *Acidia heraclei.*

been described in several particulars. There are now two oral plates, one on either side of the mouth-opening, the right plate being larger than the left. Each bears two hooks, which are probably used in dividing the food. The anterior hook of the right plate is the largest of the four, and the distortion which regularly occurs brings it exactly in front of the mouth-opening (fig. 5). The asymmetry of the oral plates may be connected with the circumstance

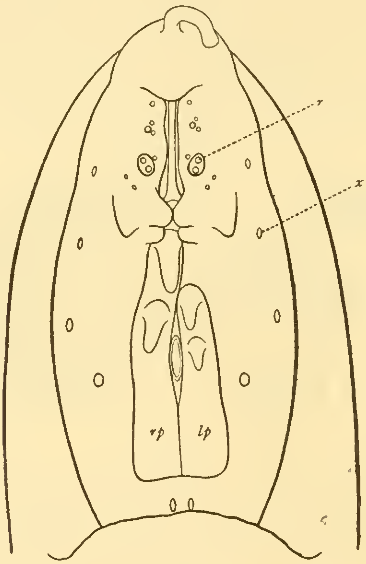


Fig. 5.

Head and prothorax of larva of 3rd stage, ventral view. *lp*, *rp*, left and right oral plates; *r*, oblique sunk rods; *x*, chitinous rings. (× 360.)

that the larva lies on its side while feeding on the cells of the leaf. The endocranium is stronger and of darker colour, almost black. The anterior median piece has become distinct from the forked part (fig. 6). A new structure, the tentacle, now appears on the exposed surface of the head; what seems to be the labrum is produced into two pairs of lobes; there are also for the first time chitinous rings on the head and prothorax which resemble the bases of setæ and are perhaps sensory (no true setæ have been seen on any part of the cuticle); the oblique sunk rods are more conspicuous. The segmental bands of

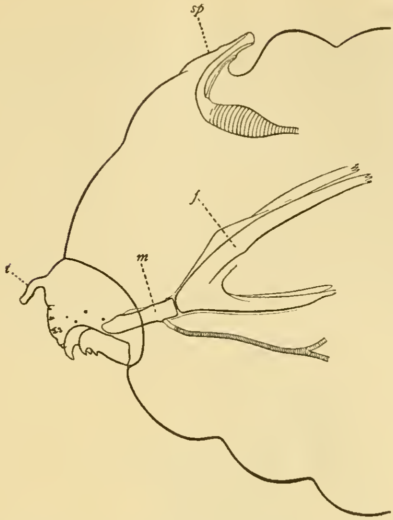


Fig. 6.

Head and thorax of larva of 3rd stage, lateral view. *f*, forked plate of endocranium ; *m*, median ditto ; *sp*, anterior spiracle ; *t*, tentacle. (× 200.)

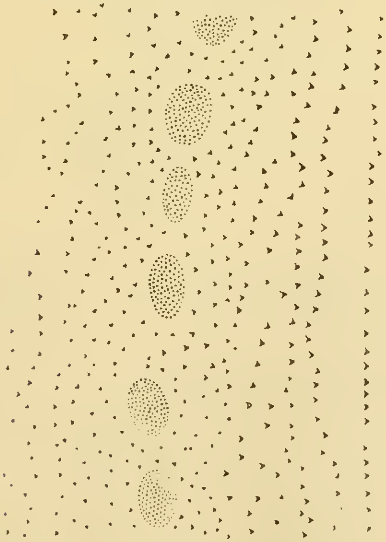


Fig. 7.

Portion of segmental band of hooks from larva of 3rd stage, showing the muscular insertions (dotted); the hooks point backwards. (× 430.)

hooks become broader and the hooks more numerous. Areolæ, devoid of hooks, and answering to the attachments of segmental muscles, are found in the bands (fig. 7). In the third stage the 3rd–6th bands are continuous dorsally. The tracheal network is richer, and the anterior and posterior spiracles are functional, their initial threads having been replaced by open extensions of the main trunks (tracheal extensions).

The spiracles have already been described as they appear in the first larval stage. We go on to describe the spiracles of the last larval stage, and then notice those of

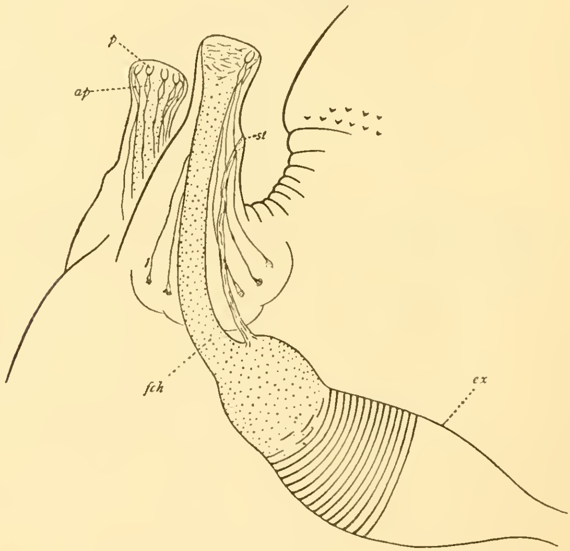


Fig. 8.

Anterior spiracles of larva of 3rd stage. *ap*, earring-like appendage with filament; *ex*, tracheal extension; *fch*, "felted chamber"; *p*, pit; *st*, closed spiracle with cord ("Narbenstrang"). (× 280.)

the second larval stage, which are intermediate in structure between the earlier and later ones.

In the third stage the anterior and posterior spiracles project from the surface of the body. The anterior spiracle (fig. 8) is a compound structure ("compound spiracle" of De Meijere*) consisting of a functional and a closed spiracle, both carried on a cuticular process of the skin. The internal part of the functional spiracle

* Zool. Jahrb., vol. xv, pt. iv, p. 623 (1902).

consists of an air-containing cylinder ("felted chamber") which, arising from the end of the tracheal extension, runs up the stalk and terminates in an expanded "end-plate." The closed spiracle is attached to the side-wall of the stalk and connected by a solid cord ("Narbenstrang") with the end of the tracheal extension. The cavity of the air-containing cylinder is subdivided by chitinous trabeculæ into minute spaces, and presents a dotted appearance when the air has been removed by alcohol. The end of the tracheal extension has the same structure. The end-plate of the spiracle is flattened from side to side, and carries on its inner and posterior faces six or more radiating pits (the number is not constant). Each pit has a thickened

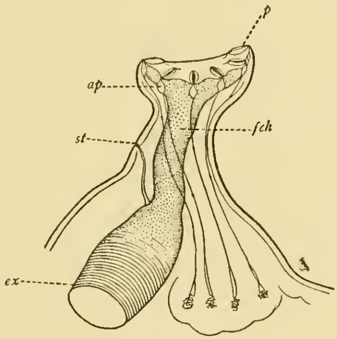


Fig. 9.
Posterior spiracle of larva of 3rd stage.
Lettering as in fig. 8. (× 330.)

margin from which an oval appendage hangs down like an earring in the space outside the air-containing cylinder. From each appendage a delicate filament is given off, which, passing down the stalk, branches and ends in intricate beaded coils, resembling the termination of a nerve on a muscle-fibre. The structure of the posterior spiracles (fig. 9) is similar to that of the anterior ones, the felted chamber, pits, appendages and filaments, and the closed spiracle being all present. The pits are more elaborate, and resemble miniature spiracles; they are carried on prominences which are situated on the outer side of the end-plate, and vary in number from five to nine, the number being usually different in the two spiracles. Each pit apparently opens to the exterior by a slit.

In the second larval stage the tracheal extensions are not dilated, but each is connected with an air-containing cylinder terminating in an end-plate, which forms a knob-like projection on the surface of the body. The pits with their appendages and filaments, if they are actually present, are difficult to demonstrate.

III. Pupation.

About the middle of March the larva is full grown and ready for pupation. It is still imprisoned within the leaf, but can move freely about in the blister, which is now a large open space lying between the leaf-veins and the epidermis. The palisade-cells are always the first to be attacked; sometimes the spongy cells are excavated as well, but this comes later; in any case the epidermis with the cuticle is left intact.

Before pupation the larva prepares an opening, through which it may afterwards emerge as a fly. To this end it pares down the epidermis in one place until only the external cuticle remains. This area, which may be called the "pupal blister," is parabolic in plan, and although very small is easily distinguished from the rest of the larval blister by its different colour. The apex of the pupal blister is sharply defined, but the base gradually shades off. It now becomes possible to observe the movements of the larva through the transparent cuticle. The edge of the pupal blister is pierced; the larva turns over and lies on its back with the ventral surface pressing against the cuticle; the movements of the oral plates become slower and at length cease. Two short black rods now become visible in a strong light; these are the anterior spiracles projecting from the top of the prothorax. At first they lay behind the exposed part of the head, and pointed upwards and backwards. The head is now completely retracted into the thorax, and the spiracles occupy the front extremity of the body, having swung round so as to point forwards. After a few preliminary trials they are passed through the slit in the cuticle, and become fully exposed to the outer air. They form a black speck on the apex of the pupal blister, and can easily be felt by the finger-tip.

IV. The Pupa and the Emergence of the Fly.

The pupa, shrouded in a delicate transparent membrane

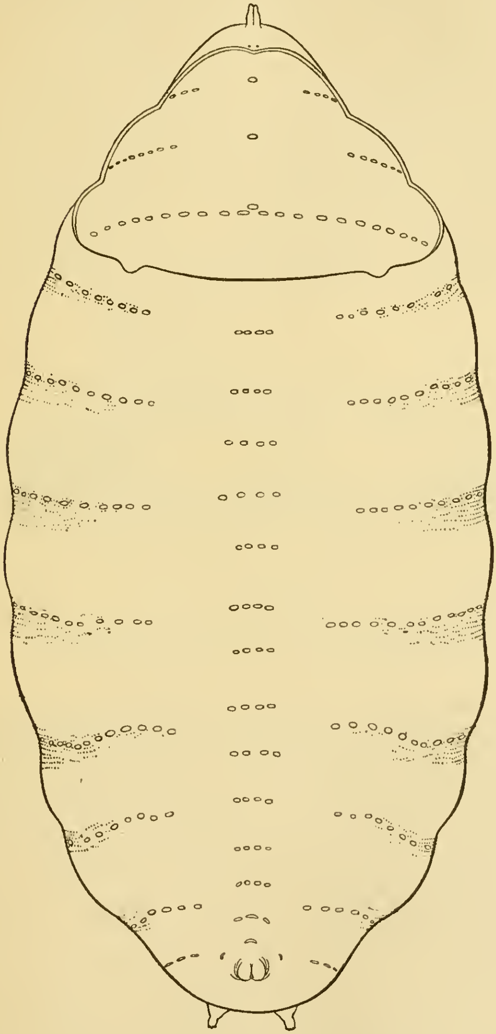


Fig. 10.

Puparium, ventral view. The hinged plate has been removed; the hooks and insertions of larval muscles are shown. (× 45.)

(the true pupal skin), remains enclosed in the larval cuticle, which has become much thickened by calcareous deposit on its inner surface. By appropriate methods the thin larval cuticle can be separated from the later calcareous addition. The body of the puparium (fig. 10) is rusty in colour, with a smooth shining surface, and flattened dorso-ventrally. The larval head has been completely retracted, and the fore-part of the prothorax, sharing in the movement of retraction, forms a funnel-shaped depression on the front part of the ventral surface of the puparium. This depression is partly filled up with a waxy secretion, which appears at the mouth just before the movements of the larva cease. The spiracles, anterior and posterior, are now black and strongly chitinised. The fly escapes from the puparium by a hinged plate (fig. 11) which very nearly coincides in position and extent with that special part of the general blister which we have called the

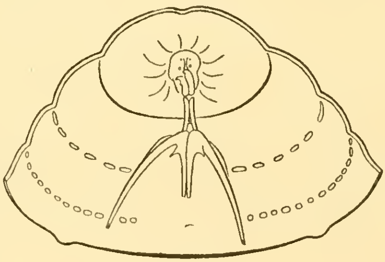


Fig. 11.

Hinged plate of puparium. The oral and endocranial plates of the larva remain attached to the inner surface. (× 45.)

"pupal blister." When the fly is ready to emerge the plate is raised in front and pushed back (fig. 12), bringing with it the cuticle of the blister. The rupture is effected by the alternate swelling and contraction of the frontal sac of the fly, which is very distensible and roughened on the outer surface with numerous fine denticles. The ventral surface of the fly appears first with the legs. The wings are crumpled when they are withdrawn from their sheaths, but soon expand.

Empty pupal cases in blistered holly-leaves can easily be identified by the raised hinged plate. Sometimes, instead of the raised plate, one finds in the pupal blister a small circular aperture; this marks the place through which a parasitic ichneumon has escaped, and it is interesting to notice that the ichneumon quits the puparium and leaf at the place of weakness which has been made ready for the escape of the fly. We have not attended to the ichneumon parasites of the holly-fly further than to note that there are two distinct species at least, one appearing early in June and the other later in the summer. We have found parasitic larvæ in holly-fly larvæ of all ages, but are unable to say when or how the eggs are deposited.

Cyclorrhaphous and Orthorrhaphous Diptera.—The larval skin, which forms the wall of the puparium, is marked by prepared lines, which facilitate the escape of the fly. In the holly-fly one line begins on the prothorax, just below the spiracle, passes horizontally back to the fore-part of

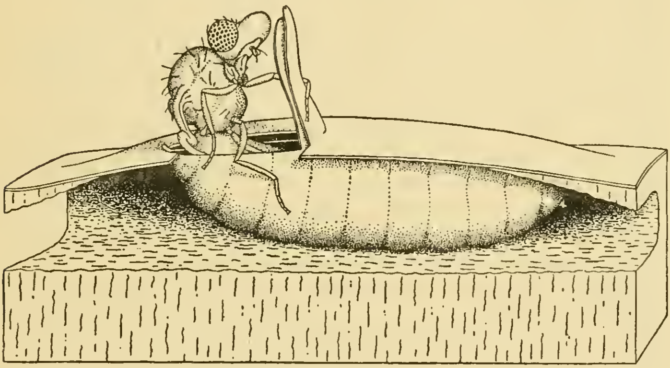


Fig. 12.

Fly emerging from puparium. (× 20.)

the 1st abdominal segment, and there forks into a descending and a slighter ascending branch. It will be convenient to speak of these lines as "lines of dehiscence." * In the holly-fly the horizontal line of dehiscence, together with the descending one, marks out a triangular ventral plate, which can be turned back as on a hinge to allow the fly to escape. In Drosophila a similar horizontal line of dehiscence runs along the thorax, and then forks as in the holly-fly. Here, however, the ascending branch is the

* Such lines have been called "sutures," a term which is open to objection, because it suggests the line of union of distinct morphological elements, as in the phrase "sutures of the skull." They differ, on the other hand, from lines of fracture in being prepared in advance; they can be traced in a puparium from which no fly has emerged.

stronger and meets its fellow in the mid-dorsal line; the hinged plate is dorsal in position, and the descending branch does not aid in emergence. In the blow-fly the ascending and descending lines of dehiscence practically disappear, being represented by two minute diverging branches at the posterior end of the horizontal line. When the fly emerges the dorsal and ventral halves of the puparial thorax are pushed asunder, and a transverse rupture occurs on the dorsal or on the ventral half, sometimes on both. Thus in the blow-fly the whole thorax often becomes completely detached from the puparium. In Oscinis frit the horizontal line of dehiscence forks into two branches, of which the ascending one, passing about half-way to the mid-dorsal region, is the stronger. At emergence the puparium splits open along the horizontal line, generally along the ascending branch and sometimes also along the descending one.

In all these cases the horizontal line of dehiscence is constant and functional, while the transverse line may be slightly developed and functionally unimportant. It is not at all certain whether Brauer used the term "cyclorrhaphous" of the vertical or of the horizontal line of dehiscence, or of both. In some text-books the writers, evidently basing their statements on what they suppose Brauer to have meant, explain the term "cyclorrhaphous" with reference to what we have called the ascending and descending lines of dehiscence, making no mention of the horizontal one.

The term "orthorrhaphous" is also at present ambiguous. It was originally used by Brauer * to describe a particular mode of dehiscence of the last *larval* skin at pupation. In his later account † he modified his views, and it is not clear to us how his later definition is to be understood, and whether the orthorrhaphous dehiscence is a dehiscence of the larval integument, or of the pupal integument, or of both, or sometimes of one and sometimes of the other. It seems to us that further investigation is called for. Dipterologists may fairly be expected to say with some precision what they mean by the terms "orthorrhaphous" and "cyclorrhaphous," and to indicate the types which they have actually examined.

* Monogr. der Oestriden, p. 33 (1863).

† Zweiflügler des kais, Museums, i, p. 7 (1880).

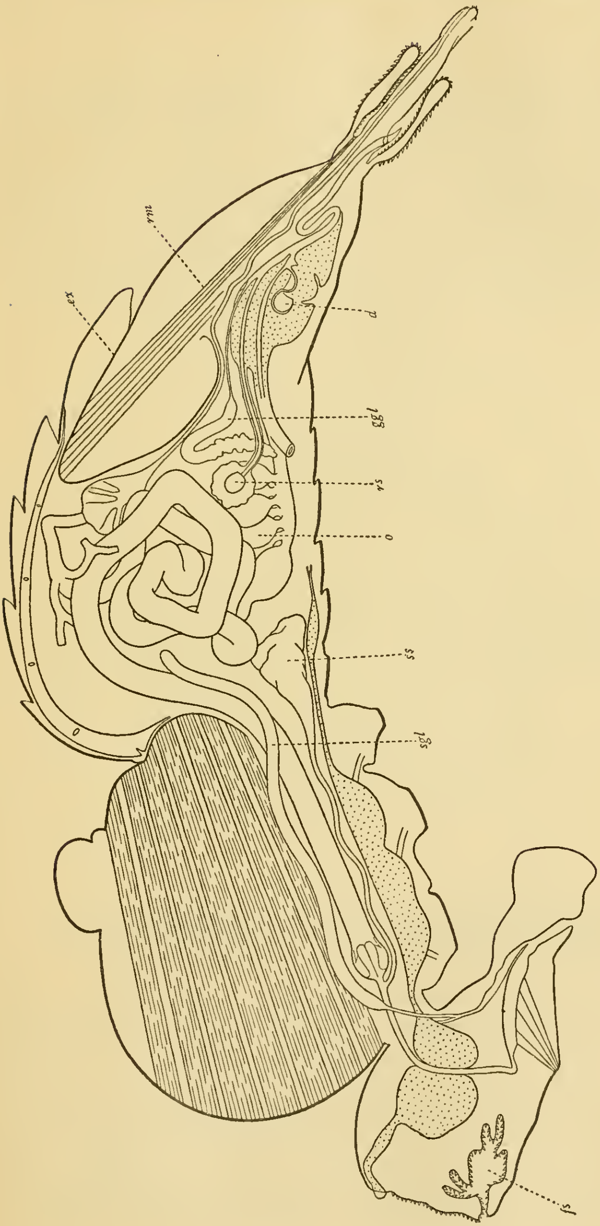


FIG. 13.

Sagittal section of female fly. The Malpighian tubules are cut short. *d*, ventral diverticulum of uterus surrounded by muscular mass; *ex*, conical extension of 7th segment; *fs*, frontal sac (retracted); *ggl*, gluten-gland (only one is shown); *o*, right ovary (the left is not shown); *rm*, retractor-muscles of ovipositor; *rs*, sperm-receptacle (only one is shown: *sgl*, left salivary gland. (× 50.)

V. The Fly.

External Features and Segments.—The mature insect is about $2\frac{1}{2}$ mm. long, the females being rather larger than the males. The body is black in colour. When the abdomen is distended the successive tergal and sternal plates are separated by pale-coloured intervals, and there is also a similar lateral band on each side. The halteres are white.* The abdomen of the female fly consists of nine segments. The 1st is seen with difficulty on the dorsal side, and is represented ventrally by a small plate.

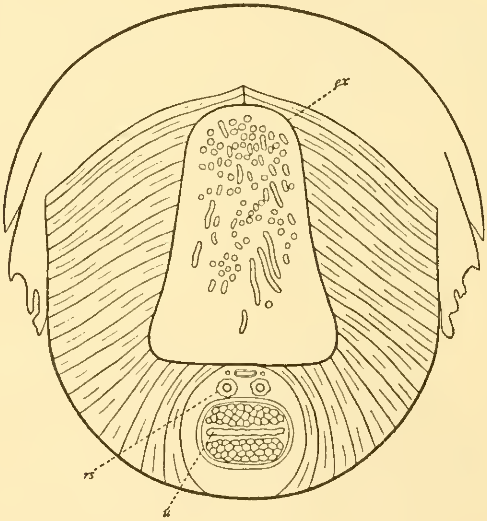


Fig. 14.

Transverse section through 7th segment. *ex*, conical extension, containing retractor muscles of ovipositor, and giving attachment to the oblique muscles of the segment; *rs*, ducts of sperm-receptacles, dorsal to which are the rectum and the ducts of the gluten-glands. (× 115.)

The next five segments are distinctly visible both on the upper and under-surface. The 7th segment differs from the rest in having the sternum and tergum united to form a short tube, into which the ovipositor can be retracted. The upper-front border of this tube is drawn out into a chitinous sheet, which extends throughout the segment next in front; its sides are bent downwards and

* The rest of the description relates to the female fly only.

backwards, so that it forms an inner conical chamber

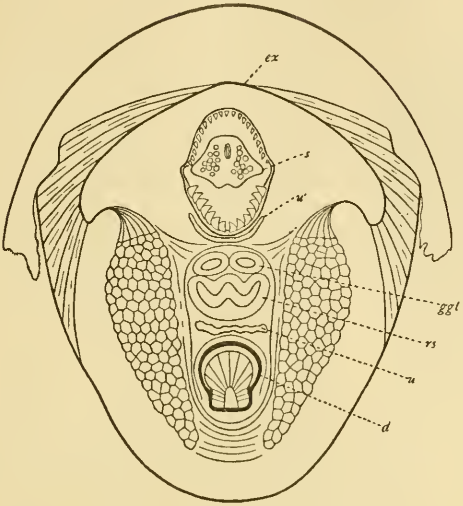


FIG. 15.

Transverse section through 7th segment; the plane of this section is posterior to that of fig. 14. *d*, ventral diverticulum of uterus; *ex*, conical extension of 7th segment, containing 8th and 9th segments (retracted), giving attachment laterally to the oblique muscles, and ventrally to the muscular tissue surrounding the uterus; *ggl*, ducts of gluten-glands; *rs*, fused ducts of sperm-receptacles; *s*, 9th segment enclosed in 8th; *u*, uterus; *u'*, thin-walled region of uterus. (× 140.)

enclosed by the 6th segment (fig. 13). From the wall of this chamber and from its inner surface spring the

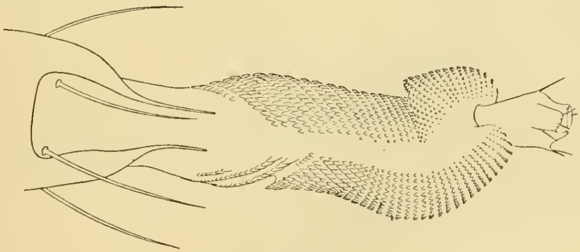


FIG. 16.

Ovipositor of fly, lateral view. The 9th segment is partly retracted into the dentigerous 8th segment; the posterior end of the 7th segment is shown. (× 120.)

retractor-muscles of the ovipositor, while to the outer lateral surface is attached a set of oblique muscles (figs.

14, 15) which pass to the inner face of the tube (7th segment). They enclose between them a median portion of the hæmocœle, in which lies the special muscular portion of the uterus. It is difficult to say whether these oblique muscles effect a change in the shape of the external wall of the 7th segment or in that of the conical extension. It is possible that they serve to protrude the ovipositor by setting up an increased blood-pressure in the last segments of the body. The 8th and 9th segments are specially modified to form the ovipositor. The dorsal and ventral surfaces of the 8th segment bear an elaborate arrangement of denticles (figs. 16, 17) which facilitate the operation of boring into the tissues of the holly-leaf during feeding and oviposition. The 9th and last segment bears at its posterior extremity a pair of short valves. The thin intersegmental cuticle between the 8th and 9th segments is much enlarged, and permits the 9th segment to be completely telescoped into the 8th (figs. 18, 19).

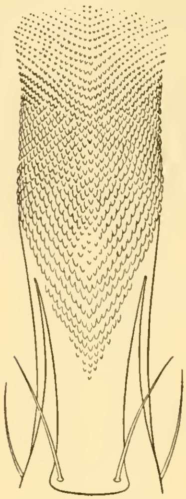


Fig. 17.

Ovipositor of fly, dorsal view. The 9th segment is completely retracted and not shown. (× 120.)

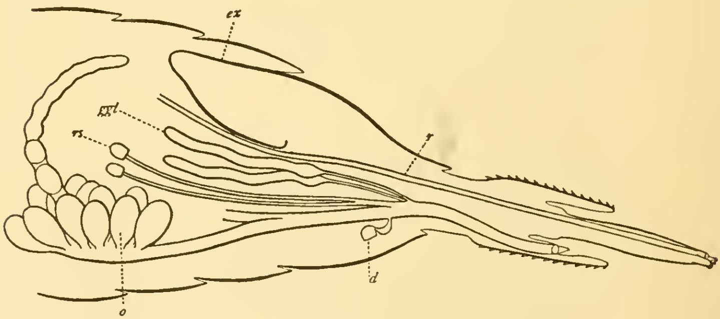


Fig. 18.

Posterior abdominal segments of female fly, diagrammatic. The ovipositor is extended. The left ovary alone is shown; one tubule is complete; *r*, rectum; the rest of the lettering as in fig. 13.

The hinder-part of the 8th can be folded back into the fore-part. When fully retracted, the ovipositor is enclosed within the tube-like 7th segment. The muscles effecting this retraction arise from the inner surface of the chitinous extension of the 7th segment, and are inserted into the 9th segment, some at its beginning and some further back.

Alimentary Canal.—The general arrangement is similar to that of the larva. The salivary glands (fig. 13) persist, but are much reduced in size. The posterior part of the œsophagus gives off a median ventral diverticulum. This passes back through the thorax as a narrow tube lying below the stomach, and dilates in the abdomen into a very distensible thin-walled sac, which corresponds to the sucking-stomach of other insects. As the pharyngeal

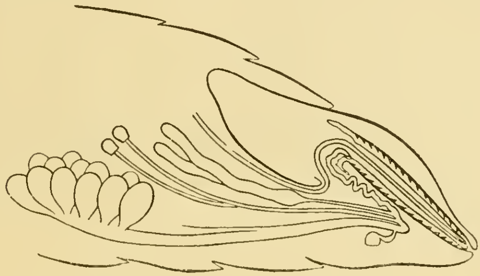


Fig. 19.

Posterior abdominal segments of female fly, diagrammatic. The ovipositor is retracted into the 7th segment.

pump no doubt serves to draw fluids into the mouth, it is rather uncertain what is the special function of the sucking-stomach. The rectum dilates near its beginning into a pyriform chamber, the wall of which is provided with four papillæ.

The Heart.—The heart (fig. 13) lies in the dorsal part of the abdomen. It is widest in front, where it abuts upon the posterior surface of the mesothoracic wall. From its anterior end a fine tube passes downwards and enters the thorax, lying along the dorsal surface of the stomach (this thoracic portion is not represented in fig. 13). Ostia occur in the first five abdominal segments.

The Ovary.—The paired ovary (fig. 13) consists of twelve to fourteen tubules, which are connected at their base with the oviduct. The two oviducts unite to form the uterus, which opens ventrally between the 8th and 9th segments. A pair of scoop-like plates, situated one on either side of the external aperture, perhaps serve to direct the egg as it emerges from the uterus. The uterus receives on its dorsal aspect the ducts of the receptacula seminis and of the gluten-glands. Both these organs are paired, and the ducts are lined by a chitinous intima which in the case of the ducts of the gluten-glands is spirally wound. Where they join the uterus the muscular wall of the latter is considerably thickened both dorsally and ventrally, giving rise to a conspicuous body of tissue lying in the 7th segment. Imbedded in the ventral portion of this muscular tissue occurs an unpaired hemispherical sac (*d*, figs. 13, 15, 18), which communicates by a short duct with the cavity of the uterus. The walls of both the sac and the duct are strongly chitinous. The floor of the sac as seen in sections strongly arches into the cavity, but as it is provided with muscles it can probably also be depressed; we are unable to explain the function of this organ. Behind this special muscular region the uterus is thin-walled and much elongated to permit of the extension of the ovipositor.

VI. Egg-laying and Eggs.

The eggs of the holly-fly are laid in June. At this time the young leaves are being put forth, while those of the past season are turning yellow. Some six or eight leaves are borne on each young shoot; the lower ones are the first to mature, and for about three weeks there is a constant succession of leaves fit for the operation of egg-laying.

On examining holly-leaves at almost any time of the year a number of pits will often be remarked on both the upper and the lower surface. These first appear when the leaves are young and tender, but they persist in the fully-developed leaf without increasing in number. We used to think that these pits were caused by the spines of the old leaves, which pricked the young leaves at times of high wind, but we have now been led to adopt a different explanation. The pits do not actually perforate the leaf-blade; they commonly enter but do not pass through the mesophyll. Holly-trees which are not infested by flies do not show pits on the leaves, but those which are much blistered are also much pitted. Moreover we have seen the female fly piercing the leaves with her ovipositor. She makes an incision with her pointed ovipositor, then steps backward and applies her tongue to the wound, as if she were extracting sap from the cells. Her movements at this time remind us of the way in which a fowl scratches the ground in search of a worm, and then steps back to examine the loosened soil. Egg-laying is a work of time with the holly-fly, for all the eggs are laid separately, and the female requires a regular supply of food. We have no reason to suppose that the male fly is able to draw sap from the cells of the leaf; it has to be content with what it finds on the leaf. Feeding-holes are made only in young and tender leaves; the ovipositor could not be made to penetrate an old leaf. Sometimes the fly fails to find the hole made by her own ovipositor, and then she makes another. While feeding the female is often visited by the male. When he is on the same leaf he seems to be guided to the spot by the working of the ovipositor; his movements become more alert as soon as he is aware of the presence of the female. Stealthily approaching while the female is absorbed in the act of feeding, he effects a secure embrace, from which he is not easily dislodged. The fertile female now proceeds to lay her eggs. She selects young leaves, but is now careful to pierce the under-side of the midrib, preferring a point near the base of the leaf. The piston-like ovipositor is repeatedly pressed up and down until the central vessels are reached. Then, by a contraction of the abdomen, an egg is passed into the hole. The fly tests the place with her tongue, and when satisfied goes off to another leaf. Thin sections through the place of oviposition show that a vertical shaft ascends from the hole; on reaching the vessels it makes a right-angled bend, and runs for a short distance along the vein; the egg is deposited in the horizontal part of the shaft. That the ovipositor is able to bend at a right angle can be made out by watching live flies. A captive female sometimes lays her egg, not in the midrib, but in the blade of the leaf, and this is, in a young leaf, sufficiently translucent to enable us to follow the action of the ovipositor. The wound made in the midrib is speedily closed by cork-cells.

The egg (fig. 20) is of oval shape, and lies lengthwise in the midrib. One end is blunter than the other, and bears the micropyle; this end is turned towards the opening by which the egg was passed into the leaf. There are two egg-envelopes, an external chorion, which is yellowish, finely pitted, and prone to adhere to the vessels of the midrib, and a transparent vitelline membrane. The head-end of the embryo is at first adjacent to the micropyle, and therefore points to the mouth of the passage, but before hatching the embryo reverses its position, as if to facilitate the travelling of the larva along the vessels towards the apex of the leaf.

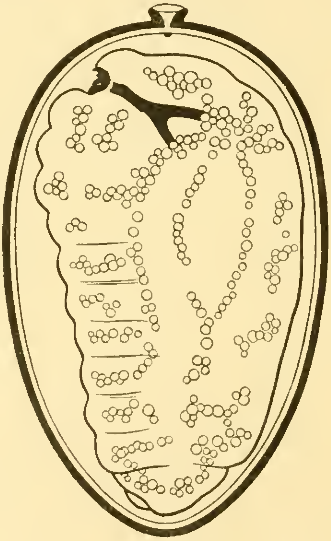


FIG. 20.

Egg with unhatched larva taken from midrib of holly-leaf. (× 165.)

In the fresh-hatched larva segmentation is already complete, and the mouth-parts are well developed. The fat-body, which contains the residue of the fat-globules of the egg, is scanty. The tracheal system is filled with air, but does not as yet open to the exterior. Numerous fine denticles are already developed on the surface of the body. The alimentary canal contains no solid food.

Very little change in the appearance of the larva can be noted so long as it remains in the midrib; the fat-body enlarges, and the fat-globules become more numerous.

As soon as it begins to feed on the mesophyll-cells the calcareous concretions form in the fat-body, and these become conspicuous when the body is examined by transmitted light as large, brightly-refractive objects.

The mode of life of the free larva has been related in an earlier part of the present paper (pp. 259, 260).

XVII. *The Vinegar-fly* (Drosophila funebris). By Ernest Ewart Unwin, M.Sc. Communicated by Professor L. C. Miall, F.R.S.

[Read March 20th, 1907.]

Vinegar-flies, small brownish two-winged flies with bright red eyes, belong to the Muscid family. The commonest species is *Drosophila funebris*.

Drosophila larvæ live in rotten and fermenting fruit; they also frequent beer and vinegar casks. Dufour * mentions finding them in marmalade, and between the layers of a decaying onion, and other records give mincemeat and poor butter as places where the larvæ have been found. Howard † includes Drosophila among the common excrement breeders. I have found the flies feeding on putrefying mussels, and an open decanter of claret will attract swarms of them in the summer time. The larvæ of another species have been found mining the leaf-stalks of swedes (see below). Slices of tomato, squashed plums or other fruit readily attracted the flies to the laboratory, and a large supply of all the stages was easy to obtain for examination. The flies are most abundant during the summer months, but in the laboratory they persist well into the winter, and eggs have been laid as late as the end of November.

Outline of Life-history.—The fertilised female lays her eggs in the fruit-pulp, and after three days or so small whitish maggots can be seen crawling about the mass. These feed continually, grow rapidly, and become full grown in about three weeks. They then leave the pulp to find a convenient place for pupation. The natural place is the soil, but they readily pupate on the sides of vessels, or even upon a dryer portion of the pulp. The last larval skin is retained as a puparium, which turns brown and hard. The duration of pupation, as well as that of the other stages, varies at different seasons of the year; in summer it may be as short as a week, or it may

* Dufour (1839 and 1845, 2). † Howard (1900).

last all the winter. In this latter case the larvæ bury themselves in the soil, remain as pupæ all through the winter, and reappear as flies in the early summer. The winter may be passed in the winged stage, the flies hibernating in some convenient place.

It will be convenient to commence the detailed account with the larva.

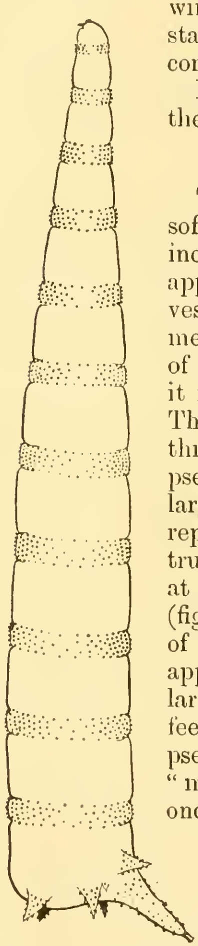


Fig. 1.

Larva (left side view). (× 20.)

The Larva.

The larva of Drosophila is a maggot, soft and white, about one-third of an inch long when full grown. There are apparently eleven segments behind the vestigial head, and between each segment the body is roughened by a band of minute hooks. In general features it resembles the blow-fly larva (fig. 1). The anal processes are of two kinds: three pairs of small, conical, unjointed pseudopods arranged laterally, and a large dorsal retractile process, perhaps representing a united pair, which, protruding backwards and upwards, carries at its distal end the posterior spiracles (fig. 1). Professor Miall, in his account of the harlequin-fly,* refers to such appendages in the case of Nemoceran larvæ. Like the prothoracic and anal feet of a Chironomus larva, these pseudopods of the Drosophila larva "may be the remnants of a series which once extended over many segments." These pseudopods are covered with minute hooks. Their function is rather obscure. They may serve for locomotion by giving a better purchase to the body when moving through the food, and may also possibly enable the larva to keep its balance. The blow-fly larva has similar processes, which, according to my observation, are used in much the same way.

Mouth-parts.—The general structure of the mouth-parts

* Miall (1900).

agrees very closely with that of the blow-fly larva.* Slight differences in the shape of the sclerites are noticeable, particularly in the parastomial sclerites, which in Drosophila join together in front, and form a conspicuous knob to which muscles are attached (fig. 2).

Alimentary Canal.—The alimentary canal exhibits the same parts and the same general structure as that of the blow-fly larva.† The anterior part is shown in fig. 2.

The pharynx exhibits a well-developed straining apparatus. It is more perfect in Drosophila than in the blowfly, and approaches more closely to the arrangement found in the Eristalis larva, as described by J. J. Wilkinson, though it is not so large or efficient (fig. 3).

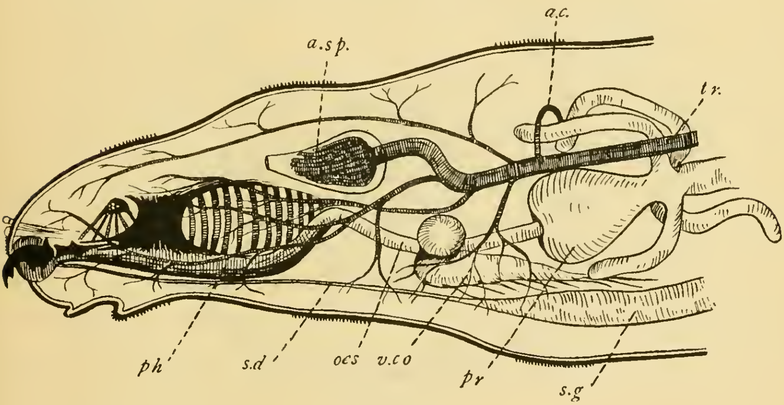


Fig. 2.

Anterior segments of a late larva viewed as a transparent object. (× 50.) *a.c.*, anterior connective; *a.sp.*, anterior spiracle; *oes.*, œsophagus; *ph.*, pharynx with straining appendage; *pr.*, proventriculus; *s.g.*, *s.d.*, salivary gland and duct; *tr.*, main tracheal trunk of left side; *v.co.*, ventral complex.

"The floor of the strainer bears nine parallel longitudinal ribs which are probably folds of the chitinous lining. They are long, narrow and deep, resembling planks set on their edges at equal distances. In front they begin abruptly, their lower-ends lying in one transverse line, and they are continued to the hinder-end of the chamber. While their lower-edges are attached to the floor, their upper-edges are free and bear fringes of numerous close-set barbules. The outermost rib on each side has only a single fringe, which projects inwards;

* Lowne (1890–95), pp. 37–46. † Lowne (1890–95), pp. 55–62.

each of the remaining ribs has a pair of fringes, and in cross-section resembles the letter Y—the two arms being the fringes and the stem the supporting rib. The cavity of the strainer is thus divided into a series of eight lower compartments and a single upper one." *

The salivary glands in the Drosophila larva are not so large as those of the blow-fly. The intestine, too, is less coiled in the former larva.

Nervous System.—The nervous mass, which corresponds to the brain and ventral cord of Chironomus, is situated in the metathoracic segment. It consists of a well-marked

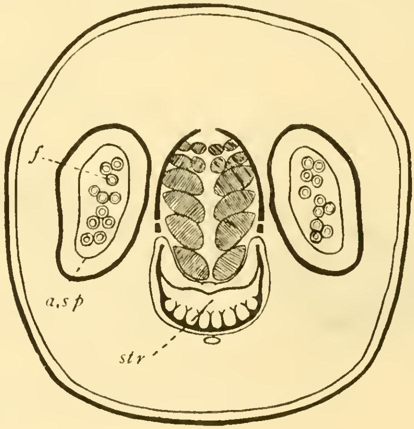


Fig. 3.

Transverse section through the pharynx of a late larva. (× 100.)
a.sp., anterior digitate spiracle ; *f.*, single filament of same ; *str.*, pharyngeal straining apparatus.

"brain" and a "ventral complex"; I have to thank Professor Miall for this convenient name. The paired nerves indicate its segmental character, a pair of nerves being given off to each segment of the body. The œsophagus pierces the nerve mass lying between the hemispheres and the ventral complex † (fig. 2).

Heart and Circulation.—There is nothing worthy of special note in the heart and circulatory system of Drosophila.‡ In a living larva the pulsations of the posterior end of the dorsal vessel, the so-called heart, can be seen. The exact extent of the "heart" cannot be

* Wilkinson (1901). † Lowne (1890–95), p. 68.
‡ Lowne (1890–95), pp. 87–91.

defined, as there is no important difference between it and the rest of the dorsal vessel.

Tracheal System.—The larva lives in semi-fluid substances and burrows into its food. Naturally the anterior spiracles are not functional, while the posterior ones become large, and discharge the whole duty of renewing the air in the tracheæ. Two longitudinal tracheal trunks proceed forwards from the posterior spiracles to the anterior ones. Two transverse connectives unite these main trunks: an anterior connective situated in the 3rd segment, and a posterior one in the last segment. Branches are given off from the main tracheæ to all parts of the body; those supplying the anterior segments are shown in fig. 2.

In a young larva the anterior spiracles are solid oval bodies, which close the fore-ends of the main tracheal trunks. These are commonly withdrawn into the body, but may be protruded by slight pressure (fig. 4). This simple structure of the anterior spiracles is only found in young larvæ. If older larvæ are examined, a very curious structure is seen. The simple solid spiracle is now replaced by a digitate structure, the expanded extremity of the tracheal trunk sending out a number of finger-like processes, each of which has its own epidermal investment (figs. 2 and 3). This digitate spiracle becomes functional in the pupa, and a further account of it will be given under that heading.

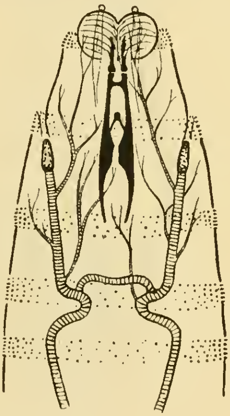


FIG. 4.

Anterior end of a young larva, showing solid plug-like anterior spiracles. (× 60.)

The posterior spiracles of the old larva do not differ materially from those of the young one. They are carried at the distal end of a dorsal retractile process and are functional throughout the larval stage. They are very similar in general structure to those of many other Dipterous larvæ, for instance Dicranota.* The tracheal trunks do not open directly to the exterior, but the cavity of each posterior spiracle is closed by a spongy chitinous plug. In the centre of the plug is a flask-shaped cavity,

* Miall (1893).

which seems to communicate with the exterior through a small aperture (fig. 5). A number of fine branched hairs form a rosette around the spiracle tip. They remind one of the hairs on the extremity of the respiratory tube of the Eristalis larva,* and have probably a similar function.

The power of extending or retracting the spiracles, although not considerable, is of great service to such a larva as Drosophila. When the larva is burrowing deeply in its food, and is completely submerged, the process is retracted, and the spiracles become flush with the surface of the body. When the larva is near the surface the process can be extended, causing the spiracles to reach the air, or even to be protruded into it. At such times the head and the rest of the body may remain buried in the food, so that feeding and breathing take place simultaneously. If the larvæ are put into shallow water the spiracle-bearing process is protruded, thus carrying the spiracles above the surface of the water. If more water is added so that the larvæ are entirely submerged, the spiracles cannot reach the surface, and in time the larvæ drown. Several experiments were tried, using water, vinegar, fruit-juice, etc., but in every case the submerged larvæ perished.

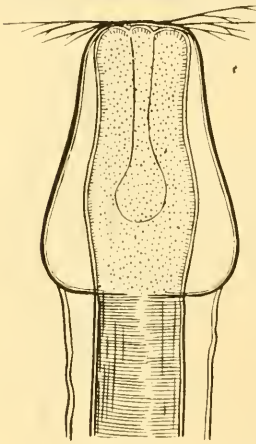


Fig. 5.
Posterior spiracle of the larva. (× 200.)

The Pupa.

The larva, when full grown, shows considerable anxiety to leave the food in which it has been living. It seeks out some dry spot on the sides of the vessel, and there pupates. The natural place of pupation is no doubt the ground, as with many other Muscidæ. The fall of the fruit to the ground would make it easy for the larva to enter the soil. When Drosophila larvæ, about to pupate, are placed on loose earth, they quickly burrow into it, and if uncovered show great eagerness to get below the surface

* Miall (1895), fig. 72.

again. Some of the burrowing larvæ had already contracted the head segments in preparation for pupation, but when they were uncovered they seemed uncomfortable, protruded the head once more, and began to burrow vigorously. During pupation the head is finally retracted and the anterior digitate spiracles are thrust out. The larval skin is retained as a puparium, which at first is soft and light-coloured; it soon becomes hard, and turns to a golden-brown colour.

The puparium is slightly shorter than the larva. The segmental markings are still visible, and the anal processes can be made out (fig. 6). Anteriorly the dorsal

FIG. 6.
Puparium (right side view). (× 12.)

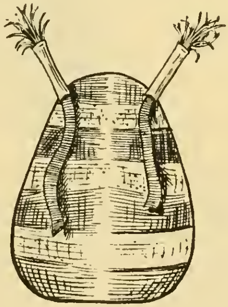


FIG. 7.
Dorsal plate of the puparium (inner surface).

surface is flattened to form an oval plate, from the front of which the two digitate anterior spiracles protrude. The general structure ot the digitate or pupal spiracles is shown in fig. 8. If one of the finger-like processes be examined with a high power, the epidermal lining can be seen with its characteristic spiral thickening, and at the apex there appears to be a bending-in of the wall (fig. 9). Whether there is an aperture or not at this point I have failed to ascertain, although several experimental ways of demonstrating minute apertures have been tried.

Within the puparium the usual changes take place, and at the end of seven days, in the summer, the form of the imago can be seen through the puparial wall.

The wings and legs of the fly can be made out, and the scarlet compound eyes are very conspicuous.

The Fly.

The escape of the fly from the puparium is rendered possible by means of a special dorsal plate that opens like

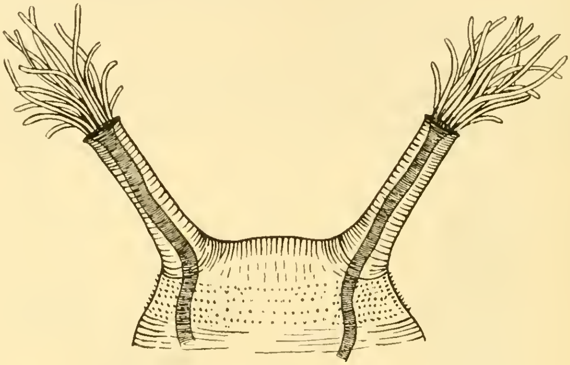


Fig. 8.

Anterior end of puparium, showing the digitate spiracles. (× 50.)

a lid (figs. 6 and 7). This plate can be observed upon an unopened puparium, for it is marked out by special lines of weakness along which the dehiscence takes place. On each side a longitudinal horizontal line extends from the anterior end of the puparium to the junction of the metathoracic and the 1st abdominal segments, where it

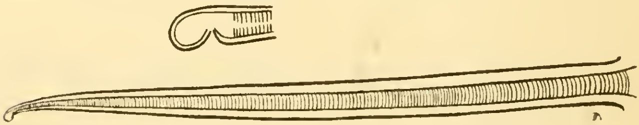


Fig. 9.

A single filament of the pupal spiracle, showing its epidermal investment. (× 200.)

forks into a dorsal or ascending and a ventral or descending branch. The ascending branch meets its fellow of the opposite side in the mid-dorsal line, but the descending one is very short and is not functional. Such a plate is a common contrivance in the Muscidæ, although it is not always dorsal. Mr. T. H. Taylor informs me that it is ventral in the pupa of the holly-fly. A bladder-like swelling on the head of the fly, also a common feature in Muscidæ, forces off this lid. This bladder may also assist the newly-emerged fly to work its way to the surface of the ground by helping to displace the particles of earth in its way.

When newly emerged the fly is of a light-yellowish colour, the eyes are bright scarlet, and the wings crumpled into small blackish masses. The wings gradually expand by blood-pressure, the fly meanwhile running to and fro.

The fully-developed fly is a small brownish insect about one-fifth of an inch in length. The dorsal surface of the abdomen is marked by transverse bands of light and dark blackish-brown. These bands are more distinct in

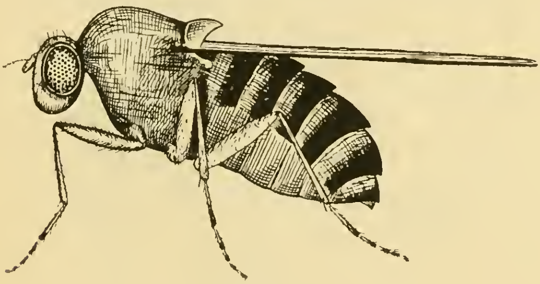


FIG. 10.
Side view of the fly (female). (× 12.)

the female because the abdomen is distended with eggs (fig. 10).

Drosophila has a very distinctive flight. It flies very slowly and deliberately, changing its course every now and then by sudden jerks. When attracted by a fruit culture it flies aimlessly to and fro above the fruit for a time; then, as if it had just made up its mind, it suddenly alights in a very clumsy and abrupt fashion. It is very nimble on its legs, running about the surface of the food to look for the best feeding or egg-laying sites.

The head of the Drosophila fly is very similar to that of the blow-fly in general structure;* the compound eyes, however, are bright red in colour. The bristle of the antenna is feathered completely on the upper-side, but only the distal half on the lower. The proboscis is

* Lowne (1890–95), pp. 119–126.

of the general Muscid character. Wesché * claims that the well-developed palps are not maxillary palps, as Lowne describes them, but labial palps, and that traces of the maxillary palps are often present in Diptera. He maintains that in Muscidæ, for instance, both labial and maxillary palps are represented (fig. 17 in Wesché's paper). The structure of the proboscis of Drosophila

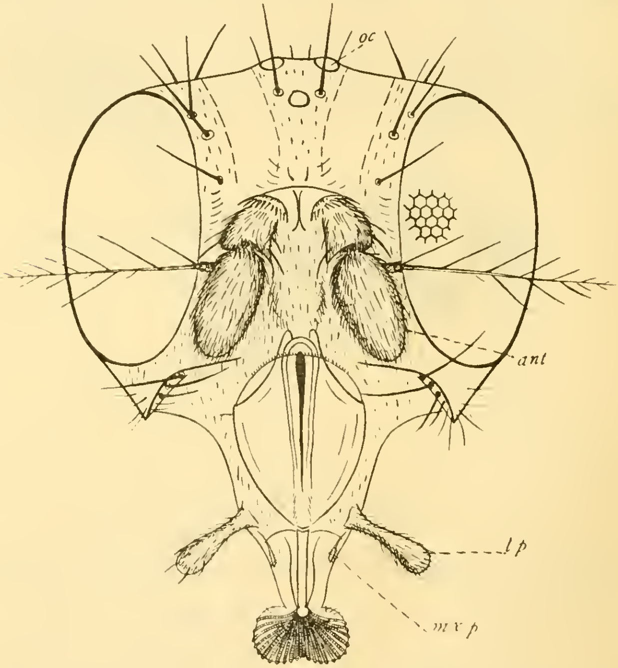


Fig. 11.

Head of fly (front view). *ant.*, antenna; *l.p.*, labial palps; *mx.p.*, maxillary palps (abortive); *oc.*, ocellus. (× 60.)

bears out Wesché's account. The chief part of the proboscis is formed from the labium, and well-developed labial palps are carried on its anterior surface. At the extremity is the labella, consisting of two symmetrical tracheated flaps. The flaps represent the paraglossæ, and the chitinous transverse bands the ligulæ. Small abortive maxillary palps are clearly visible just below the attachment of the large labial palps (fig. 11).

* Wesché (1904).

The general structure of the fly (fig. 12) follows the typical Muscid type.

The Reproductive Organs.—In their general features the

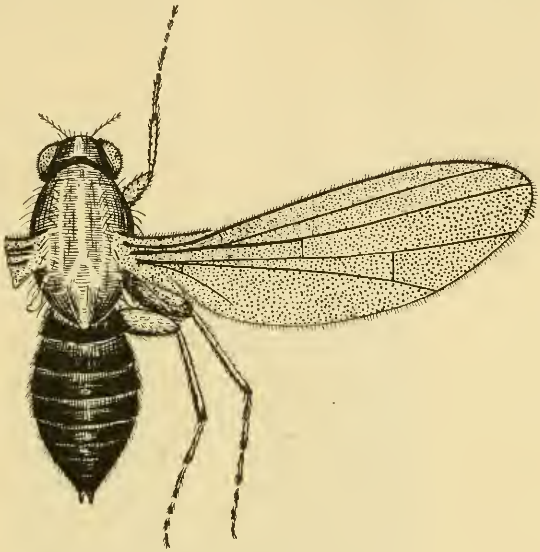


FIG. 12.
Dorsal view of the fly (female). (× 12.)

reproductive organs of both male and female Drosophila closely resemble those of the blow-fly, but there are

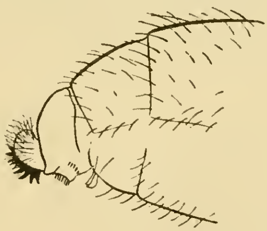


FIG. 13.
Fly (male), genital armature. (× 30.)

differences in the external armatures of both sexes. In the male a pair of curious structures are seen just ventral to the rectum; each resembles a cock's comb. There are as well a pair of smaller processes with spiny teeth. All these are no doubt connected with copulation and serve as claspers (fig. 13).

In the female we do not find a well-marked ovipositor. The parts which answer to an ovipositor are usually withdrawn into the 7th segment of the abdomen, but when protruded they are seen to consist of two valves between which the oviducal opening is situated. There are a number of small tubules situated in the 6th or 7th segments ventral to the oviduct into which they discharge. They may correspond in position to the collateral glands of the cockroach, but their function is not evident, as there is no cocoon secreted by Drosophila (fig. 14).

When a male meets a female he follows her about the

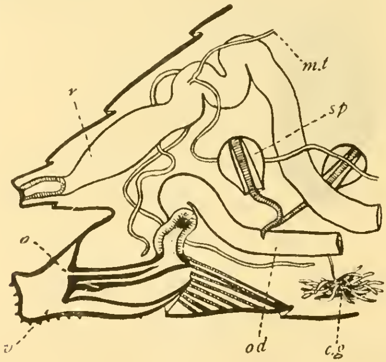


Fig. 14.

Fly (female) bisection of the terminal segments of the abdomen. (× 30.) *c.g.*, so-called colleterial gland ; *m.t.*, malphigian tubules ; *o*, external opening of oviduct, *od.* ; *r.*, rectum ; *sp.*, spermatheca ; *v.*, valve.

surface of the food. The slight vibration of the wings and the short eager runs show how excited he is. He tries to get quite close to her, and now and then touches the tip of her abdomen with his proboscis. The male is repeatedly repulsed by a backward thrust of the female's hind legs. To attract the attention of a female, the male will sometimes waltz rapidly round her two or three times, and then renew his attack at the rear.

A fertilised female seeks out convenient spots for laying her eggs, preferring a part of the fruit that is not too moist. Although I tried the experiment repeatedly, I could not get a female to lay her eggs in a fluid. The method adopted was to imprison fertilised females under bell-jars, or in breeding-cages, with some suitable fluid, such as vinegar or fruit-juice. In every case the female laid no eggs, but if some fruit-pulp was substituted for the fluid, eggs were readily laid.

The Egg.

The eggs are whitish ovoid bodies about one-thirty-sixth of an inch in length, having at their upper ends four slender filaments, each about two-thirds the length of the egg. They are usually laid so that these filaments protrude into the air. At the upper-end of the egg is situated

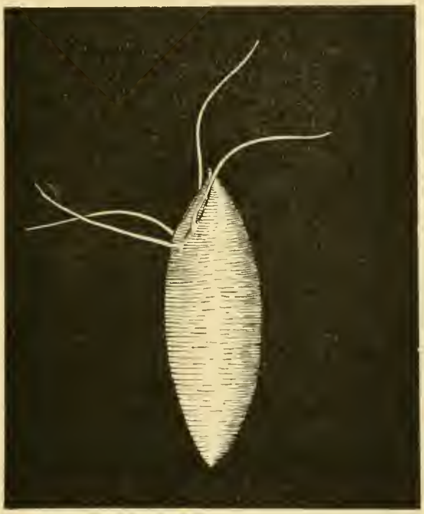


Fig. 15.

Egg of *D. funebris* (side view) showing the four filaments and the micropyle. (× 80.

the micropyle, and below this the egg-shell is flattened to form an oval plate (fig. 15). This may be compared with the puparium lid; it renders the escape of the larva possible. The four filaments arise from the sides of this plate, two from each side. The function of these filaments may be twofold. Packard * quotes the following from Comstock :—

"The egg is inserted into the soft pulp of the decaying fruit; these appendages leave the ovipositor last, and are spread out upon the surface of the mass. They, in this

* Packard (1898), p. 518.

way, serve to keep the egg in place, and thus insure the emergence of the larva into the open air instead of into the more or less fluid mass in which the egg is situated. The larva issues from the egg just above the base of these appendages."

The egg of *Drosophila funebris* has four of these appendages; they are generally stretched out over the surface of the pulp, and would certainly keep the egg from sinking. Another probable function of the filaments is to supply the egg with air. The exceeding whiteness of both egg and filament led me to suspect the presence of air. The egg-shell or chorion shows an hexagonal pattern on the surface, and under the high power of the microscope exhibits a spongy or granulated structure. It is in this layer that the air is contained. The filaments are continuous with the substance of this layer, having a spongy core surrounded by a compact wall. Air is also present in the spongy core of the filaments. The eggs of many Hemiptera have a similar contrivance. Some have a pair, others a greater number of filaments at the upper end of the egg. Korschelt * considers these filaments to be respiratory in function. The eggs of aquatic Hemiptera, such as Nepa or Ranatra, that are furnished with these filaments, are deposited in the stems of water plants, and the filaments protrude from the stem into the water. In the case of Capsid bugs the filaments project into the air. The eggs of Drosophila are inserted into fermenting fruit where respiration is impossible or very difficult; the filaments projecting upwards or lying on the surface of the mass will, however, be able to act as respiratory organs. The eggs after two or three days hatch into minute larvæ.

Drosophila and Fermentation.—Drosophila flies feed upon fermenting fruit-masses. In consequence of this their bodies readily harbour bacteria and other germs, and the flies often act as infection-carriers from one fruit-mass to another.

In his paper on "The Sorbose Bacterium" † Bertrand gives evidence that supports this view. He noticed that Drosophila flies were attracted to a dish containing fermenting rowanberry-juice, and that they laid their eggs in the thick scum that had formed on the surface. After the visit of the flies the character of the scum changed, and at the same time a change took place in the liquid. The

* Korschelt (1886). † Bertrand (1904).

gelatinous scum was found to be composed of a bacterium, to which he gave the name of "sorbose bacterium" ("la bactérie du sorbose"). The presence of the bacterium caused the formation of sorbose (a hexose sugar). Bertrand describes an interesting observation in support of his opinion that the bacterium is carried to the culture by Drosophila flies:—

"Ayant placé dans une étuve, vers la fin du mois d'Avril, un cristallisoir contenant un liquide favorable (vin et vinaigre), j'y aperçus, après quelques jours, une culture d'aspect caractéristique, développée en ligne sinueuse à la surface. Une petite mouche du vinaigre, venue peut-être de fort loin, était tombée dans le liquide; après bien des efforts et du chemin parcouru à la nage, elle avait fini par mourir; je la retrouvai à l'une des extrémités de la ligne sinueuse, au milieu d'une sorte d'auréole beaucoup plus large, témoignant de ses dernières luttes contre la mort. Il est manifeste que cette petite mouche, née au sein d'une culture antérieure, avait le corps recouvert de germes; partout, sur son sillage, elle en avait ensemencé le liquide."

No doubt Drosophila flies carry other bacteria and ferments besides the sorbose bacterium. One organism that is commonly carried by them is the ordinary vinegar ferment, *Mycoderma aceti*. When all vinegar was home-made Drosophila would thoroughly justify its name of vinegar-fly. It would visit the jar containing the sugar, treacle, vinegar and water, which were the ordinary ingredients employed, and in those cases where no vinegar plant had been introduced, it might infect the brew with both yeast cells and the vinegar ferment. Flies would also lay their eggs in the gelatinous cake that floated upon the new vinegar; thus new generations of flies would carry away with them the germs that cause fermentation. Nowadays, when vinegar is manufactured on a large scale and continuously, the presence or absence of Drosophila is immaterial. They swarm in vast numbers round the vats in vinegar factories, and unless their presence becomes troublesome they are tolerated by the manufacturer.

Another interesting example of the carriage of ferments by Drosophila flies has been noticed by Mr. S. H. Davies, M.Sc., chemist to the Cocoa Works, York, to whom I am indebted for the following:—"Cases have been observed of the Drosophila in Jamaica carrying large quantities of acetic organisms to cocoa beans fermenting in boxes, and also there is good reason to suppose that they are responsible for conveying cells of true Saccharomyces, and thus assist in regulating the fermentation of the beans."

Drosophila and Disease.—Drosophila flies may also be one of the means of spreading typhoid fever. They have been known to breed in human excrement and also to feed upon it. If this excrement contains typhoid bacilli, infection may be carried into houses. "As this fly (*Drosophila ampelophila*) is frequently found in houses in the autumn about dishes containing fruit, and as it also affects canned fruits, pickles, raspberry vinegar and similar substances, this discovery that it will and does breed in human excrement makes this species and the following (*D. funebris* and *D. busckii*) very dangerous ones." *

Mr. T. H. Taylor has drawn my attention to some larvæ living in the decaying crowns of swedes, and also mining the leaf-stalks. Upon examination I found that these larvæ closely resembled those of *Drosophila funebris*, although they were smaller in size. Having procured a supply of diseased swede-crowns, I kept the larvæ alive until they pupated, and then obtained the flies, which proved to belong to a small brownish species, *Drosophila fenestrarum*, Fall.

Structure of the Larva of D. fenestrarum.—In general structure this larva agrees with the *funebris* larva, but there are one or two interesting points of difference, which are connected with its habit of mining the leaf-stalks of swedes, instead of living in decaying fruit like *D. funebris*.

The minute hooks, which in *D. funebris* are arranged in eleven narrow bands, here almost completely cover the body. The anal pseudopods are conspicuous, and are covered with minute hooks. I have watched live larvæ in their burrows, and the use of these anal pseudopods in giving a powerful purchase to the body was very evident. As would be expected from the circumstance that the larva of *fenestrarum* is not buried in its food, we do not find the posterior spiracles carried upon an extensible process, as in *D. funebris*, but protruding only a short way beyond the end of the body. The anterior spiracles exhibit the same digitate structure as in *D. funebris*; at pupation they are

* Howard (1900).

protruded, and become functional. Full-grown larvæ bite their way to the surface of the leaf-stalk, crawl through the aperture, fall to the ground, and there pupate. In the swedes that I kept in the laboratory a few pupæ were found protruding from the ends of the burrows in the leaf-stalk; this was probably accidental and due to artificial conditions, for the swedes in the field had no projecting pupæ.

The Pupa of D. fenestrarum.—The pupa, although smaller, exhibits the same structure as that of *D. funebris.* Larvæ were collected at the end of October; they soon pupated, and in the course of ten or twelve days several flies emerged. In summer the duration of the pupal stage would be still shorter. The flies seem to persist late in the year; on November 24th a living one was captured upon swedes.

The larvæ, as it has been stated, mine the leaf-stalks. A mine usually runs up the vascular tissue, extending from the leaf-base for a considerable distance up the leaf-stalk. The walls of the burrows exhibit signs of decay.

Professor Potter of Newcastle-upon-Tyne has given attention to the decaying agents in the swede and turnip,* and has shown that it is due to bacteria. But these bacteria are "powerless to set up decay unless placed in contact with the parenchymatous cells of the cortex." Although many other living things, such as caterpillars, slugs and snails, may be chief agents in giving the start to the decaying bacteria, the mining habits of such larvæ as Drosophila would provide the bacterium with a ready means of access to the underlying parts. As the larva eats its way up a leaf-stalk it gives access to bacteria, and may carry bacteria along with it as it travels from infected to sound parts. The tissues adjoining the burrows turn brown and decay, and in the end the whole leaf may shrivel and fall off.

In much-decayed swede-crowns I have found blow-fly larvæ feeding.

In conclusion, I wish to tender my sincere thanks to Professor Miall for the interest he has shown and for the help and encouragement he has given me during the course of this inquiry.

* Potter (1899 and 1903).

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XVIII. Odonata *collected by* Lt.-Colonel Nurse, *chiefly in North-Western India.* By Kenneth J. Morton, F.E.S.

[Read April 10th, 1907.]

Plate XXIV.

I am indebted to Lieutenant-Colonel Nurse for allowing me to examine a collection of *Odonata* made by him chiefly in North-Western India. The localities whence the insects came are Deesa in the province of Gujerat, Quetta, Kashmir, and there is one species each from Simla and from Lahij in Arabia. The collection is of special interest on account of the presence, amongst the material from Quetta and Kashmir, of a number of species characteristic of the Mediterranean region, and even of some which are of more northerly type. The species from Deesa are more tropical in character.

In connection with the *Libellulinæ* I have had the benefit of invaluable assistance from Dr. Ris, all the more important species in that sub-family having been determined or verified by him, and he also gave me much general information concerning them.

In dealing with the smaller species I have thought it indispensable to give figures of the appendages of the species I have described as new. To these I have added figures of some others, which I have referred to Selysian species, in order that there may be no uncertainty about the identity of the species I had before me.

LIBELLULINÆ.

Sympetrum fonscolombii, Selys.—Quetta, July; Kashmir, 5000–6000 ft., June. A wide-ranging species which does not appear to tend to split up into geographical races.

S. decolorata, Selys.—A very interesting series from Quetta in June. Dr. Ris assures me these conform to the types of *decolorata* in the Selys Collection, although it was there mixed with specimens of *meridionalis* and pale-coloured *striolatum*. Quite distinct-looking from *vulgatum*, which it probably entirely replaces in the area which it inhabits, *S. imitans* from Amurland being another race.

S. striolatum, Charp.—Quetta, July; Kashmir, 5000–6000 ft., May. Differing little from Central European specimens; probably from its utmost south-eastern limit.

S. commixtum, Selys.—Deesa, July, 1 ♀. This takes the place of *S. striolatum* in the warmer parts of India.

Trithemis pallidinervis, Kirby.—Deesa, October. A rather common species in Ceylon, India, etc. Described by Kirby as a *Diplax* (*Sympetrum*).

T. festiva, Rambur.—Quetta, June. A small form of this wide-ranging species.

Crocothemis servilia, Drury.—Dr. Ris is disposed, chiefly as a matter of convenience, to reserve this name for the Eastern forms of this insect, *i.e.* those from tropical India, Ceylon, South China and the Archipelago (and even those from Japan which are rather different), which have the wings somewhat longer and narrower and tipped with brown. In *C. erythræa* from Africa, Madagascar, Southern Europe to Asia and Kashmir, the wings are relatively shorter and broader and not tipped with brown. In Northern India intermediates occur. Specimens from Deesa, January, February, June, July and October, are to be referred to the Eastern type, while a ♂ from Quetta, June, is Western. A somewhat teneral specimen from Kashmir, 5000–6000 ft., May.

Libellula quadrimaculata, Lin.—Kashmir, 8000–9000 ft., June. Already recorded from Kashmir. In these specimens the nodal spots are small, and, as Dr. Calvert has pointed out in connection with ♂♂ taken in Kashmir by Dr. Abbott, the black of the basal spot on the hind-wings does not extend into the triangle.

Orthetrum sabina, Drury.—Deesa, February, June, July and October. Another wide-ranging species. Examples from India are as a rule small.

O. chrysostigma, Burm.—Lahij, May, 3 ♂♂. A difficult species running into geographical forms. Ris says these specimens are intermediate between East African specimens and the following:—

O. chrysostigma, race *luzonicum*, Brauer.—Deesa, October. Brauer's types are from the Philippines.

O. brunneum, Fonsc.—Quetta, May; Kashmir, 5000–6000 ft., May. Hardly different from Swiss and South European specimens.

O. ramburii, Selys.—Recorded from the Mediterranean region, from Asia Minor, Transcaucasia and Syria; a series from Quetta (June) is very interesting. This species seems to take the place of *O. cœrulescens* in the countries where it occurs.

O. tæniolatum, Schn. — Deesa, January and August. Another interesting Mediterranean species recorded by Selys from Rhodes, Cyprus and Syria (Odonates de l'Asie Mineure). Dr. Ris informs me that it is also the *O. anceps* of Selys (Beyrout) and the *O. hyalinum* of Kirby.

O. internum, McLach.—Kashmir, 5000–6000 ft., May.

O. pruinosum, Burm., race *neglectum*, Ramb.—Murree Road, Kashmir, 4000 ft., June. Dr. Ris considers that the red Indian species of *Orthetrum*, *pruinosum*, *clelia* and *neglectum* are geographical forms of one species, *neglectum* being the form found in Ceylon and the Continent from India to South China.

Diplacodes nebulosa, Fab.—Deesa, October.

Acisoma panorpoides, Ramb.—Deesa, October.

GOMPHINÆ.

Onychogomphus lineatus, Selys.—Quetta, June. Several females and mutilated males from Deesa, July, August, and October, probably appertain to the same species.

Thecagaster brevistigma, Selys.—Two ♂♂, Simla, May.

ÆSCHNINÆ.

Anax parthenope, Selys.—Kashmir, 5000–6000 ft., May. Well known from Kashmir. Calvert has pointed out that examples from that region agree rather with European than with Japanese individuals.

Hemianax ephippiger, Burm.—Colonel Nurse says: "This species was in thousands at Quetta in June 1903. I never saw so many dragonflies anywhere." A wide-ranging species of migratory tendencies.

CALOPTERYGINÆ.

Epallage fatima, Charp.—Quetta, 2 ♂♂, June. Smaller than examples I have from Asia Minor, but I can detect no material differences otherwise.

AGRIONINÆ.

Platycnemis latipes, Ramb., race *dealbata*, Selys.—Quetta, June.

Ischnura elegans, Van der Lind.—Quetta, May and June.

I. forcipata, n. sp.

♂. Labrum blueish; epistoma above black with metallic sheen; frons including two basal joints of antennæ greenish; head above bronzed black, with small blue postocular spots.

Prothorax bronzed black, broadly greenish laterally, with an irregular isolated green spot which runs to a point anteriorly; posterior margin slightly elevated, the middle forming a moderate sub-acute lobe wider than high, narrowly outlined with green.

Thorax above bronzed black with well-marked uninterrupted shoulder lines and a very short black line under anterior wings.

Legs yellowish, femora black externally with a short black streak at the base of the tibiæ.

Abdomen with segments 1–7 bronzed black above, with narrow pale sutures; segments 8–10 dark blue above, 10 with a large black sub-quadrate dorsal patch; the raised lobe tinged with blue and distinctly excised.

The superior appendages very large; seen from above, they are in the upper part sickle-shaped and black, the lower inner portion paler, clothed rather densely with hairs; beneath, these appendages are continued into long finger-shaped processes black at the apex. The inferior appendages are separated at the base where they are broadest; they are regularly curved inwards, narrowing to the apex which is black; seen from the side, they are strongly upturned.

Wings hyaline; fore-wing with 8 post-nodals; pterostigma oblique, narrower in front than behind, hind-margin slightly curved, bright blue in outer half, black inwardly; pterostigma in hind-wings much smaller, nearly diamond-shaped, pale yellowish.

Length of hind-wing, 13 mm.; of abdomen, 22 mm.

Quetta, June 1902.

I. delicata, Selys.—Deesa, January, February, July and September.

Ischnura? nursei, n. sp.

♂. Epistoma above dark, bronzed; frons to the antennæ pale, slightly reddish; 1–3 joints of antennæ also pale; rest of head, above, bronzed black.

Prothorax with hind-margin regularly rounded, bronzed black, paler at sides which are slightly pruinose.

Thorax bronzed black above, sometimes with narrow shoulder stripes. Legs reddish with black streaks on tibiæ of two anterior pairs.

Abdomen short and rather stout; segments 1–4 above carmine ("dark reddish-purple," Nurse), 2 darkly marked at the base, 3, 4 with slight transverse dark streaks before the apex which is also narrowly dark; 5 lemon-yellow with similar dark markings; 6 yellowish or reddish in anterior half; remainder of abdomen metallic violet, the posterior part of the last segment and the appendages reddish. Apex of last segment only very slightly raised, but seen from above there is a very distinct and wide excision bounded on either side by a small projecting process.

Superior appendages seen from above, shorter than inferior, broad, obliquely truncate, posteriorly abruptly turned downwards and terminating in an acute point. Inferior appendages seen from the side, broad at the base, narrowing to the apex, upper margin nearly straight, inferior margin sinuous; seen from beneath they are rather widely separated at the base, but there are pale inner processes which nearly meet; viewed from above they are concave, curved inwards in their upper part which is armed with a small black dentate plate.

Wings hyaline; neuration reddish. Pterostigma in fore-wings diamond-shaped, bright carmine inwardly, paler externally; pterostigma in hind-wings small, yellow.

Length of hind-wing, 12 mm.; of abdomen, 16½ mm.

Deesa, October, November and January.

This is not a true *Ischnura*, although referred provisionally to the genus in the absence of the ♀. It differs in the relatively short and stout abdomen, and in the absence of postoculars.

There are 3 ♀♀ from Kashmir, 5000–6000 ft., May, which may belong to *Ischnura rufostigma*, Selys. They recall *Pyrrhosoma tenellum*, but the thorax is paler. In the meantime, in the absence of the ♂, the determination is uncertain.

Enallagma cyathigerum, Charp.—Kashmir, 5000–6000 ft., May.

Enallagma ? parvum, Selys.—Deesa, June and October.

Pseudagrion decorum, Ramb.—Deesa, June, July, August, October and November.

P. hypermelas, Selys.—Deesa, January and February.

P. bidentatum, n. sp.

♂. Discoloured ; colours very likely blue and bronzed black.

Labrum reddish ; epistoma above black, frons reddish, vertex black with very large triangular bluish postocular spots connected by a distinct transverse line.

Prothorax pale marked with black.

Thorax above with a black line on either side of the median suture and black shoulder stripes, otherwise blue.

Legs yellow ; femora of anterior distinctly marked with black externally, others faintly marked.

Abdomen above with black-bronzed markings margined with blue. 1 with a large sub-quadrate spot ; 2 with thistle-shaped marking connected with a black apical line ; 3–6 with elongate markings broadest before the apex ; in 3 reaching the base, in 4, 5, 6 markings more lanceolate not reaching the base ; 7, 8, 9 probably all bronzed black with narrow blue sutures ; 10 black.

Superior appendages seen from side nearly straight above, terminating in a black, slightly-down-turned hook, from the hook the posterior margin curves strongly inwards, the lower margin being produced into a strong tooth which from above is seen to be bifid. Inferior appendages short and rounded.

Length of hind-wing, $16\frac{1}{2}$ mm. ; of abdomen, 23·75 mm.

Deesa, February, 1 ♂

Ceriagrion coromandelianum, Fabr.—Deesa, February, August and October.

Agriocnemis pygmæa, Ramb.—Deesa, July.

Lestes barbara, Fabr.—Kashmir, 5000–6000 ft., May.

L. gracilis, Selys.—Deesa, October ; a single ♀ referred here with slight doubt.

Sympycna fusca, Eversm.—Quetta, June, 1 ♂.

Explanation of Plate XXIV.

[*See Explanation facing the* Plate.]

XIX. *Entomological Observations and Captures during the visit of the British Association to South Africa in* 1905. By F. A. Dixey, M.A., M.D., F.E.S., *and* G. B. Longstaff, M.A., M.D., F.R.C.P., F.E.S.

[Read June 5th, 1907.]

Plate XXV.

Cape Town.

Lat. 34° S. Sea level. August 8th, 1905.

Surely no one who was on deck when the "Kildonan Castle" anchored in Table Bay will forget the impressive scene. Behind the town-lights which gleamed along the front the grand mass of Table Mountain, clear cut against a streak of dawn, lay under the Southern Cross and Magellanic Clouds, while in the opposite quarter Jupiter and Venus shone brilliant beyond our experience, the latter reflected in the sea, and Orion standing on his head demonstrated that we were indeed in a Southern land. These astronomical facts had a bearing on our entomological operations, since we had to grow accustomed to the fact that the most promising hunting-grounds were slopes with a *north-east* aspect.

Faithful to our own science rather than to the association of which we were members, we had decided to go on to Durban by the same steamer, and put in as many days collecting as possible on the Natal Coast. This left us but a day and a half at Cape Town, in which to get a glimpse of its fauna and flora, and we were truly fortunate in that the Southern spring smiled upon us and provided, if indeed few insects, at any rate what Mr. Boswell would have termed "some fine prospects."

We were aware of the poverty of the Cape Peninsula in Rhopalocera, and Mr. L. Péringuey, the obliging director of the South African Museum, impressed the fact upon our minds, yet we were hardly prepared to find butterflies so scarce as in fact we did.

The best scheme seemed to be to drive to Camps Bay, stopping on the way to collect on the slopes of the Lion's Head, above Sea Point. While waiting for the carriage we took in the garden of the Mount Nelson Hotel, on narcissus flowers, a few honey-bees, *Apis mellifica*, Linn., of the somewhat brighter race *adansonii*, Latr., that is common throughout South Africa, and with them their familiar mimic *Eristalis tenax*, Fabr. An *Empis* was also common in the garden.*

The country had all the appearance of early spring, and it was evident enough that we were much too early for good sport. Below the Lion's Head, by a little stream perhaps 200 feet above sea-level, we took two specimens of the brownish Lycænid *Cacyreus palemon*, Cram., quite unlike any "Blue" that either of us had previously seen alive; these and a Skipper that eluded us at Camps Bay were the only butterflies we saw that day.

Turning over stones proved disappointing; besides sundry scorpions and myriapods the chief tenants were ants, a larger yellowish species, *Camponotus maculatus*, Fabr., and a smaller black species, *Acantholepsis capensis*, Meyr. With the ants were a few beetles, such as two specimens of *Formicomus cœruleus*, an Anthiid, *Microlestia tabida*, Fabr., another beetle not yet determined, and two larvæ of a *Lampyris*.

Along with the beetles were sundry cockroaches, creatures we were afterwards to find numerous; among them were two *Deropeltis juncea*, Sauss., and immature examples of *Blatta orientalis*, Linn.

The best harbour for insects appeared to be a species of *Solanum*, a medium-sized, prickly shrub bearing numerous seed-capsules. On this plant the red Lady-bird *Chilomenes lunata*, Fabr., was abundant, also a black species, *Chilocorus* sp., unrepresented in the National Collection, was fairly common. Several other Lady-bird-like beetles, as yet undetermined, were found on the same plant, as well as one specimen of *Epilachna hirta*, Thunb. (the sole phytophagous genus in a family otherwise carnivorous). On the leaves were also two examples of the tiny *Abacetus minutus*, Dej.

A dark-green, scarlet-striped bug, *Lygæus festivus*, Thunb., accompanied the Lady-birds, while immature specimens of

* The original idea was to allude to every insect seen by us in our rush through South Africa, but at the time of going to press many species, especially among the *Orthoptera*, *Diptera*, and *Lepidoptera-Heterocera*, were still undetermined, and so for the most part are not mentioned.

the same were common inside the seed-vessels together with numbers of a fetid brown bug not yet named and what we took to be beetle larvæ. A third bug, of a pale scarlet colour when alive, frequented the same *Solanum*.

The few flowers that were out yielded nothing but a honey-bee and an *Empis* sp.

At Clifton, Camps Bay, on the under-cliff above the dazzling white beach, we took off the flowers of a shrubby *Senecio*-like Composite the small green Longicorn, *Promeces linearis*, Linn., the small bronzy bee, *Halictus jucundus*, Smith, ♀, and *Apis mellifica*, 2 ☿.

A small Carabid, *Platynus rufipes*, Dej., found under a stone, completed our short list. As we often experienced afterwards, the South-east Trade brought up clouds and gave us a dull afternoon, so that collecting was practically over at an early hour.

Port Elizabeth, Algoa Bay, Cape Colony.

Lat. 34° S. Sea level. August 11th.

The steamer did not give us a very long time at this place. After an early breakfast we took the train to Zwaartkops, some seven miles to the northward.

The coast here is flat and fringed with sand-hills; by the railway the country is sandy and heathy; on the south side of the river its delta forms a level plain perhaps a mile wide between the sand-hills and the railway, this is diversified by brackish swamps and intersected by streams. On the drier portions of this plain Termitaria are numerous, from 1 foot to 2½ feet high, and 2 to 3 feet across; they are smooth and hard on the surface as if "rendered" with cement, many-chambered within. One long ridge of sand was covered with thorny shrubs. The most conspicuous plant was a tall *Aloe* (? *arborescens*, ? *ferox*), 6 or 8 feet high in full flower, but there were also at least two species of *Cotyledon* [*Echeveria*], and several species of *Mesembryanthemum*. Low growing *Euphorbias* were many and varied, one appeared to be absolutely stemless. There was also an ivy-leaved *Pelargonium*. A fresh easterly breeze swept over the open ground and added much to the difficulty of catching butterflies.

The males of *Synchloë hellica*, Linn., were rather common, flying fast, but occasionally settling; four specimens were secured. Of *Leuceronia buquetii*, Boisd., at least three were seen, two were secured, both males, but a third managed to get out of the net; they flew strongly. The proboscis of this butterfly when fresh is of a bright green colour like its eyes. On the other hand, *Colias electra*, Linn., was more restrained in its movements, and two males were taken. Of *Pinacopteryx charina*, Boisd., several were seen, also two or three individuals of an orange-tipped *Teracolus*, probably *omphale*, Godt.

On the lee side of bushes which afforded a slight shelter, the Lycænid, *Leptomyrina lara*, Linn., was common, taking short flights and settling on the ground or on low plants. Nearer the sea on a sunny bank under the lee of the sand-hills, the very beautiful and singular Lycænid *Phasius thysbe*, Linn., was not uncommon, though apparently very local; it has a quick skipping flight and time allowed the capture of but two males and a female. In the same locality a pretty little rose-coloured Geometer, *Sterranthia plectaria*, Guen., was fairly common, but unfortunately only two specimens were brought away. On the open plain the familiar and cosmopolitan *Nomophila noctuella*, Schiff., was often disturbed and two were taken, as well as a specimen of the scarcely less widely distributed *Phlyctænia ferrugalis*, Hübn.

A piece of rough heathy ground near the railway-station yielded two Satyrids, *Pseudonympha sabacus*, Trim., and others were seen near the same spot; the genus is characteristic of South Africa. Close by a small Blue *Zizera lysimon*, Hübn., was netted, as well as a fine variety of *Sterrha sacraria*, Linn.

Under some planks lying on the sand of the river bank we found among smaller bugs, our first specimens of *Physorhynchus crux*, Thunb. This large Reduviid, whose wings are so closely appressed to the abdomen that we for some time took it to be apterous, is very conspicuous when alive, the pale testaceous thorax and margins of the abdomen showing up the black cross upon its back, but the pale portions soon darken and the insect is dingy in the cabinet.

Turning over stones produced a few beetles: single examples of *Lycanthropa synæcoides*, Ques., *Harpalus exiguus*, Dej., and *Blenosia* [*Blacodes*] sp., as well as two *Trigonopus* sp., the last two both represented at South Kensington, but unnamed. With the beetles were several *Blattidæ*, *Deropeltis erythrocephala*, Fabr., ♀, an immature

Cosmozosteria sp., and three specimens of another *Blatta* which stands unnamed in the National Collection.

An old termitarium, long abandoned by its builders, afforded asylum to a number of insects, among which the most numerous and most conspicuous was the large Carabid *Microlestia rugoso-punctata*, Thunb.; there was also a solitary weevil, *Hipporrhinus appendiculatus*, Gyll.

The great spikes of Aloe proved attractive to flies and a bee, *Prosopis sandaracata*, Bingh. At the same flowers a long-tailed bird was very busy, but whether catching bees or eating honey could not be made out.

The Hopliine beetle *Gymnoloma atomaria*, Fabr., was taken on a flower. Among flies the cosmopolitan genus *Sarcophaga* was represented, and what would appear to be a *Dysmachus* was noted to settle on the ground.

While searching for beetles it was impossible to overlook the numerous empty spires of the large and handsome snail, *Achatina zebra*, Chem. [=*fulgurata*, Pfr.]; one of them was tenanted by a stump-tailed lizard. A couple of tortoises added to the picture.

[Among the small bees that we brought home was a small one (unfortunately not labelled) that was in all probability taken at Zwaartkops, though possibly at Cape Town, which turns out to be a new species, *Halictus inornatus*, Bingh. Its description, with those of other *Aculeata* taken by us in South Africa, will be included in a paper to be presented to the Society very shortly.]

East London, Cape Colony.

Lat. 33° S. Sea level. August 12th.

An eager reconnaissance from the deck before breakfast revealed a tempting spot a mile or two to the north-east of the town where hills of blown sand capped by scrub suggested many possibilities. Accordingly we landed at the earliest opportunity and took a carriage. The road from the quay in the inner harbour brought us in a very few minutes into the Queen's Park, through which we were to drive. Our attention was at first caught by the weird forms of gigantic tree-Euphorbias, but these were soon forgotten, for as we passed the park gates we seemed to enter a very preserve of butterflies. To one of us the sight was new as it was beautiful, to the other it brought back vivid recollections of India and Ceylon; both agreed to dismiss forthwith the Kaffir driver, who doubtless, while he pocketed his easily-earned fare, pondered on the strange results of European civilization and the increase of lunacy consequent thereon.

The park is formed out of a piece of the primæval scrub of varied growth, filling a horseshoe-shaped hollow between the town and a tributary of the Buffalo. It is intersected with roads, footpaths, and streams; in parts are artificial shrubberies and flower-beds, which are gradually ousting the natural scrub. In the varied scene of insect life the most obvious characters were clouds of *Mylothris agathina*, Cram., of both sexes, their brilliant white and orange colouring showing clearly as they fluttered slowly and fearlessly over the large bushes of Poinsettia [*Euphorbia pulcherrima*] glowing with their scarlet bracts. The males give out a strong scent very closely resembling that of sweet-briar. Amongst the *agathina* we took three specimens of the nearly allied *rüppellii*, Koch, of both sexes, and in another part of the Park a single male of the delicate *trimenia*, Butl., with its pale yellow hind-wings.

Less showy, but almost equally common, was *Belenois severina*, Cram., the "common white" of this part of the world. Both sexes were well represented, the male having a distinct scent. All were of the dry-season form; some were very small. Of *B. gidica*, Godt., a single male was taken, also strongly scented.* Of the more gaudily coloured *B. zochalia*, Boisd., two males and a female turned up.

Terias was represented by a single *brigitta*, Cram., a male; *Colias* by two *electra*, Linn., also males; and *Teracolus* by two *omphale*, Godt., one of each sex. Last, but not least beautiful of the Pierines was *Eronia cleodora*,† Hübn., of which five specimens were taken, while a male *E. leda*, Dbl., was netted, but it managed to get away.

The widely-ranging *Limnas chrysippus*, Linn., of the typical African colouring, which, as is well known, is darker than in the Indian form, was flying slowly about in some numbers; two *females* that were taken yielded the "musk-rat" odour.

* On the subject of scents in South African butterflies, see DIXEY, Proc. Ent. Soc. Lond., 1905, pp. liv–lix, and *ibid.* 1906, pp. ii–vii.

† It is well known that the local races of *E. cleodora* show great differences in the amount of black bordering to the wings. This in the East London specimens is reduced to a minimum. See DIXEY, Proc. Ent. Soc. Lond., 1905, p. lxvi.

Another butterfly that was very common was the Nymphaline, *Eurytela hiarbas*, Dru. It has a curious slow gliding flight backwards and forwards about bushes, for flowers seem to have no attraction for it; but if the flight of this butterfly, and its coloration, brown with a transverse white band, remind one of the *Neptis* group, its general appearance and shade-loving habits suggest a Satyrid. *E. hiarbas* orients itself with tail to the sun, but not very accurately. Conspicuous amongst the Nymphalines was our old friend *Pyrameis cardui*, Linn., mostly in poor condition, but one very fine. The large genus *Precis* was represented by three species, *sesamus*, Trim., *archesia*, Cram., and *cebrene*, Trim., the latter not uncommon. One specimen of each was secured, but we had our first lesson in the elementary fact that to see a *Precis* is not always the same thing as to catch it.

A sunny bank cleared of scrub was grown over with a *Senecio* not unlike the Oxford *squalidus*, Linn. Amongst these flowers *Byblia goetzius*, Herbst, was rather common; they often settled on the ground; they were all females, one of "intermediate" character, the rest "dry." A single *B. ilithyia*, Dru., was "very dry." This and a specimen taken at Ladysmith were all of this species that we saw in South Africa.

One of the spots in the park where butterflies were especially numerous was a sunny bank close to an open drain whose black stream evolved so much sulphuretted hydrogen as to suggest pollution by a laundry. Some Poinsettia bushes (including one with the bracts pale yellowish instead of the more usual scarlet), growing where the smell was most sickening, proved quite as attractive to butterflies as others in sweeter situations.*

A few fine blue and black Papilios dashed about to tantalize us (they were almost certainly *P. nireus*, Cram., f. *lyæus*, Dbl.), but the common South African *P. demodocus*, Esp., proved much easier to capture, and between the Park and the town two specimens fell victims to our nets; one of them seemed to have been injured by a bird.

* This reminded me of a part of "The Happy Valley" at Hong Kong (in 1904), so fouled with human excrement that collecting was difficult, yet clouds of butterflies fluttered about the flowers of *Lantana camara*, Linn., growing around. There was no evidence that the insects were attracted by the ordure, but they were certainly not repelled. It is well known that *Charaxes* is a foul feeder. —G. B. L.

Satyrids were conspicuous by their absence. A single female specimen of the common dingy South African skipper, *Gegenes zetterstedti*, Wallgr. (=*hottentota*, Latr.) was the sole Hesperid seen, but the Lycænids were better represented by a solitary male of the far-ranging *Tarucus telicanus*, Lang, and several specimens of the "amphisbaenoid" tailed and lobed Blue, *Argiolaus silas*, Westw. This has a rapid and jerky flight and is fond of settling high up, so that the observation of its "false head" and its attitude at rest was attended with difficulty, but a male and four females were easily taken off the red blossoms of a tall shrub.

The only moth taken was the day-flying Lymantriad, *Euproctis mesozona*, Hmpsn., a male; this is a species represented in the National Collection solely by the type.

Among other orders the *Diptera* were represented by an *Idia* and another fly; we did not take a single beetle, being indeed too busy with the butterflies. There were many small grasshoppers in the coarse grass by the foul stream, the most striking being the common South African *Catantops melanostictus*, Schaum, whose red tibiæ and striped femora render it conspicuous. The only Aculeate taken was a worker *Belonogaster praunsi*, Kohl, one of two seen on the same plant. This genus, very characteristic of the country, has an extremely long peduncle to the abdomen. A specimen of the Sawfly *Athalia himantopus*, Klug, a species that Col. Bingham says is widely spread over the African continent, was taken. The bug *Atelocera stictita*, Westw., was caught flying: during life its underside is covered with a white waxy substance.

Among the things that we saw that morning, but did not catch, were a *Charaxes*, an *Amauris* (probably) and *Atella phalanta*, Dru.

Durban, Natal.

Lat. 29° 50′ S. Sea level. August 13–21.

At Durban we had the great advantage of an introduction to Mr. A. D. Millar. This gentleman and the members of his family are enthusiastic entomologists. It had been our intention to go northwards and explore the country about the mouth of the Tugela, but, acting on Mr. Millar's advice, we decided to stay in Durban and so make the best use of our time, which was here, as elsewhere, all too short.

The Ocean View Hotel in the residential suburb called THE BEREA is perhaps 200 feet above the sea; its garden yielded a few of the commoner butterflies—*Papilio dardanus*, Brown, a male, *Precis clelia*, Cram., *Mycalesis safitza*, Hew., both sexes, and *Zizera lucida*, Trim., a male.

Lanes and bits of open ground near the hotel, still retaining much of the character of the primæval scrub, afforded fair collecting. It was in such a place that we were much excited at beating out our first *Salamis anacardii*, Linn., a large greenish nymphaline very leaf-like on the under-side and with a peculiar satiny sheen that gives it a very tropical aspect. There we found late in the afternoon both sexes of *Limnas chrysippus*, Linn.; with them were less familiar butterflies, *Acræa terpsichore*, Linn. (=*buxtoni*, Butl.) several (they feigned death in the net); *A. cabira*, Hopff., one; a pair of *Precis sesamus*, Trim.; an example of *Eurytela hiarbas*, Dru.; also several specimens of *Byblia goetzius*, Herbst, of both sexes, all more or less "dry" in character; this butterfly flies rather quickly low down and settles usually on the ground under a bush, but is easily disturbed. We also took at the Berea two males of *Belenois severina*, Cram.; two males and a female of *Mylothris agathina*, Cram.; and one of each sex of *Terias regularis*, Butl. Of smaller things we took one each of *Zizera lysimon*, Hübn., and *Gegenes zetterstedti*, Wallgr., and beating produced a Geometer, not yet identified.

The glow-lights of the Hotel only yielded the Boarmid *Tephrina arenosa*, Butl., and two Noctuæ:—*Ophiusa mejanesi*, Guen. (a moth that occurs in India, coming very near to Walker's type of *expedita*, a species sunk by Sir George Hampson), and *Eulaphygma micra*, Hmpsn. A humble fly, *Homalomyia canicularis*, Linn., was an inmate of the Hotel.

Sandy banks by the roadside were haunted by various Fossors, two of which, *Liris hæmorrhoidalis*, Fabr., a male, and *Pompilus diversus*, Smith, a female, exhibit Lycoid coloration, the last-named more especially with its yellow-brown wings tipped with black. With these were two *Dielis fasciatella*, Hübn., both males. The Syrphid fly, *Eristalis tæniops*, Wied., was too handsome to be passed by.

The first of his favourite localities to which Mr. Millar directed us was the old Cemetery at SYDENHAM. About three miles to the north of Durban, it lies on the north (sunny) side of a hill sloping very gradually towards the

Umgeni River, and may be some 400 feet above sea level. The Cemetery itself is neglected and overgrown with coarse grass and herbage, which doubtless nourishes many larvæ, while there are enough flowers to attract butterflies. The grassy lanes on either side afford excellent collecting ground, and, although most of the land around is cultivated, there is some scrub to the south.

Here we found, besides our familiar friend *Limnas chrysippus*, Linn., our first specimens of *Amauris albimaculata*,* Butl., both males. Single specimens of the beautiful dark red *Acræa petræa*, Boisd., and of *A. natalica*, Boisd., a male, were taken. The fore-wings of the last-named are when the insect is fresh of a fine rose-crimson, the hind part of the abdomen (in the male) being banded above with pale rose-pink and white, but white beneath. Males of *A. terpsichore*, Linn., were fairly common, especially among dead grass. *A. encedon*, Linn., of which two examples were taken, was so successful in its mimicry of *L. chrysippus*, as at first to make one of us believe it to be that species.

In the Cemetery a few males of *Hypolimnas misippus*, Linn., were sailing around, flying high and seldom flapping their wings, but no females were observed. In an open space within the enclosure, as well as in a cleared mealy-field adjoining, *Precis clelia*, Cram., was locally common, settling on the bare earth and on the grave-stones; with them were a couple of *P. cebrene*, Trim., but that species was commoner in the dry bed of a spruit half-a-mile to the north; some of the specimens were very small. Three examples of *P. natalica*, Feld., were taken; *P. sesamus*, Trim., was not uncommon. Only two *Catacroptera* [*Precis*] *cloantha*, Cram., were seen, one of them in the dry spruit. *Eurytela hiarbas*, Dru., was very common about hedgerows. Single specimens of *Pyrameis cardui*, Linn., and *Salamis anacardii*, Linn., turned up. Several male specimens of *Byblia goetzius*, Herbst, were taken, but it was hardly common. *Charaxes varanes*, Cram., required considerable negotiation to effect its capture, as its flight is both high and strong, but it has a habit of settling at the end of a prominent twig, and is then fairly easily detected in spite of the resemblance of its under-surface to a leaf.

Of *Mycalesis safitza*, Hew., two females were taken, one

* For the specific distinctness of this form from *A. echeria*, Stoll, see Rothschild and Jordan, *Novit. Zool.* x, 1903, p. 504.

near the Cemetery, the other in the village of Sydenham (a mile nearer Durban), they were flying in full sunshine in the early afternoon. Of *M. perspicua*, Trim., three males were taken among dry grass, etc., near the before-mentioned spruit, they were rather common there but of restless habits, so that it was very difficult to see them settle. It was interesting to find that on separation of the wings and stroking the patch near the costa of the hind-wings they gave out a very strong scent quite distinct in character from that of *M. safitza*, Hew., which last has one of the strongest scents met with.

Of *Belenois severina*, Cram., a male was taken; but *B. gidica*, Godt., appears to have been commoner, since three males and a female were brought home. Three *Pinacopteryx pigea*, Boisd., two males and a female (near Sydenham village), and one *P. charina*, Boisd., were taken. We met with but one *Mylothris agathina*, Cram., a male, but *Eronia leda*, Dbl., was not uncommon, flying rapidly along a lane near the Cemetery, often in company with *Teracolus auxo*, Luc.; it was hard to catch, but three males and a female were secured. The genus *Teracolus* was more dominant at Sydenham than at any other locality which we visited, the most abundant species (especially in fields) was *T. auxo*, Luc. (the dry form called by Wallengren *topha*). The males appeared to outnumber the females by two to one. On one occasion a specimen of *auxo* and one of *Eronia leda*, both males, were in the net together, they were duly pinched and as the net was lying open on the ground another *auxo* (sex not known) came and settled on it close to the dead butterflies! The next commonest species was *T. annæ*, Wallgr. (dry-season phase, = *wallengrenii*, Butl.), of which thirteen males and one female were taken. On the other hand, of *T. omphale*, Godt., we took but three males and one female, and of *T. achine*, Cram., a like number, while of *T. phlegyas*, Butl. [according to Trimen = *ione*, Godt.], we secured but a single male, of which it was noted that the purple tip was not apparent in flight. Butterflies of the genus *Terias* were in abundance locally, the specimens brought home proved to be *T. regularis*, Butl., four males (one of them "intermediate" in character, the rest dry), and *T. senegalensis*, Boisd., one male (dry). The only other Pierine taken was *Colias electra*, Linn., on the road about a mile on the Durban side of the Cemetery; the species was not common.

One *Papilio dardanus*, Brown, was taken at Sydenham, but *P. demodocus*, Esp., was common; it flew fast but generally not very high, twice at least it was observed to flutter its wings when feeding, as its congener *P. erithonius*, Cram., [= *demoleus*, Linn,] has been observed to do in India. A specimen taken in Sydenham village was very small.

A considerable variety of Lycænids was taken, though they cannot be said to have been abundant: *Virachola antalus*, Hopff., a male; *Hypolycæna philippus*, Fabr., a female; *Axiocerces harpax*, Fabr., a male settled on a rose-bush in the Cemetery; *Lycæna bœtica*, Linn., one; *Zizera lucida*, Trim., two females; *Z. lysimon*, Hübn., one on the way; *Lachnocnema bibulus*, Fabr., four, in the Cemetery, this species sits with the abdomen turned up at an angle of 45° (like *Euchloë*); *Catochrysops malathana*, Boisd. (= *asopus*, Hopff.); while on the slopes of the spruit before mentioned was taken a single example of *Alæna amazoula*, Boisd., a female; this last was very cryptic when among the grass where it was found. In general appearance it so closely resembles a tiny *Acræa* that at first it was placed next to that genus.

The Skippers again were varied rather than numerous, single specimens being taken of each of the following:—*Sarangesa motozioides*, Holland, almost invisible as it sat on a rock in the spruit with its wings spread out flat; *Netrobalane canopus*, Trim., resting with expanded wings on the upper side of a *Solanum* leaf; *Baoris fatuellus*, Hopff.; *Gomalia albofasciata*, Moore; the large species *Rhopalocampta pisistratus*, Fabr., and *R. forestan*, Cram.; lastly *Caprona adelica*, Kirsch, a prettily marbled butterfly with a scaleless patch on the fore-wing, of which there are but two specimens in the British Museum.

The Syntomids *Pseudonaclia puella*, Boisd.; *Syntomis simplex*, Walk., two, a metallic-blue thing easily caught; and *Euchromia formosa*, Guér., were taken flying, the latter near the spruit. A crippled specimen of the singular Geometer, *Cœnina pœcilaria*, H.-S., was taken in the Cemetery, a better one missed in the spruit, both among long grass.

The following *Hymenoptera* were taken: *Xylocopa divisa*, Klug, a male; a grey wasp, *Icaria cincta*, Lepel., ☿; the ant *Camponotus maculatus*, Fabr., eight specimens under a stone; and an undetermined Ichneumon.

The great order *Coleoptera* was very poorly represented by two Lady-birds, *Ortalia* sp., beaten out of a composite creeper (apparently a *Senecio*), the species is represented in the British Museum, but unnamed; three *Haplolycus*, apparently of two species [one possibly *congener*, Gerst.], were either beaten out of, or taken flying about the same creeper; *Acantholycus constrictus*, Fabr., was caught flying slowly; two specimens of *Anomalipus porcatus*, Sol., were found under a stone; and four specimens of a Heteromeron were also found under stones, *Opatrum* sp., apparently in the National Collection, but unnamed.

The bugs, at least as regards individuals, were somewhat more plentiful; beating the climbing composites (one with yellow, another with lavender flowers) revealed a number of the fetid Pentatomid *Antestia variegata*, Thunb., at first taken by both of us to be Lady-birds; two other fetid Pentatomids, *Holcostethus goniodes*, Dall., and *H. scapularis*, Thunb., were also taken.

There were two as yet undetermined Acridians among our captures as well as the common *Catantops melanostictus*, Schaum. Also a Dragonfly, *Orthetrum fasciolatum*, Ramb.

The Botanical Garden lies on the slope of the hill between the Berea and the Race-course, and comprises portions of the original scrub, so that it naturally harbours many butterflies. Amongst these was a small female of *Limnas chrysippus*, Linn., which was actually mistaken by one of us for its mimic *Acræa encedon*, Linn., of which three specimens were captured. A single specimen of *Planema esebria*, Hew., and two of *Acræa cabira*, Hopff., were netted, one of the latter settled on a leaf with wings closed was inconspicuous. Of *Amauris albimaculata*, Butl., a male and two females were taken, one of the latter settled near the ground before 9.0 a.m., at which time it was noticed that Skippers were especially active.

Eurytela hiarbas, Dru., was common in the wooded parts of the garden, where also three *Precis elgiva*, Hew., were secured, together with two *P. natalica*, Feld., of the dark, or intermediate form (one very tattered), sitting on leaves with wings fully spread. The same bit of surviving scrub yielded two of the Satyr-like *Crenis boisduvalii*, Wallgr., one of each sex. *Neptis agatha*, Cram., was not uncommon, but as the garden is a good deal exposed to the prevalent south-east wind many of the specimens were worn. *Salamis anacardii*, Linn., was beaten out at

4.45 p.m., it had a very slow flight. Of *Byblia goetzius*, Herbst, we took a male of the dry form. In a shady spot were two *Melanitis leda*, Cram., the only specimens that we met with in South Africa. *Mycalesis safitza*, Hew., with its *janira*-like flight, was not uncommon in the shade, the four specimens taken in the gardens were all females of the dry-season form (var. *evenus*, Hopff.).

Belenois severina, Cram., was common; though the large majority were dry, amongst them was found a semi-wet male. It was noted of a pair *in cop.* that the male supported the female in flight. Only one *B. gidica*, Godt., a male, was taken. But if not quite the commonest white of the gardens, certainly *Pinacopteryx pigea*, Boisd., was the most characteristic; a dozen specimens, both sexes about equally balanced, were secured, they were all of the dry form (= *alba*, Trim.); it appeared to be an earlier riser than many butterflies. A pair were observed *in cop.*, the male supporting the female and when settled enclosing the female between his wings. Of *P. charina*, Boisd., two of each sex were taken, one of the females was less dry than the rest. *Mylothris agathina*, Cram., was scarcely common, males prevailing. In the more open grassy parts a few *Teracoli* were to be got: of *T. speciosus*, Wallgr., we took two males; *T. omphale*, Godt., was commoner, and we took five males and two females; of *T. achine*, Cram., one of each sex. Of *Eronia cleodora*, Hübn., we took but one; *Terias regularis*, Butl., was common enough, six specimens taken proved to be all females, of the dry form. We did not meet with this species outside Natal.

Just outside the northern hedge of the Botanical Garden a fine *Papilio morania*, Ang., was taken flying low along with *Belenois severina*, Cram., and settling on wayside plants; others of the genus were *P. demodocus*, Esp., a male; *P. dardanus*, Brown, two males, a species that does not fly as fast as many of its congeners; *P. nireus*, Cram., f. *lyæus*, Dbl., a male and two females.

The *Lycænidæ* were conspicuous by their scarcity, only two being met with—*Hypolycæna philippus*, Fabr., a male taken as late as 5.0 p.m., and *Zizera lysimon*, Hübn., two, one of them beaten out but little earlier (together with two *P. pigea* and two *B. severina*).

But if Blues were scarce it was far otherwise with Skippers: of our old friend *Gegenes zetterstedti*, Wallgr., seven were taken, five being males, two females; this sits in the familiar "skipper attitude" but the posterior third of the hind-wing is plaited; *Baoris fatuellus*, Hopff., one; *Acleros mackenii*, Trim., seemed to be common but was hard to catch, a male only was netted; of *Pterygospidea* [*Tagiades*] *flesus*, Fabr. [= *ophion*, Dru.], five specimens were secured; it has a rapid darting flight, dashing wildly up and down the glades like a flash of silver, and suddenly settling with wings widely spread like a *Boarmia*, usually (so far as our experience went) on the *upper* side of a leaf, though it was on at least one occasion seen to settle on the *under* side, which Mr. Trimen gives as its habit; the fine large skipper *Rhopalocampta keithloa*, Wallgr., rests in a singular attitude, the wings are raised above the back but do not meet, since both primaries and secondaries are

Rhopalocampta keithloa. Position of wings in resting attitude, seen from behind.

curved outwards somewhat spirally, moreover the posterior half of the secondaries is curiously plaited over the abdomen; a specimen of *R. forestan*, Cram., was beaten out as late as 4.45 p.m., darting away with a whirligig flight.

The Lymantriad moths *Euproctis punctifera*, Walk., three males, and *E. stellata*, Dist., two males, were beaten out one afternoon, together with the Larentid Geometer, *Epirrhoë subspissata*, Warr., one; the Acidalids *Craspedia pulverosaria*, Walk., and *Idæa spoliata*, Walk., one of each; the Deltoids *Hypena thermesialis*, Walk. [= *Ophiuche masurialis*, Guen.] three; the Pyrales *Bradina* [*Erilita*] *admixtalis*, Walk., one; *B.* [*Physematia*] *atopalis*, Walk., two; and some others not yet determined.

Two beetles only were captured, one the weevil *Stramia anconifrons*, Boh.; the other, *Cardiophorus* sp., was found under an old tarpaulin.

The sole Aculeate brought away was a beautiful light blue bee, *Crocisa picta*, Smith, ☿, which with its rapid flight suggested a small dragon-fly.

Three species of Diptera were met with: *Eristalis tæniops*, Wied.; *Syrphus ægyptius*, Wied.; and *Sarcophaga* sp.

A solitary Pentatomid bug, *Agonoscelis versicolor*, Fabr., was taken.

Of dragon-flies we took one of a species not yet determined, and two that would appear to be *Orthetrum fasciolatum*, Ramb.

In approaching Durban from the sea one first sights THE BLUFF, a ridge of high ground separating the harbour from the Indian Ocean. Access is obtained on the landward side by a steep path, the resort of many butterflies, being protected from the sea winds and lying fully open to the sun. It is at first hard to realize that south of the Equator hill-sides with *northern* aspects are the most likely hunting grounds for butterflies. At the eastern extremity, near the lighthouse, the Bluff is more or less bare; but the path towards the west soon leads into the scrub, or natural forest, of mixed growth with a scarcely penetrable undergrowth of the coarse Acanthaceous plant called by the natives "u-Bomaan." Through the scrub there has been cut a very wide road, grass-covered, which keeping parallel to the coast, runs up hill and down dale for at least a couple of miles, how much further we had not time to investigate. This road with its occasional glimpses of the sea, perhaps 150 or 200 feet below, afforded the most delightful collecting ground imaginable. One was constantly reminded of ridings through woods in Southern England, but rudely brought back by catching the net in the well-concealed thorns of the familiar "fern-asparagus" of our hot-houses and dinner-tables [*Asparagus ? plumosus*], or by a glimpse of the dusky form of a cryptically-coloured Kaffir in the gloomy shadow of the forest. But everything has its drawbacks; that of the Bluff was climatic, for all too soon after mid-day, on both our visits, the south-east Trade-wind freshened and great clouds rolling up from the Indian Ocean sent all well-regulated butterflies to bed.

Limnas chrysippus, Linn., was very common, especially towards the more civilized end of the road. *Planema esebria*, Hew. (curiously enough the only species of the Acræine group that we saw there), has a flight of moderate rapidity, but two were easily caught. Several *Atella phalanta*, Dru., were seen and a few netted. *Precis* was represented by a single *clelia*, Cram.

Eurytela hiarbas, Dru., was present but not common; of *Byblia goetzius*, Herbst, two were taken, one of them less "dry" than usual. *Salamis anacardii*, Linn., with its slow flight, looked strangely smaller than it is; it soon settled on a leaf and appears indeed to be a very sluggish insect. Two females of *Mycalesis safitza*, Hew., are recorded from the Bluff.

By far the predominant butterfly was *Belenois severina*, Cram., which was very abundant; the males largely exceeded the females in numbers, but a good many of the latter were seen. Though the very large majority were of the dry type, intermediate examples were also present. They appeared to be markedly gregarious, though this may have been due to the distribution of their favourite flowers. Two pairs were observed *in cop.*, in each case the female, hanging down impassive, was carried by the male. Of *B. gidica*, Godt., which was far less common, we took two males and three females. Most of this species were seen near the bottom of the path leading from the harbour up to the lighthouse. Of *B. thysa*, Hopff., we took two males; when on the wing they were very like the male of *Mylothris agathina*, Cram., in flight and general aspect. Indeed even as seen in the net the *Belenois* so closely mimics the *Mylothris* that one of us though specially on the look-out was deceived, and this even when the two insects were taken the same morning.

Pinacopteryx charina, Boisd., was decidedly common, but the sexes were very unequally distributed; we took 17 males to 2 females. One male specimen had lost the anal angles of the hind-wings, probably from the bite of a lizard. Of *Glutophrissa saba*, Fabr., a male was taken. The beautiful *Eronia cleodora*, Hübn., was quite common; we took 18 specimens which appear to be mostly males; it flies fast. The Plate accompanying this paper gives a fair idea of the brilliance of the butterfly and the conspicuous arrangement of its strongly contrasted colours, but it shows far more satisfactorily its cryptic coloration when resting, as it was several times observed by us, upon or close by yellow, blotched and perforated leaves of the *u-Bomaan*, as the Kaffirs call the shrub forming the bulk of the undergrowth on the Bluff. This plant, now known as *Isoglossa woodii*, Clarke [figured in J. Medley Wood's "Natal Plants," vol. i, Plate XXII, under the name of *Ecteinanthus origanoides*, T.], belongs to the natural order

Acanthaceæ, and is not the food plant of the larva.* The under-side of the hind-wing of the butterfly varies almost as much as the discoloured leaves, and the resemblance is general, that is to say, it is not a definite case of leaf-imitation. It should be noted that a coloured sketch of the leaves was made at the time, but in the absence of the butterfly, to avoid any tendency to exaggerate the resemblance. Mr. H. Knight's drawing is quite admirable.

Of *Teracolus achine*, Cram., we took a male; of *T. omphale*, Godt., two of each sex; but we naturally paid more attention to the beautiful "Purple-tips," *Teracolus speciosus*, Wallgr. [Butler named the dry form of this butterfly *jobina*, and considered the wet form to be the *ione* of Godart.] This was not uncommon, and we secured six males and two females; during its flight, which is rapid, it looks like an ordinary white, the purple not showing on the wing.

Of *Terias regularis*, Butl., we took a male, and of *T. senegalensis*, Boisd., a female, both dry.

We managed to get two specimens of *Papilio policenes*, Cram., but one of them was sadly battered; also one male of *P. dardanus*, Brown, f. *cenea*, Stoll; a specimen of *P. nireus*, Linn., f. *lyæus*, Dbl., was easily secured flying low down when a cloud passed over the sun.

Curiously enough we took but a solitary Blue, *Virachola antalus*, Hopff.†

Single specimens of the Skippers *Gegenes zetterstedti*, Wallgr., a female; *Gomalia albofasciata*, Moore, and *Baoris fatuellus*, Hopff., were taken, the last named settled on a leaf in the sun, with the wings fully expanded; also two *Kedestes macoma*, Trim.

We kicked up from grass, etc., two specimens of the exceedingly variable Noctua *Ophiusa lienardi*, Boisd., one of them settled upon the ground; in like manner we turned up a battered example of the restless Noctua *Remigia repanda*, Fabr., and found another at rest upon a leaf in the full sun. Here we took our first specimen of that beautiful Catocaline, the steel-blue and orange yellow

* Some further particulars were given when attention was first called to the matter. See LONGSTAFF, Trans. Ent. Soc. Lond. 1906, pp. 113, 114; but the Plate was not ready in time to be issued with that paper.

† See LONGSTAFF, *Some Rest-Attitudes of Butterflies*, Trans. Ent. Soc. Lond. 1906, p. 108.

Egybolia vaillantina, Stoll, known to the Colonists as the "Peach Moth." Also the Arctiid *Rhanidophora cinctigutta*, Walk., and the curious Geometer *Cartaletis libyssa*, Hopff., of which several were seen, but only one taken. It flies rather high with feeble fluttering action, and when on the wing somewhat recalls *Limnas chrysippus*, or an *Acræa*, which last it also resembles by exuding a yellowish juice when pinched, the juice in this case being odourless. Another Geometer, allied to our "Magpie-moth," was *Zerenopsis geometrina*, Feld.

The familiar *Phlyctænia ferrugalis*, Hübn., completes the list of moths, so far as we have been able to assign them names.

The yellow and chocolate-coloured Lamellicorn *Macroma cognata*, Schönh., was very conspicuous on the wing; the Clavicorn *Episcaphula aulacochiloides*, Crotch, was taken under a log, associated with ants and fungi. *Asida bicostata*, Fåhr., and *Hister subsulcatus*, Mass., were also found under logs; a specimen was obtained of the Phytophagous Lady-bird, *Epilachna infirma*, Mulsant. The weevil *Sciobius pullus*, Sparr., a female, was beaten out of a clematis-like creeper [? really a *Senecio*]. The Carabid *Arsinoë quadriguttata*, Castelnau, was taken on low herbage.

Two crickets and several unnamed Acridians were captured, including one which made a loud snapping noise in leaping, whereas the very spiny-legged *Acridium ruficorne*, Fabr., sat on a bush and made no attempt to escape. From under a log was unearthed an immature female *Blatta*, which Mr. Shelford thinks may possibly be a new species.

A blue wasp was taken, and several others seen; it turns out to be a new species and has been named by Col. C. T. Bingham *Notogonia dixeyi*; while under a log were found a number of the big-headed soldiers and thin workers of *Camponotus maculatus*, Fabr.

The conspicuous Reduviid bug, *Physorhynchus crux*, Thunb., was common under logs of wood, corrugated iron, etc., near the lighthouse; it has a peculiar pungent odour.

The sole fly brought home was apparently the cosmopolitan *Sarcophaga carnaria*, Linn.

Congella, some three miles to the west of Durban, is also a very pleasant locality. The ground rises gradually from near the level of the harbour for perhaps a mile to the large banana plantations from 200 to 300 feet above sea level, the slopes being covered with wild scrub traversed by a woodland track, while through the lower portions are cut wide grass-covered roadways foreshadowing the development of an eligible building estate.

As usual, *Limnas chrysippus*, Linn., was to be had; we took five males and a female. We took a female of *Amauris echeria*, Stoll, and three females of *A. albimaculata*, Butl., the latter flew slowly and was easily caught. *Acræa* was well represented, the commonest species being the black, yellow-spotted *A. cabira*, Hopff.; of this one specimen was taken on *Lantana* flowers, but as a rule it was seen flying about the tops of trees, in which situation it looked a much larger insect than it is; thirteen specimens were taken, one of these which reached the hotel alive, having survived pinching as *Acræ* so often do, proved very resistant to chloroform. *A. terpsichore*, Linn. [of which the southern form = *buxtoni*, Butl.], looks on the wing like a small British *Argynnis*; we took five. Of *A. petræa*, Boisd., which when alive is very rosy, both above and below, we took two. Of *A. natalica*, Boisd., we got one among grass; its hind-wings have a rosy flush in life, indeed the beauty of many of these *Acræ* cannot be appreciated from cabinet specimens; *A. encedon*, Linn., of which we took three, is a feeble insect, with slow flight, but it again succeeded in passing itself off (momentarily) as *chrysippus*. A single male *Planema aganice*, Hew., completed the group.

Byblia goetzius, Herbst, flew over the grass like a "Pearl-bordered"; one settled on a red path, another on dead grass, both with wings erect, both inconspicuous; we took a male and four females, one of the latter was "quite dry." Two *Neptis agatha*, Cram., were taken flying slowly. *Precis elgiva*, Hew., a retiring insect, was found in the track through the wood, of four specimens one was much battered; of *P. clelia*, Cram., several were seen; of *P. natalica*, Feld., two, of the dry form, one worn; of *P. sesamus*, Trim., one settled closely appressed to the ground; also at the edge of the banana garden, on very red soil a *Precis* was seen three times quite clearly, but unfortunately missed; this was either *P. octavia*, Cram. (the wet-season form of *sesamus*), or something uncommonly like it; it nearly matched the red soil in colour, but was somewhat more orange in tint. Of *Salamis anacardii*, Linn., one of each sex was obtained; of *Atella phalanta*, Dru., a single example; of *Charaxes varanes*, Cram., usually a high flier, a female was luckily netted off a shrub. *Mycalesis safitza*, Hew., was common; four males and nine females were taken.

No specimens of *Belenois severina*, Cram., appear to have been brought back from Congella, but it was certainly common there; of *B. gidica*, Godt., we took three of each sex, one had the hind-wings chipped symmetrically, apparently by a bird; of two specimens taken *in cop.* the male was dry, the female very dry. Of *B. thysa*, Hopff., we took six males, but we have no record of its model *Mylothris agathina* from that locality. Both these butterflies have strong scents, which are distinct. Of *Glutophrissa saba*, Fabr., and *Nychitona alcesta*, Cram., single examples were taken; the latter has a slow, flapping flight. Of *Eronia cleodora*, Hübn., we took two; of *E. leda*, Dbl., a single female; of *Pinacopteryx pigea*, Boisd., nine, four males and five females; of *P. charina*, Boisd., a solitary male. Congella is not the sort of locality that *Teracolus* especially delights in, and the genus was represented by but single male specimens of *T. achine*, Cram., *T. omphale*, Godt., and three males of *T. speciosus*, Wallgr. Of *Terias regularis*, Butl., we took four males and two females.

Of *Papilio demodocus*, Esp., which frequents high and open ground, we took one in the cultivated region above the woods, but of *P. nireus*, Linn., f. *lyæus*, Dbl., we got four males by taking advantage of its habit of not infrequently flying low and even settling on the ground.

Of *Zizera lysimon*, Hübn., we took two; of *Tarucus telicanus*, Lang, five, of which at least four were females, one with the fore-wings injured apparently by a bird; of *Lycæna boetica*, Linn., two; of *Castalius calice*, Hopff., one, a tattered specimen, and of *Virachola antalus*, Hopff., one female, boxed off a plant close to the ground; it was sitting head-downward, but the "false head" had been bitten off, so that it could not deceive again.

Among the Skippers were the familiar dingy *Gegenes zetterstedti*, Wallgr., two; *Baoris fatuellus*, Hopff., one; *Sarangesa motozi*, Wallgr., one; *Acleros mackenii*, Trimen, one male and two females, this and other Skippers were more active on dull days than most butterflies; *Eretis djælælæ*, Wallgr., one, settled with wings outspread;

and *Pterygospidea flesus*, Fabr., seven. Of the last species several were seen to settle on the *upper* sides of leaves, with wings spread out like a Boarmid.

The beautiful *Egybolia vaillantina*, Stoll, was rather common, it is a slow feeble flier, the wings flapping much, so it was easy to catch six specimens. The Lymantriad *Euproctis punctifera*, Walk., of which we took three males and a female, was very common, it is one of those insects which look on the wing far larger than they are, an appearance that may be due to bright colour (in this case orange) or to the mode of flight. Of the small Syntomid *Pseudonaclia puella*, Boisd., and the Chalcosiine *Anomœotes levis*, Feld., we took two each, this last looks surprisingly large on the wing.* Other moths taken were the Geometer *Gracillodes caffra*, Guen., one; the Pyrale *Antigastra morysalis*, Walk., one; *Tinægeria* sp., one, and several other unnamed Micros.

The *Odonata* were represented by two *Orthetrum fasciolatum*, Ramb. ♂, and one *Brachybasis rhomboidalis*, Beauv. The *Orthoptera* by a Blatta, found under a log, *Deropeltis autraniana*, Sauss., immature; also an Acridian, *Tryxalis ståli*, Boliv., which was very hard to see, being shaped and coloured like a piece of dead grass or straw.

Near the reservoir, on a shrubby lavender-flowered composite, were taken together the South African form of *Apis mellifica*, Linn., and the Syrphid *Eristalis tæniops*, Wied., which was noticed to be a fairly close mimic of the bee.

The beetles found at Congella were the Clavicorn *Megalodacne grandis*, Fabr., and the Heteromerous *Anthracias taurus*, Fabr., both found under logs; also *Endema nobilis*, Klug, and the very distinct Carabid, *Thyreopterus flavo-signatus*, Dej., under the bark of a dead stump among numerous ants.

From Durban to Johannesburg.

August 22, 1905.—The first point of the journey over the Highlands of Natal at which we had a few minutes' time to

* Compare my observations on the Indian Chalcosiine, *Aglaope hyalina*, Koll., in Trans. Ent. Soc. Lond. 1905, p. 68.—G. B. L.

leave the luxurious carriages of the Government Railway was INCHANGA, 2,470 feet above sea level. Here on some sandy ground near a stream bordered by rushes and coarse grass or on a bank with a few flowers (? *Senecio* sp.) we took a "dry" specimen of the Satyrid *Pseudonympha cassius*, Godt.; a wasp prettily marked with rich brown, black and white, *Polistes fastidiosus*, Sauss., ☿; a handsome Braconid, *Iphiaulax whitei*, Cameron; and an apple-green *Mantis* larva; also by sweeping the *Senecio*, etc., two *Apis mellifica*, Linn., race *adansonii*, Latr., ☿; an Asilid ? *Dysmachus* sp., and the grasshopper *Catantops melanostictus*, Schaum.

We spent the night at the Falls of the Umgeni, at HOWICK, Lat. 29° 28′ S., 3,400 feet above sea level, and before dark turned over a few basalt stones, taking a number of ants, *Pheidole irritans*, Smith; two *Blattæ* with a very strong, sweet, rather pleasant scent, suggesting pear-drops (or amyl acetate), they were immature, possibly of a new species (R. Shelford); a small beetle, *Euleptus caffer*, Boh., and an Acridian, at present unnamed. It was cold at night here.

August 23, 1905.—At MOOI RIVER Station, Lat. 29° 17 S., alt. 4,600 feet, we took a solitary Acridian only.

At ESTCOURT, Lat. 29° 2′ S., alt. 3,800 feet, on an open grassy place near the Station we were rather more successful. Two males of *Synchloë hellica*, Linn., were secured; they were noticed when at rest to withdraw the fore-wings completely between the hind-wings, and to raise the abdomen. We also took a small Syntomid (as yet unnamed), a Lady-bird, *Epilachna similis*, Thunb.; two ants, *Camponotus cosmicus*, Smith, and a locust *Trilophidia*, sp.; this was discovered by Mr. G. A. K. Marshall, and declared by Señor Bolivar to be a new species, but it has not yet been named by him.

COLENSO, Lat. 28° 46′ S., alt. 3,200 feet. The late afternoon was spent on the low ground south of the Tugela, between the river and the spot where Col. Long's guns were abandoned. The only butterflies seen were *Pyrameis cardui* and *Limnas chrysippus*. Several moths were kicked up, the Boarmid Geometers *Osteodes turbulenta*, Guen., two; *Zamarada pulverosa*, Warr., one; and *Nassunia petavia*, Stoll, a male; also two tiny Noctuæ with yellow hind-wings, *Pseudosterrha sperans*, Feld.; a Crambus and two Micros, none of them yet named. Two immature

Acridians of the colour of dry grass were taken, also a beetle *Scaptobius natalensis*, Boh., one, and the Heteromeron *Opatrum ? arenarium*, Fabr., six. Several specimens of the ant *Pheidole irritans*, Smith, were taken, also some Termites, two workers and two soldiers of the same community. The former when taken were carrying bits of grass and leaves, when brought back to the hotel they were dead and partly mutilated, ? by the soldiers in the same pill-box. The soldiers, on the contrary, reached home alive and pugnacious, for they would grasp the point of the forceps and allow themselves to be lifted off the ground without letting go.

August 24, 1905.—The next forenoon we ascended Hlangwane, the hill commanding the whole position, which unfortunately Buller did *not* occupy on December 15th, 1899. Again we saw no butterflies, and this morning we did not even get a moth! Under cow-dung on the plain two specimens of a dung-beetle were found, *Eratognathus natalensis*, Pér., and under stones, chiefly on the hill, we found an *Omostropus*, which M. Péringuey says is new; an immature bug and sundry ants, to wit, the small *Pheidole irritans*, Smith, of which the workers are very tiny; *P. megacephala*, Fabr., well deserving its name, and the big black *Mesoponera caffraria*, Smith; also a *Blatta*, sp., and an Ant-lion. Near the top of the hill a large family of the Cockroach, *Deropeltis erythrocephala*, Fabr., was found under a stone.

Under stones in and among the Boer trenches a number of large scorpions were found, olive-coloured, with testaceous rings, the large joint of the chelæ and tip of the tail pale testaceous, paler beneath. Other dwellers under stones were very young snakes, a nearly globular toad which squeaked piteously when taken up, and a gecko.

A drive to Hart's Hill in the afternoon made one realize completely what is meant by "carriage exercise," for the road is probably the worst that we ever traversed. It proved more interesting from the point of view of Military History than that of Entomology, nevertheless at the bottom of the Hill we kicked up *Sterrhanthia lineata*, Warr., a brownish Geometer near *Sterrha sacraria*, Linn.; on the slopes, we took under stones *Harpalus capicola*, Dej., ♂; *Pæderus crassus*, Boh.; a "Staph" represented both in the General Collection at South Kensington and in the Sharp Collection, but in both unnamed; the big ant

Acantholepis vestita, Smith; the tiny *Pheidole irritans*, Smith; and *Tetramorium solidum*, Emery.

On the summit of the Hill, in an old Boer trench, looking down over the slopes on which many a brave soldier breathed his last, was *Pyrameis cardui*, Linn., the only butterfly that we saw that day. It may be remarked that it was bitterly cold when we reached Ladysmith a little before midnight.

Ladysmith, Lat. 28° 38′, 3,300 ft., August 25, 1905.—The next day was devoted to Spion Kop, and naturally enough disputed questions of strategy and tactics diverted our attention from the *Arthropoda*. A specimen of *Precis sesamus*, Trim., was taken close to a Boer's grave near the farm-house below the Aloe Knoll, while a conspicuous Larentid, *Ortholitha pudicata*, Walk., with reddish fore-wings and orange hind-wings, was netted on the top of the Knoll. The beetle *Zophosis caffer*, Deyr., was found just below, running on the path. A small grasshopper was brought from the summit of Spion Kop, and a larger species from the lower slopes on the north side; this last was coloured like dead grass on the exposed portions, but the lower surface of the abdomen and the lower edges of the femora were of a deep bright red. On the road back to Ladysmith, near the half-way house, the conspicuous *Graphipterus cordiger*, Klug, was taken under a stone, as well as the dingy *Zophosis caffer*, Deyr.

August 26, 1905.—On our walk out to Waggon Hill and Cæsar's Camp we found under a stone on the open veldt a Carabid, *Polyhirma notata*, Perond.; when touched it emitted from its mouth a quantity of dark brown fluid having no perceptible odour. The dingy Boarmid *Semiothisa brongusaria*, Walk., was common on rough bushy ground.

The famous work at the western end of Waggon Hill was garrisoned by *Precis sesamus*, Trim., while the variable Geometer *Tephrina catalaunaria*, Guen., was taken close to the Earl of Ava's grave.

Within the trenches of Cæsar's Camp we took the Geometer *Tephrina arenosa*, Butl., as well as two Acridians.

Returning to Ladysmith we found on the northern, reverse, slope of Cæsar's Camp, under large stones near the head of the (then) dry spruit, the curious cockroach, *Homalodemas porcellio*, Gerst. (= *Derocalymna intermedia*, Kirby). It is remarkably flat and sits closely appressed to the stones; it appeared to be extremely local. Between this point and the bridge over the Klip River just outside the town we found insects much commoner. The scrub is intersected with deep gullies, for the most part dry, but evidently conveying at some time much water to the Klip; in these gullies *Precis cebrene*, Trim., and *P. sesamus*, Trim., were not uncommon, also *Synchloë hellica*, Linn., of which a male and four females were taken. A male of *Colias electra*, Linn., and a female of *Teracolus eris*, Klug, were taken near the river. Single examples of *Ypthima asterope*, Klug, *Zizera lysimon*, Hübn., and *Tarucus sybaris*, Hopff., ♀, were secured, while other Lycænids were seen, as also *Pyrameis cardui*, and *Limnas chrysippus*.

The Quadrifid Noctua *Acanthonyx prætoriæ*, Dist., was taken resting in the dry bed of a spruit; the dingy Boarmid, *Osteodes turbulenta*, Guen., and other Geometers were kicked up, including a beautiful green one (with somewhat the look of *Euchloris vernaria*, Hübn.) which got away in the undergrowth. An ichneumon and a common honey-bee were also taken. A small bug, *Pododus* sp. (not in the National Collection), was seen running on the sand; on being pinned it exhaled a strong odour of acetate of amyl. The beetle *Zophosis caffer*, Deyr., while running swiftly over the sand was occasionally blown over by the wind.

The electric lights about the town and railway-station attracted a fair number of insects, the commonest being the large flying ant, *Dorylus helvolus*, Linn., ♂, a yellowish-brown insect with very flexible abdomen, whose position in the insect world was at the time a puzzle to us. When pinned, the thorax cracked and emitted a puff of white powder. The largest insect at light was the Lamellicorn, *Oryctes boaz*, Fabr., a rotten-wood feeder, of which two were taken. With these were the Noctuids *Audea variegata*, Hmpsn., *Borolia* [*Leucania*] *melianoides*, Möschl., *Homoptera canescens*, Walk.; the Syntomid, *Thyretes caffra*, Wallgr., ♂; three Phycids, *Microthrix inconspicuella*, Rag. (1) and *M. insulsella*, Rag. (2), and several other moths not yet named.

Two moths, *Plusia limbirena*, Guen., and a Micro, were taken in the bedroom of the hotel.

August 27, 1905.—An afternoon was spent on the north-eastern defences, "The King's Post," and "The Devons' Post," which were on low rocky hills with a little low scrub.

At the latter, which runs out towards Lombard's Kop, exposed to the cross-fire of two "Long Toms," the works were more solid and better built than any that we came across, and showed pretty plainly that there must have been skilful wallers among the Men of Devon. Single specimens of *Precis archesia*, Cram., *Acræa neobule*, Dbl. and Hew. (semi-transparent), and *Byblia ilithyia*, Dru., were taken at the King's Post, but the commonest butterfly there was *Pyrameis cardui*, for the most part small and rather worn specimens; flying with it was *Utetheisa* (*Deiopeia*) *pulchella*, Linn. Lizards were numerous, but although some time was given up to watching them, they were not seen to make any attacks on butterflies.

At the Devons' Post *Synchloë hellica*, *Pyrameis cardui*, *Precis cebrene*, and *Zizera lysimon*, were taken. By a stream separating the two hills *Yphthima asterope*, Klug, was rather common, looking not unlike a Blue on the wing; futile attempts were made to see the butterfly settle, but it was restless. At the flowers of *Aloe ? ferox* were *Xylocopa hottentota*, Smith, ♀, the wasps *Belonogaster distinguendus*, Kohl, 3 ☿, and *Eumenes dimidiatipennis*, Sauss., ♀, a large red and black, brown-winged insect, as well as the Phytophagid *Ortalia pallens*, Muls., taken flying near the same flowers.

Anywhere along the ridge that strange locust *Phymateus leprosus*, Serv., might be seen. This is of a grey- or yellowish-green, tinted with yellow, orange and pink. Its hard thorax though strongly tuberculate shines with an enamel-like texture. It is very sluggish, and unlike most locusts does not readily take flight, but when it does so makes a rattling noise. When touched it emits copiously a dark olive-green very fetid fluid, which dries up as a sticky varnish; this accidentally tasted was found to be bitter and unpleasant.

August 28, 1905.—At INGAGANE Station, Lat. 27° 56′ S., altitude 3,900 feet, a specimen of the Geodephagous beetle, *Acupalpus natalicus*, Pér., was found under a lump of hard earth.

At NEWCASTLE, Lat. 27° 48′ S., altitude 3,900 feet, a specimen of *Precis sesamus*, Trim., was found in a tiny dark kloof, its love of darkness was also noted on subsequent occasions. Several Acridians, whose determination is postponed, were taken. Also an immature Blatta, *Cosmozosteria* sp., was found under a flat piece of iron, together with a community of the ant, *Acantholepis vestita*, Smith. The Heteromerous beetle, *Zophosis caffer*, Deyr., was caught running swiftly over sand.

At Inkwelo, under the shadow of Amajuba (Lat. 27° 32′ S., about 4,500 feet above the sea), a fly, *Sarcophaga* sp., was taken, but on this day at these altitudes the conditions were decidedly wintry, and the night of August 28th was cold.

Johannesburg, Transvaal.

Lat. 26° 10′ S. Altitude 5,700 feet. Aug. 30th—Sept. 2nd.

The weather during our short stay was chilly and almost sunless, while the time available only permitted of two short afternoon walks in the outskirts just beyond West Cliff.

But three butterflies were seen, *Pyrameis cardui*, Linn.; *Papilio demodocus*, Esp.; and the Skipper *Baoris ayresii*, Trim., a species that does not appear to be widely spread. Moths were about as poorly represented by the cosmopolitan *Nomophila noctuella*, Schiff., by *Sterrha sacraria*, Linn., of the dingy South African form, and by that obscure Phycid, the almost cosmopolitan *Etiella zinckenella*, Treit.

The most promising mode of collecting appeared to be turning over stones, old tins, etc., on the veldt; this back-aching process yielded ants in great plenty, the commonest species being the big-headed *Camponotus marginatus*, Latr., which turned up in this locality only; close by, the more generally distributed *C. maculatus*, Fabr., was found, while the long black *Plectroctena caffra*, Spinola, the smaller *Philodole megacephala*, Fabr., and two *Cremastogaster sordidula*, Nyl. var., were also met with. There were in addition to the ants plenty of Termites.

The beetles included several Carabids, viz.: *Chlænius sellatus*, Dej., two; another *Chlænius* that may possibly be new; *Harpalus deceptor*, Pér., nine specimens; *H. angustipennis*, Boh., two; *Macrochilus dorsalis*, Klug, one; *Trechus rufipes*, Boh., one; then there were two of a *Trigonopus* that may possibly be new; the very distinctly marked *Graphipterus cordiger*, Klug; an *Opatrum* that is probably *arenarium*, Fabr., six specimens; an unnamed *Psaryphis*; a Lamellicorn of the genus *Aphodius* that is not represented in the National Collection; two weevils, *Hipporhinus corniculatus*, Fabr.; and *Brachycerus severus*, Fåhr.; also a Lady-bird, *Exochomus nigromaculatus*, Goez., which is occasionally found in Britain.

Under stones were two Pentatomid bugs, *Dalsira modesta*, Fabr., and the lance-head-shaped *Gonopsis angularis*, Dall., also *Lygæus rivularis*, Germ.; there were also several other bugs that are not yet named. Along with the bugs were several *Blattæ* and a black and red scorpion. A number of as yet undetermined Acridians were also taken.

By far the most interesting insect met with at Johannesburg was a Homopteron, *Gyaria walkeri*, Stål., allied to *Flata*, a genus well known from its alleged resemblance when at rest to a spike of flowers. It is of a creamy-white colour with eyes of a beautiful pinkish hue, which is unfortunately soon lost after death by cyanide. The insects are gregarious, and sit in rows of from three to five each near the *base* of the stems of a shrubby herb which attains the height of about two feet. Sitting for the most part with their heads up, they cannot be said to look in the least like flowers, the larvæ indeed look more like a *Coccus*, or even a luxuriant growth of *Penicillium*. When a plant harbouring the *Gyariæ* is approached the insects jump off and then fly away a short distance much like moths. They were only found within a very circumscribed area.

Settled on rocks basking in what little sun was to be had several flies were captured, all males, of a species of *Dichætometopia* allied to *tessellata*, Macq., but probably new to science.

Pretoria, Transvaal.

Lat. 25° 53′. Altitude 4,500 feet. August 31st.

The British Association paid a mere flying visit to the political capital, but this just permitted a carriage-drive to the Wonderboom,* which stands at the foot of the northern slope of a range of hills about 3½ miles to the north of the city. So far as results were concerned the time and trouble, and more particularly the dust, might as well have been saved. Insects were very scarce save at the sweet-scented white flowers of *Dombeya densiflora*, which proved very attractive. There was however an incommensurability between the height of the trees and the length of the net-stick which was tantalizing in the extreme. A few white butterflies were *seen* as well as *Limnas chrysippus*, and a Lycænid. The pedunculated wasp *Belonogaster*

* A singular tree of wide-spreading growth.

griseus, Fabr., was abundant, and four males were with difficulty secured; the South African form of *Apis mellifica,* was also busily at work together with two smaller bees (♀♀). These last Col. C. T. Bingham has described as a new species under the name of *Ceratina vittata,* so an otherwise disappointing day was redeemed. A specimen of the Chafer *Oxythyrea marginalis,* Schönh., was taken on the lavender flowers of a *Buddleia* near the river, and close by a single example of *Spindasis mozambica,* Bert. On the veldt below the big tree, the common but pretty locust *Catantops melanostictus,* Schaum, was very active and difficult to secure; in the same place we netted two specimens of *Terias brigitta,* Cram., a species we had not met with in Natal.

RAILWAY JOURNEY FROM JOHANNESBURG TO KIMBERLEY.

September 4th, 1905.

GLEN SIDING. Lat. 28° 55′ S.

On the flowers of a low-growing *Senecio* (not unlike the Oxford *squalidus,* L.) a wasp was taken, *Ammophila* ? *argentea,* Brullé, ♀, which Col. C. T. Bingham says is not typical, but possibly a local form of the species; with this was a honey-bee, *Apis adansonii,* Latr., ☿. At this place *Pyrameis cardui* and *Colias electra* were noted.

BLOEMFONTEIN. Lat. 29° 7′; alt. 4,500 feet.

In the station-yard here the last named two butterflies were again seen, and a female *Synchloë hellica* was taken.

NORVAL'S PONT, CAPE COLONY. Lat. 30° 38′; 4,000 ft.

The cosmopolitan *Plutella cruciferarum,* Zell., came to our lights.

COLESBERG JUNCTION. Lat. 30° 44′; alt. 4,370 feet.

At this station, which one naturally associates with the exploits of General French, several moths visited the lights of the train. They were the pretty silver-striped Geometer *Conchia nitidula,* Cram.; a Noctua (unnamed); our old friend of many lands *Nomophila noctuella,* Schiff.; and three Phycids, two of them being the dingy *Microthrix insulsella,* Rag.

Kimberley, Griqualand West.

Lat. 28° 43′ S. Altitude 4,010 feet. Sept. 5–7, 1905.

The Diamond City with its white dust (in striking contrast to the red of the Golden City) did not impress one as a good locality, moreover we had but little spare time, and the weather, for the most part cloudy, was unfavourable.

At Kenilworth the weevil *Cleonus mucidus*, Gerst., was beaten from *Senecio*, and two dead *Heteromera*, *Psammodes vialis*, ? Burch., and *P. scabricollis*, Gerst., as well as an earwig were taken under stones. Under one stone a large dark short-legged spider with globular abdomen was found in the midst of copious remains of beetles, etc.

On the veldt in the outskirts of the town, beyond the Old Kimberley Mine, the following were found by turning over stones, old tins, etc.:—The Lamellicorn, *Trox denticulatus*, Oliv.; the Heteromeron, *Psammodes vialis*, ? Burch., two dead specimens; the Weevils, *Brachycerus globosus*, Fabr., one; *Episus bohemani*, Auriv., one; *Sparticerus* sp., four; and *S. rudis*, Fåhr., nine. None of the last three species were represented in the British Museum; for weevils their integuments are but moderately hard, but, on the other hand, in the red sandy soil under the old tins, or among the roots of composite plants, their rough surface as well as their colour make them difficult to see. Eight specimens of the Carabid, *Bæoglossa melanaria*, Boh., were found in holes in the ground under stones or tins; they ran fast when disturbed. It was noted that under the South African sun even large stones, not to speak of the omnipresent rusty tins, afford so little protection that in many cases insects were found lurking in holes in the earth beneath, so that they were doubtless often passed over. Besides the above beetles the stones and tins harboured a number of the Ant *Monomorium subopacum*, Smith, race *australe*, Emery.

Under an old calf's foot and pastern were three specimens of *Necrobia rufipes*, Fabr., a British insect; two of the cosmopolitan *Dermestes vulpinus*, Fabr., and another beetle not yet named. The fly *Agria nuba*, Wied., was captured in the same locality.

At the Dutoitspan Mine we saw *Pyrameis cardui*, and took two *Synchloë hellica*, one of each sex, as well as the Locust *Acrotylus* sp. A Longicorn, *Tetradia lophoptera*, Guér., was seen on the wing, it settled on the light grey road of the Compound and disappeared, being so exactly the colour of the dust that it was most easily found by feeling with the hand!

At the WESSELTON MINE, on a weedy piece of waste ground, two specimens of a Lycænid, so worn as to be scarcely recognizable, were netted; as well as two of a very elegant Bombylius, *Systœchus* sp., which was only to be seen on the wing as the light caught its long white pubescence.

A dull, cheerless morning was spent on the GOLF LINKS, in sight of the Memorial to the Honoured Dead. There seemed to be nothing to do but turn over stones, which, though doubtless an annoyance to the golfers, afforded shelter to a number of *Arthropoda*. The most interesting beetle was *Graphipterus cordiger*, Klug, a quite soft insect of a drab colour bearing a black mark upon its elytra which has been variously compared to a heart, a fiddle and a tennis-racquet; of this we secured eight examples. Of the weevil *Sparticerus rudis*, Fåhr., which was very common, we took seven specimens, again noticing its resemblance to the red soil of the veldt. It may be here mentioned that the general colour of the soil at Kimberley, as at Johannesburg, Pretoria, Durban, and indeed most of the places that we visited, is red; the white dust that is so disagreeable in the town is derived from the mining refuse, and a very similar dust is met with near the gold mines of the Rand. Among the common *S. rudis*, Fåhr., was found another *Sparticerus* which shammed death, this species is not represented in the British Museum collection; we also took two *Episus bohemani*, Auriv. The *Carabidæ* were represented by one *Bæoglossa melanaria*, Boh., three *Harpalus hybridus*, Boh., all females, and five *H. affinis*, Pér. Dead examples of the Heteromera, *Psammodes scabricollis*, Gerst., and *P. vialis*, ? Burch., with other remains showed that it was not the season for that genus, and a large beetle-larva which was unearthed pointed to the same conclusion.

With the beetles were several bugs and an ant, *Aphænogaster barbara*, Linn., var. *capensis*, Mayr., accompanied by a number of "silver fish" (*Thysanura*).

RAILWAY JOURNEY FROM KIMBERLEY TO BULAWAYO.

September 7th and 8th, 1905.

TAUNGS, BRITISH BECHUANALAND. Lat. 27° 33′ S. Alt. 3,590 feet.

The very distinct Catocaline Noctua *Chalciope rivulata*, Hmpsn., and a Tinea, not as yet determined, came to light in the train.

MOCHUDI, BECHUANALAND. Lat. 24° 22′ S. Alt. 3,100 feet.

Two flies which would appear to be the too familiar *Musca domestica*, Linn., were taken near the station, as well as an obscure beetle found under a stone.

It was somewhere near this place that we entered the forest characteristic of this part of Africa, an open or easily penetrable growth, with deciduous trees of moderate size having a tendency to be flat-topped.

ARTESIA. Lat. circa 24° S. Alt. 3,100 feet.

A female of the very African-looking Lycænid, *Zeritis damarensis*, Trim., as well as a specimen of the wide-ranging *Lycæna bætica*, Linn., also a female, were netted; the hasty turning over of a few stones yielded the pentatomid bug *Diploxys acanthura*, Westw.; four ants, *Camponotus maculatus*, Fabr.; also a dead beetle with a very hard carapace, *Anomalipus* sp., represented in the British Museum collection, but without a name; as well as a weevil, *Sparticerus* sp.

MAHALAPYE. Lat. 23° 3′ S. Alt. 3,300 feet.

Here we entered the tropics, an event that was signalised by the capture of a male *Catopsilia florella*, Fabr., and the determination of its sweet scent.

PALAPYE ROAD STATION. Lat. 22° 44′ S. Alt. 3,010 feet.

The beetle *Xenitenus dilucidus*, Pér., was taken in the train.

SERUI. Lat. 22° 27′ S.

The electric lights of the train attracted a number of insects while stopping at this station, among those that were secured were the very small drab Noctua, *Entlemma* sp. (near *fœdosa*, Guen.), a Quadrifid Noctua, *Homoptera* sp., an Acontiid Noctua, *Areyophora rhoda*, Hmpsn., a flying ant, *Mesoponera caffraria*, Smith, a female; and several moths not yet determined, comprising some other Noctuæ, a Geometer, a Phycid and a Crambus.

Bulawayo, South Rhodesia. Lat. 20° 9′ S. Alt. 4,470 feet. September 9–11, 1905.

The most promising spot near the Matabili Capital was, we were told, the Waterworks situated a few miles to the westward, at an altitude of perhaps 4,600 feet.

Two shrubs in full flower proved very attractive to insects: one with white sweet-scented flowers, *Dombeya ? rotundifolia*, Harv. [Nat. Ord. *Sterculiaceæ*], was frequented by *Acræa doubledayi*, Gúer., though these butterflies seemed shy of actually settling upon the flowers. Altogether we took seven specimens, three about the *Dombeya*. On these flowers we also took the slender Scoliad *Myzine capitata*, Smith, ♂, and the long-bodied wasp *Belonogaster griseus*, Fabr., ☿; there were also two beetles of the genus *Mylabris* (or perhaps *Ceroctis*), a Cantharid of very similar colouring to the Longicorn *Hylomela sexpunctata*, Fabr., a species that we met with at Ladysmith and East London, but not nearer; two of the Cetoniid, *Rhabdotis* [*Pachnoda*] *sobrina*, G. and P., were also taken on the *Dombeya*; it is an active insect easily alarmed and taking flight. This dark olive-brown beetle is less conspicuous on the white flower than might be expected owing to the small white spots with which it is relieved breaking up the mass of its ground-colour. Another entomologist had discovered the attractive powers of the *Dombeya* before we did—the yellowish-grey, yellow-marked *Chamæleon dilepis*, Leach, ♀; it was surprising that so large an animal could be so inconspicuous.

The other attractive shrub was a species of *Combretum* [Nat. Ord. *Combretaceæ*] with spikes of yellowish-green flowers having the superficial appearance of catkins. This was especially attractive; it was frequented by *Acræa doubledayi*, Guér.; but the Lycænid *Axiocerces harpax*, Fabr., settled on it in large numbers, and seven specimens, five of them males, were secured; they closely resembled when so settled the curiously formed old dry seed-vessels of the *Combretum* of which many remained on the bush.

Other Lycænids at the same flowers were *Crudaria leroma*, Wallgr., of which only two were obtained, together with single specimens of *Tarucus telicanus*, Lang, ♂, and *Alœides? taikosama*, Wallgr., ♂. With these butterflies were a number of other insects, conspicuous among them the bright coral-red Braconid, *Iphiaulax whitei*, Cameron, its smoky-black wings bearing a scarlet (or yellowish) triangle on the costa, and the large blue-winged pedunculated wasp *Eumenes dyschera*, Sauss., var. ♂. Less striking hymenoptera were *Icaria cincta*, Lepel., ☿, and the new species *Myzine rufo-nigra*, Bingh., ♂. The Sphex *Chalicodoma cœlocera*, Smith, ♀, was taken at a flowering shrub, whether *Combretum* or some other is uncertain, but be that as it may, the *Combretum* certainly produced an unnamed bug and sundry flies: *Rhynchomyia* sp., *Exoprosopa* sp., and *E. ? lar*, Fabr.

Apart from those found on or about flowers, insects were scarce, and it took a good deal of work to secure the following butterflies:—*Teracolus topha*, Wallgr., a female; *T. antigone*, Boisd., a female which flew slowly near the ground without settling; *T. annæ*, Wallgr., a female; *T. achine*, Cram., two males, and *Terias brigitta*, Cram., a male and two females, the former less "dry" than the latter. Certain dark, yellow-striped orthopterous larvæ were seen on the stems of *Combretum* and other shrubs; they were very gregarious and were observed to advance and halt together as if drilled.

On a stretch of somewhat lower flat country covered with coarse dead grass we saw many individual specimens of the Red Locust, *Schistocerca peregrina*, Oliv., but no swarms; we spent much time in endeavouring to catch these, for they are extremely wary and took to flight when approached within four or five yards. The general colour of the living insect is dark mahogany-red, with some greenish-brown shading, but the wings shine brightly in the sunlight, so that the insects a good deal resemble small flying-fish.

On September 10th we had a delightful excursion to The Matopos, a wild group of granitic hills about forty miles to the S.S.W. of Bulawayo. The veldt may be from 4,500 to 5,000 feet above sea level, the kopjes rising from 100 to 800 feet higher. In the wider valleys are stretches of coarse grass, but for the most part the country is covered by somewhat open scrub and forest, not especially tropical in aspect. Some of the hills are wooded, others mere bosses of almost smooth granite. Such a country was most attractive, but the length of the drive to and from the terminus left little time for collecting.

The commonest butterfly was *Acræa doubledayi*, Guér., which was taken flying among long grass as well as at the flowers of *Combretum* and *Dombeya*, altogether eight specimens were taken ; a single example of *A. caldarena*, Hew., was taken among long grass, together with *Yphthima asterope*, Klug, var. *norma*, Westwd., and the Blue *Everes cissus*, Godt.

The catkin-like racemes of the shrub *Sclerocarya caffra*, Sond. [Nat. Ord. *Anacardiaceæ*], were also very attractive, yielding the Lycænids *Hypolycæna cæculus*, Hopff., a female, and the very beautiful and distinct *Stugeta bowkeri*, Trim., a male, also the now familiar *Apis adansonii*, Latr., ☿; but far more startling than any of these was the beautiful long-beaked Sun-bird with blue throat surmounting a breast of crimson shot with violet.

On the branches of the *Sclerocarya* were a number of *Polyrachis schistacea*, Gerst., a dull black ant with nearly globular abdomen.

A small tree with sweet-scented, viscid, yellow-green flowers, a species of *Gardenia* * [Nat. Ord. *Rubiaceæ*], was extremely attractive to insects, and it was interesting to watch the Sphinx *Cephanodes hylas*, Linn., hovering amidst the numerous Carpenter-bees, the commonest of which, *Xylocopa caffra*, Linn., ♀, var. *mossambica*, Grib. (with two white rings on the abdomen), it appeared to mimic; of the other species *X. olivacea*, Fabr., and *X. divisa*, Klug, var., single examples only were secured, females; the former species is very handsome, its thorax being of a beautiful "old gold" colour. A Bombyliid fly, *Systœchus* sp., as well as a male of *Catopsilia florella*, Fabr. (by no means the only one seen), were taken on the same tree.

The *Combretum* attracted besides *Acræa doubledayi*, the Lycænid *Axiocerces harpax*, Fabr., a male, and the fine wasp *Belonogaster griseus*, Fab., ☿, which has a conspicuous yellow spot on the side of the abdomen, also a number of the brilliantly coloured Braconid *Iphiaulax whitei*, Cameron. On the same plant was found a Lady-bird,

* Or possibly *Tricalysia jasminiflora*, Hook., of the same natural order.

Chilomenes sp., which is in the National Collection, but without a name.

On *Dombeya* flowers, besides ants, three specimens of the Cetoniid *Rhabdotis sobrina*, G. and P., were taken.

Certain Aculeates were taken at flowers of one sort or another which it is not now possible to distinguish:—*Belonogaster guerini*, Sauss., ☿, var. *dubius*, Kohl, *Elis* (*Dielis*) *fasciatella*, Hübn., ♂; also the long-waisted, black, red and yellow wasp, *Eumenes lucasia*, Sauss., ♀. This last is the third specimen known to Col. C. T. Bingham, the type being at Paris and the co-type in the British Museum from Bab-el-Mandeb (2,500 miles away); lastly a small slender, black, white-ringed solitary wasp, *Labus ravus*, Bingh., ♀, a new species said by Col. Bingham to come very near the Javan species that is the type of the genus. It would appear to be the first notice of this genus in Africa.

Other things that were picked up on that memorable day were a worn specimen of the pale fawn-coloured *Mycalesis simonsii*, Butl., one of two or three that were seen at one partially shady spot; a large "dry" *Terias brigitta*, Cram., ♀; a *Tryxalis* sp.; a fly, *Anthrax* sp.; and a beetle, *Zophosis angusticollis*, Deyr., found running rapidly over the ground at the "World's View," close to the grave of C. J. Rhodes.

The account of the expedition would not be complete without mention of the swarms of the Red Locust, *Schistocerca peregrina*, Oliv., which during the drive back to the train rose in glittering clouds on every side. It was, however, not without repeated efforts that a few specimens were netted out of the many thousands seen.

In the town of BULUWAYO, *Zophosis caffer*, Deyr., was taken running over the ground, while by turning over stones many things were obtained, including the curious hairy beetle, a Heteromeron, *Usagaria australis*, Pér., four specimens; *Psaryphis* sp., which is not represented in the British Museum; the Geodephagid, *Omostropus consanguineus*, Pér., three; the "Staph," *Myrmedonia procax*, Pér.; a weevil; and the small dingy bug, *Pododus depressus*, Walk.

About the filter-beds near the Railway Station the Lycænids *Zizera lysimon*, Hübn., one, and *Alocides taikosama*, Wallgr., two males, were taken.

The two beetles, *Meligethes* sp. and *Pseudocolaspis* sp.

(the last mentioned in the National Collection but unnamed), and the small dingy bug *Agonoscelis puberula*, Stål., were taken either at or near Buluwayo, or at the Matopos; the beetle *Pogonobasis* sp. (unnamed in the British Museum) was taken somewhere in South Rhodesia prior to our arrival at the Falls, but the locality cannot be now designated, for the notes concerning these insects are unfortunately defective.

THE RAILWAY JOURNEY FROM BULUWAYO TO THE VICTORIA FALLS.

September 11th, 1905.

RED BANK STATION (19 miles from Buluwayo).

We took alongside the train *Teracolus achine*, Cram., a male; *T. antigone*, Boisd., a male; and two fine specimens of *Papilio angolanus*, Goeze [= ? *corinneus*, Bert.], which had probably been disturbed from the drippings of the water-tank.

SAW-MILLS STATION, near Umguzi (57 miles from Buluwayo).

A male of *Belenois mesentina*, Cram., was netted, also a Noctua flying in the sun. The Red Locust, *Schistocerca peregrina*, Oliv., was abundant. By great exertions we succeeded in catching two.

GWAAI (89 miles from Buluwayo). Lat. 19° 7′ S. Altitude 3,240 feet.

Towards evening the train stopped in a stretch of flat, bare country beside a reedy pond to take in water. A fine specimen of *Charaxes saturnus*, Butl. (the only one we saw in our travels), was taken flying about a low tree. We also took the brilliant cardinal-red dragonfly, *Crocothemis erythræa*, Brullé.

Sweeping the rank vegetation by the pond yielded a multitude of small insects, amongst them a number of the singular fly *Diopsis affinis*, Adams, which carries its eyes and antennae upon long rigid stalks or horns projecting on either side of the head. The appearance of these little black and red flies forcibly suggests a "Watkin Range Finder" in miniature, the eyes being so far separated as to afford an appreciable base-line; if the insect were resting on the under-side of a stalk it would be able to see its enemies or prey above it without exposing itself. With the *Diopsis* were *Musca ? domestica*, Linn., *Sepedon* sp. and other small flies; two small Scoliads, *Myzine* sp., in too bad condition to name; and other insects, including the Phytophaga, *Haltica pyritosa*, Erich., *Hispa spinulosa*, Boh. [not *H. spinulosa*, Schönh.], *Chætocnema* sp., and a small moth, *Tinægeria* sp.

An unnamed Geometer, the cosmopolitan Tineid *Plutella cruciferarum*, Zell., and the Blatta *Cirphis* [*Paraplecta*] *pallipes*, Stål., all came to light in the train on the night of Sept. 11th between Gwaii and Wankie.

The Victoria Falls of the Zambesi.

Lat. 18° 0′ S. Altitude 3,000 feet. September 12–19.

This was our furthest point and the locality from which we expected most.

Apart altogether from the magnificence of the Falls themselves and the geological puzzles that they afford, the locality presents certain peculiarities to the botanist and entomologist.

Picture a rolling sandy plateau a little over 3,000 feet above sea level. Low distant hills bound the view, though the characteristic South African kopje is for once absent. Above the Falls the banks of the Zambesi are low and almost flat, the country on either side of the river resembling much of that passed through in the railway journey from Buluwayo. The forests of South Rhodesia are chiefly composed of deciduous trees of moderate size, for the most part tending to be flat-topped and so harmonising with the horizontal strata and giving the landscape a character of its own. The undergrowth of scrub is, as a rule, scanty and easily traversed, while the coarse grass and other herbage was so sparse as to leave much burning sand quite bare; though it must be borne in mind that our visit was towards the end of a very dry season. Doubtless during the rains much of this sand would be covered with vegetation and gay with flowers, but as it was we found loose dry sand extending to within a very few feet of the *Papyrus* growing at the water's edge. The banks above the Falls are fringed with a narrow belt of shady wood in which (especially on the right bank) the small date-palm, *Phœnix reclinata*, is the prevailing tree, and a shrubby *Ipomœa* was at the time of our visit the most striking flower. Here and there towered the monstrous Baobab tree, *Adansonia digitata*, with stem like an inverted carrot. The first leaves on the commoner forest trees spread an emerald tint suggestive of spring and affording a refreshing contrast to the parched herbage and scorching sand.

Opposite to the Falls is the "Rain Forest," poetically called by the Barotse "The place where the rain is born." This stretches along the cleft for three-quarters of a mile, not counting the similar growths on the "Knife-Edge." Between the Rain Forest proper and the edge of the chasm, where the spray is most drenching, is a strip of coarse boggy grass and herbage looking for all the world like a bit of Exmoor into which the bright blue flowers of *Lobelia crinus* have escaped from some parterre. The forest proper, from 50 to perhaps 300 yards wide, is of varied growth, in which large specimens of *Ficus* with their characteristic stems are a prominent feature; but towards the Falls it is bounded by a dense hedge of very bright green trees, *Eugenia cordata*, an evergreen of the myrtle tribe. The amount of spray, or "Rain," naturally varies with the height of the water and the force and direction of the wind. A sound that one soon learns to associate with the ceaseless roar of the cataract and the pattering of the spray-drops on the forest leaves is the musical cry of the "emerald-spotted dove" (*Chalcopelia afra*).*

We saw the Falls at a period of low water, but if this detracts from their grandeur, and above all from their characteristic mystery (by the shrinking of the spray columns), it enables one to see them better and so better comprehend their weird topography. But though the most absorbed collector cannot fail to be impressed by such unwonted surroundings, this is not the place to dwell upon the majesty of the Falls themselves, or the airy beauty of the brilliant rainbows that attend them by day or their more ghostly representatives in the moonlight.

Two pre-eminent impressions remain graven upon the memory—a vast river over a mile in width, dotted with

* For an excellent account of the botany of Southern Rhodesia, with a good description of the Matopo Hills and the country about the Falls, see a paper by Miss L. S. Gibbs, F.L.S., Journal Linnean Soc. 1906, pp. 425–494.

wooded islets, glides noiselessly through the burning sand, coming one knows not whence; and again the same mighty river, with scarce a warning rapid or even swirl upon its peaceful waters, suddenly draws a veil of spray over its face as with a mighty roar it flings itself down 350 feet into a chasm athwart its channel, and emerging thence, one can scarce see how, pursues its long mysterious course between grim basaltic crags through the incredible zigzags of the Batoka.

The hotel is situated close to the railway-station, in the open forest, about a mile from the Falls, and perhaps 100 feet above them, though geographically speaking below. The first insect to attract notice was a large *Acræa* flying about the tops of the trees, occasionally as many as a dozen together. After the exercise of some patience a fair series of specimens and a stiff neck were secured. These butterflies proved to be very beautiful, with pinkish fore-wings and white hind-wings; they were new to Mr. Marshall, but previously known to Mr. Trimen by two specimens only and then considered by him to be a variety of *A. anemosa*, Hew., to which Aurivillius gave the name of *alboradiata*. A long series amply proves this form to be a new species, which should consequently bear the name given to the supposed variety by Aurivillius. If, tired of gazing up at these beauties, the eyes were turned with relief to the ground, ants might be seen running swiftly over the sand with their abdomina borne high in the air. They were *Camponotus fulvopilosus*, De Geer, dull grey-black with pale brown hairy abdomen, very cryptic in their sandy home. The species was common about the hotel and on the way to the Falls. Also running swiftly over the sand a small beetle was taken, a *Zophosis* not in the National Collection. A flowering tree close to the hotel produced the widely spread *Apis mellifica*, Linn., race *adansonii*, Latr., as well as two other bees not yet determined.

The irrigated kitchen-garden of the proprietor attracted numerous insects, the most striking being *Acræa atolmis*, Westw., of which about a dozen, all males, were secured; it is a beautiful insect looking blood-red when alive; with them were taken three *A. atergatis*, Westw.; three male *A. anemosa*, Hew., one of them a dwarf, and two *A. alboradiata*, Auriv., ♂ and ♀. With the Acræas were two females of *Terias brigitta*, Cram., of the dry form, also one

Aphnæus erikssoni, Trim. In the same garden were taken the steely-blue-winged wasp, *Discolia ebenina*, Sauss., four males and a female; also another somewhat fly-like wasp, the handsome black and yellow *Bembex capicola*, Handl., a male—only the second specimen known to Col. C. T. Bingham, the type being at Vienna.

The electric lights of the hotel attracted a considerable number of insects, but they were for the most part small and insignificant in appearance :—

NOCTUINA.

Xanthoptera opella, Swinh. (3), a common Indian species.
Homoptera scandatula, Feld. (1), a Catocalid.
Homoptera ? n. sp. (1).
Arcyophora ? n. sp. (1). An Acontiad not in the British Museum.
Entelia polychorda, Hmpsn. (1), a variable Quadrifid.
Metachrostis (*Ozarba*) *snelleni*, Wallgr., a very small Quadrifid.

GEOMETRINA.

Comibæna leucospilata, Walk. (1). A pretty emerald.

PYRALINA.

Argyractis, sp. (2).
Stemmatophora chloralis, Hmpsn., n. sp. (5). A very distinct and pretty little insect, whitish-green with black central band. [Its description will shortly be published.]
Parthenodes scotalis, Hmpsn., n. sp. (5). A somewhat dingy Hydrocampid. See Ann. and Mag. Nat. Hist., 1906, p. 470.
Platytes, n. sp. (5). A beautiful Crambid which Sir George F. Hampson has kindly promised to describe.
Microthrix insulsella, Rag. (2). A dingy Phycid.
Etiella zinckenella, Treit. (1). An almost cosmopolitan Phycid.
Several other small moths not yet determined.

NEUROPTERA.

Halter ? *glaumrigi*, Koll. Three specimens of this very singular insect came to the lamps. Its very long, slender and spirally twisted hind-wings make it more like a flying machine than an insect.

? *Œstropis*, sp., and ? *Blymorphanismus* sp., two green Trichoptera, together with other caddis-flies more like European forms.

ORTHOPTERA.

A cricket.

HEMIPTERA.

Acanthaspis nugax, Stål., a Reduviid bug with a peculiar fetor.

COLEOPTERA.

Apate monacha, Fabr. (2 ♀).
Himatismus, sp. (3). Not in the British Museum.
Trochalus, sp. (1). In the National Collection, unnamed.
Xylopertha, sp. (1).

Two Longicorns, *Plocederus melancholicus*, Gahan, and *Tetradia lophoptera*, Guen. (= *fasciatocollis*, Thomps.), also came to light; the latter was captured by one of us on his bed, clinging closely to the sheet, and making a curious creaking noise when disturbed.*

Lastly a male *Acræa alboradiata* was taken fluttering on the floor below an electric light at 9.0 p.m. !

While one of us was busy with the electric lights a waiter excitedly called out that there was a "Tarantula" under the Stoep. He was most anxious that it should be secured, but declared that its bite was deadly. It proved very fleet of foot and doubled like a hare; other waiters joined in the chase, which turned out most exciting, especially when it ran over the neck of the ardent entomologist. When the fierce creature yielded at last to the soothing influence of cyanide it was seen to be of a pale reddish-brown, with pale grey abdomen, but armed with most formidable-looking red-brown mandibles, tipped with black. Black eyes added to its ferocious aspect. Ultimately a second specimen was bottled—together with one of another species.

Above the Falls the RIGHT BANK of the river (here the south-western) was the most readily accessible collecting ground, and perhaps for that reason received an undue

* "The voice no doubt proceeds from the mesonotum."—*G. J. Arrow, in litt.*

amount of attention. There our familiar friend *Limnas chrysippus*, a female somewhat small and dark, was busy with the flowers of *Combretum*. The genus *Acræa* was well represented : *A. alboradiata*, Auriv., though not so common as close to the hotel, was frequently seen, especially near the cascade at the western extremity of the Falls, locally known as the Leaping Waters; with this were several *A. anemosa*, Hew., all males, one very small; we also took three *A. encedon*, Linn.; a single specimen of *A. caldarena*, Hew., a male; *A. rahira*, Boisd.; an *A. atergatis*, Westw., stunted, and close to the Falls a female *A. atolmis*, Westw. In a way the most striking butterfly was *Hamanumida dædalus*, Fabr., for it was the first time that either of us had seen it alive. It was very common, flying close to the ground, and settling on the grey sand or dust with wings spread out flat, in which position it was curiously inconspicuous. *Precis clelia*, Cram., and *P. cebrene*, Trim., were both fairly common, but of *P. natalica*, Feld., and *P. archesia*, Cram., we took but one apiece, the former of the "dry" the latter of the moderately dark, or intermediate form. *P. sesamus*, Trim., was seen though not taken. *Neptis agatha*, Cram., graceful as always, was not uncommon; *Atella phalanta*, Dru., was there also, with its fearless sailing flight, returning again and again to the same spot. Two male *Byblia goetzius*, Herbst, were taken playing together, but *Charaxes varanes*, Cram., was more often seen than netted. The Satyrids were represented by the restless little *Yphthimas*; of these *Y. asterope*, Klug, was common enough in the half-shade, and with them were taken a couple of the var. *norma*, Westw., also two *Y. itonia*, Hew.

The "common white" of the Zambesi appeared to be *Belenois gidica*, Godt., and very dry they were; the dry form of *B. severina*, Cram., was also quite common. Of the *Teracoli* we took five species, by far the commonest being *T. omphale*, Godt., the males predominating; of *T. achine*, Cram., we took four males, of *T. antigone*, Boisd., one. Near the Leaping Waters we got a single female specimen of *T. phlegyas*, Boisd., and two *T. eris*, Klug, both males. Many of the genus fly quickly, but the flight of *T. eris* is specially rapid and erratic, so that in all probability more were seen than taken. *Terias brigitta*, Cram., both sexes, was fairly common, it was especially attracted by a small low-growing, lavender-flowered labiate, four or five flying together over a patch of it. This butterfly has a jerky flight, so that it proved to be not so very easy to catch as one at first imagined. Of *T. senegalensis*, Boisd., two males were taken. The *Terias* were by no means so markedly "dry" as the *Teracoli*. A single *Papilio corinneus*, Bert. [? *angolanus*, Goeze], was secured.

The *Lycænidæ* were not very prevalent, and no species was abundant. Of the handsome *Stugeta bowkeri*, Trim., and of *Axiocerces amanga*, Westw., we took single examples, but *A. harpax*, Fabr., was commoner, especially among reeds and sedges at the water's edge. Of *Hypolycæna cocculus*, Hopff., *Zizera lysimon*, Hübn., and *Liptena* [= *Durbania*] *pallida*, Trim., we took but one each, the latter at flowers of *Ipomæa*.

The Skippers were represented by solitary male individuals of *Gegenes occulta*, Trim., and *Parnara mathias*, Fabr. (= *mahopaani*, Trim., = *inconspicua*, Boisd.).

In addition to the butterflies already named the following may be mentioned as being taken while drinking at the mud of small inlets and backwaters of the right bank of the river :—

Both sexes of *Acræa alboradiata*, Auriv., and *A. atolmis*, Westw., of which latter the bright coppery-red looks on the wing almost blood-red. *Belenois gidica*, Godt., and *Belenois mesentina*, Cram., both males. Of *Terias brigitta*, Cram., contrary to the usual rule with Pierines at water, a female was taken, but this species, though certainly attracted by water, is of a restless habit like *Ypthima*, and seldom settles. Of *Papilio leonidas*, Fabr., three specimens were taken at mud and others seen; lastly a specimen of *Axiocerces amanga*, Westw.

So much for the butterflies found on the right bank. The moths were far less numerous, and the only things brought home were a Geometer, *Gracillodes caffra*, Guen.; a *Crambus* sp. and another a small, and as yet unnamed Pyrale, *Argyractis* sp.

As might have been expected Dragonflies were fairly numerous, especially a species with a full "cardinal-red" body, *Crocothemis erythræa*, Brullé, which has a very wide range in Africa. Some of these were taken at mud puddles in the back-waters, others about the rocks which extend far into the river above the Falls, rocks on which one often saw the Snake-bird, *Plotus levaillanti*, sitting absolutely still and giving an appropriate finish to the peaceful landscape. Another large and handsome species, *Pseudomacromia torrida*, Kirby, with a pair of sapphire-like spots behind the eyes, was common, as was also the smaller *Pseudagrion deckeni*, Gerst. Besides these were other Dragonflies not yet named.

A *Myrmeleon* sp. was noted as being the colour of dried grass. Some "white ants" were taken, but, so far as our observations went, Termites are not as common at the Falls as in other parts of South Africa that we visited.

Very little attention was paid to *Diptera*, partly perhaps because, fortunately, they did not pay the usual amount of attention to us; only two were brought home, *Sarcophaga* sp. and *Hæmatopota* sp., the latter taken on the "topi" of the captor.

Of the Aculeates the most striking were the Carpenter-bees, of which the commonest was *Xylocopa divisa*, Klug, found at *Combretum*, or other flowers, though one, a male, was noted as hovering persistently about a tree overhanging the river. The male of this bee is of a beautiful "old-gold" colour; of this sex only two were taken, but females, of the variety with the band on the back of the thorax white in place of "old-gold," were commoner, and four or five specimens were secured. Of *X. caffra*, Linn., we took two specimens, both females of the variety *mossambica*, Grib., with a white ring in place of the usual two yellow rings. Of *X. olivacea*, Fabr., we got but a single female. We met with three species of the very slender-waisted wasps of the genus *Ammophila*, viz.:—*A. ludovica*, Smith, a female, and *A. beniniensis*, Pal. de Beau., a male, both at wet mud, while a female of *A. ferrugineipes*, Lepel., was taken at flowers. Of the large and handsome black and yellow *Sceliphron spirifex*, Linn., we only secured a single female, also at flowers. Of the long-waisted grey wasp *Belonogaster guerini*, Sauss., var. *dubius*, Kohl, a single worker was taken at mud. We also took single examples of *Salius* [= *Hemipepsis*] *vindex*, Smith, a male; the Scoliad *Myzine capitata*, Smith, a male, and the small red wasp *Odynerus carinulatus*, Sauss., a female, the last-named at wet mud. The integuments of two males of *Rhynchium rupeus*, Sauss., proved of a truly rocky hardness. Running over damp mud three specimens of a notable ant were taken, *Paltothyreus tarsatus*, Fabr., notable for its powerful bite, but still more for its evil odour, which is *very* strong and pungent, suggesting a mixture of formic acid and bisulphide of carbon.* Running along the branches of the tree-*Ipomæa*, near the Leaping Waters, were a number of another ant, *Polyrachis schistacea*, Gerst., which we had seen at the Matopos on *Sclerocarya caffra*.

The *Coleoptera* met with were not very numerous, but comprised *Pogonobasis* sp. (in the National Collection, but without a name), which was taken on the ground by Miss L. S. Gibbs; two specimens of *Scymnus* sp.; three weevils, *Bagous cænosus*, Gyll., which Mr. G. A. K. Marshall had previously seen from Uitenhage, Cape Colony, only; *Rhabdinocerus brachystegiæ*, Mrshl. (*in litt.*) and *Xenorrhinus incultus*, Fst., the first specimen of the latter that Mr. Marshall had seen; also a Eumolpid, *Pseudocolaspis chrysitis*, Gerst.; and two *Heteromera* of the genus *Opatrum*, under dead wood. Two specimens of *Adesmia intricata*, Klug, a Heteromeron only represented in the National Collection by specimens from Mozambique, were found crawling on the ground near the Leaping Waters.

The "Red Locust," *Schistocerca peregrina*, Oliv., was by far the most common and most conspicuous of the *Orthoptera*; as usual it was chiefly found among coarse grass, but could not be said to be gregarious.

In shallows in the river just above the Falls, a small banded water-snail, *Cleopatra morrelli*, Preston (described as n. sp. in April 1905), was to be found, together with a spotted species with sinuated lip, *Melania victoriæ*, Dohrn.

The LEFT BANK of the river differs somewhat from the right. The ground does not lie quite so low in reference to the water, there is more wood and scrub but less grass and fewer palms. A female *Limnas chrysippus*, Linn., was seen at water; of the *Acrææ* the commonest was *A. encedon*, Linn., males predominating, while single female specimens of *A. atolmis*, Westw., and *A. anemosa*, Hew., turned up. *Precis clelia*, Cram., was fairly common, and *P. sesamus*, Trim., was seen, as is its wont, fluttering about and settling under the shade of a dark bank.

The Whites were represented among our captures by two male *Belenois gidica*, Godt. *Teracoli* were far less common than on the right bank, probably because there was less of the open grassy country in which they delight; single specimens only of *T. omphale*, Godt., a male, and *T. eris*, Klug, a female, the latter at *Combretum* flowers,

* For Dr. S. Schönland's observations on the odour of this insect in Bechuanaland, see Proc. Ent. Soc. Lond. 1904, p. xl.

were secured. *Terias* was represented by a female *senegalensis*, Boisd., of the usual dry form, but also by a male *brigitta*, Cram., of distinctly *wet* character—a notable exception among so many very markedly dry butterflies.* A male and two females of *Catopsilia florella*, Fabr., were secured while feeding on the large-flowered species of *Combretum* that grows in the Zambesi scrub; this butterfly was almost certainly seen more than once on the right bank, but eluded capture, for *Catopsilia* is very swift of flight and hard to net save when busy honey-gathering. *Papilio demodocus*, Esp., was taken on the "Knife Edge" near the eastern extremity of the Falls.

Axiocerces amanga, Westw., at *Combretum* flowers, *Zizera lysimon*, Fabr., and *Liptena* [*Durbania*] *pallida*, Trim., were the only Lycænids brought home, the last taken near the top of the Palm Kloof. Between the last-named place and the railway bridge large Libellulid dragonflies were especially common, and comparatively easy to catch as they hovered over the path head to wind, like hawks. The commonest would appear to be *Pseudomacromia torrida*, Kirby; but there was also a species of *Macromia* as well as the slender *Pseudagrion ? deckeni*, Gerst.

Speaking of the railway bridge, perhaps one may be allowed to congratulate the engineer who designed it (Mr. G. A. Hobson, of the firm of Sir Douglas Fox and Partners) on a structure which seems as well fitted to its position alike in form and colour as such a thing can be; one shudders to think what *might* have been placed there by less sympathetic hands.

The only *Hymenoptera* taken on the left bank were two small bees, one at *Ipomæa*, the other *Podalirius rapidus*, Smith, ♀, hovering at *Combretum* flowers, also the coral-red Braconid *Iphiaulax whitei*, Cameron, and a long-waisted wasp, *Belonogaster guerini*, Sauss., var. *dubius*, Kohl, ☿.

Beetles were few and far between: a *Mylabris* sp. (or ? *Ceroctis* sp.), found (here, as well as on the other bank) in the flowers of *Ipomæa*, appears to mimic the Longicorn *Hylomela sexpunctata*, Fabr., a beetle that we met with only at East London. In the same flowers was another beetle, a long narrow purple fellow, not yet named.

A fly that attracted the attention of one of us by

* See Dixey, Proc. Ent. Soc. Lond. 1905, pp. lxi–lxii, and *ibid.* pp. lxvi–lxvii. Compare Longstaff on *T. hecabe*, L., Trans. Ent. Soc. Lond. 1905, p. 144.

biting his hand, *Hæmatopota* sp., was the only Dipteron taken.

If the left bank yielded us but a small bag it was some considerable consolation, at all events to the fortunate observer, to have the opportunity of contemplating from a distance of not more than 100 yards a family of Hippopotami disporting themselves in the water.

By the kindness of the Chartered Company's Forester, Mr. C. E. F. Allen, one of us was enabled to land on two of the wooded islands some miles above the Falls. Entomologically the results were disappointing, but here again Hippopotami came to the rescue, for the thicket on one of the islands was traversed in all directions by their paths, while in an open space lay the fairly recent bones of one of the uncouth monsters. The ubiquitous *Limnas chrysippus* was represented by a male fly, but no *Acræa* was taken, and the only Nymphalines were *Precis natalica*, Feld., with ocellated under-side, and a *Neptis* which eluded capture.

The common white of these islands was *Belenois severina*, Cram., of which five "dry" males were taken; but *B. gidica*, Godt., was nearly as common, and two of each sex were brought home. All the *gidica* from the Zambesi were of extreme dry type, drier than its congener. No *Terias* were taken and but three *Teracoli*, all males, two of *T. antigone*, Boisd., one of *evenina*, Wallgrn. Of *Eronia leda*, Dbl., a female of dry type was taken. The only Satyrids were four *Yphthima asterope*, Klug, var. *norma*, Westw. The Lycænids were even scarcer, as a solitary *Zizera lysimon*, Hübn., was the only Blue.

A Geometer, an "Emerald" with red chequered fringes, *Comibæna leucospilata*, Walk., was the only moth taken, while as unfortunately "other orders" would appear to have been even more than ordinarily neglected, the captures were limited to a single individual of the evil-smelling ant, *Paltothyreus tarsatus*, Fabr., and a pretty black and white two-winged fly, *Tabanus* sp.

Mr. Allen was good enough to give us four insects taken in a druggist's shop at Livingstone, five miles above the Falls: they were two flies, one of them a large, fierce-looking fellow, *Tabanus* sp., a red-bodied wasp *Odynerus carinatulus*, Sauss., ♀, and a Malacoderm beetle, *Melyris nobilis*, Gerst.

The easiest way down to the river at its lower level, below the Falls, is by the gorge known as the PALM KLOOF, which is separated by the "Knife Edge" from the eastern portion of the chasm. The path leads rapidly down into a wood of singularly tropical aspect, bounded on either hand by walls of basalt, and thence to the water's edge. The collecting ground is very restricted and difficult, being almost co-extensive with the steep path, so that the ratio of things taken to things seen was a low one.

The butterfly that was most characteristic of the Kloof was *Neptis marpessa*, Hopff.; it was distinctly common, and we took it nowhere else. It has the graceful sailing, *sibylla*-like flight of the genus, but is smaller than the more generally distributed *agatha*, Cram. Several males of *Leuceronia thalassina*, Boisd., were seen, all out of reach. They flew rather high, among the tops of the trees, and seemed to avoid the path. *Belenois gidica*, Godt., *B. severina*, Cram., and the wide-spread *B. mesentina*, Cram., were all met with in the Kloof; the latter, a male, flew fast. The path through the dark wood looked the very place for Satyrids, but only three were met with, two *Yphthima asterope*, Klug, one typical, the other of the var. *norma*, Westw., and a shade-loving *Mycalesis*, of which Mr. Trimen says: "near *campina*, Auriv., also like *anynana*, Butl., but the under-side very red." Our old friend *Papilio demodocus*, Esp., put in an appearance. A small, worn Lycænid, probably *Cacyreus lingens*, Cram., a male; a tailed blue, ? *Deudoryx* sp., ♀, which may possibly be new, and a male *Tarucus telicanus*, Lang, represented that group. Three large Geometers, two of them *Conolophia conscitaria*, Walk., the third a "Thorn" not yet determined, were disturbed from the herbage.

The Phytophagous beetle *Monolepta vincta*, Gerst., was abundant by a spring near the bottom of the Kloof, flying in the sun, but might also be taken by sweeping shrubs.

Of all the collecting grounds at the Victoria Falls, one naturally anticipated most from the Rain Forest; it was accordingly the first, as it was the last place that we visited. One caution is necessary *in limine:* the area of the forest is so small, and the driest of sandy areas are so near, that it cannot reasonably be expected to yield valuable evidence as to seasonal forms, for a butterfly captured within its ambit may well have gone through all its early stages outside and have merely entered the spray-bedewed area to quench its thirst. Human experience points in this direction; for it is difficult to imagine anything more refreshing than after some hours' collecting in the drouth to allow oneself to get wet through by the spray, which was truly grateful and comforting (especially in a thirsty land where beer is two shillings a small bottle). Repeated carefully-timed experiments showed that ten minutes in the hot sun and dry wind sufficed to dry one's garments thoroughly. The chief drawback to these natural "Rain baths" was the difficulty of manœuvring a sopping net, and the condition of some of the "very dry" *B. gidica*, when taken out of the net under such circumstances was deplorable.

One butterfly did not appear to appreciate the delicious smell of the damp vegetation, at all events our old friend *Limnas chrysippus* failed to put in an appearance. The *Acræa* too were surprisingly scarce, only single examples of *A. alboradiata*, Auriv., ♀, *A. anemosa*, Hew., ♂, and *A. atolmis*, Westw., ♀, were taken. Only one *Precis* is recorded, a ragged *natalica*, Feld., but *Neptis agatha*, Cram., was frequently seen sailing about the *Eugenia* trees. *Yphthima itonia*, Hew., was common enough, a specimen of *Y. asterope*, Klug, var. *norma*, Westw., was also taken. Another specimen was obtained of the *Mycalesis* (as yet unnamed), taken in the Palm Kloof, also one *M. safitza*, Hew. *Belenois severina*, Cram., was the commonest white; all taken were males; but extremely dry specimens of *B. gidica*, Godt. (males predominating), were fairly common, especially where the spray was heaviest. Three females of *Leuceronia thalassina*, Boisd., were taken, also a female *Glutophrissa saba*, Fabr., which was so extremely "dry" as to have lost all trace of mimicry of *Nyctemera*. Of *Terias senegalensis*, Boisd., ♀, *T. brigitta*, Cram., ♂, and *Teracolus antigone*, Boisd., ♀, single examples were secured. That only one *Teracolus* was taken is not surprising, since the genus especially haunts very dry and open places.

Papilio leonidas, Fabr., flew slowly about the *Eugenia*, with the manner of a Danaid, but the model, if such there be, was not seen; * two specimens were secured.

Zizera lysimon, Hübn., met with occasionally in all the Zambesi hunting grounds, was really common in the Rain Forest only, probably the other places were too dry for it. Of other Lycænids single examples only were taken, to

* In North-East Rhodesia, on the Chambezi, some 700 miles away, it flies with and appears to mimic *Tirumala petiverana*, Dbl. and Hew. See also Trimen, "South-African Butterflies," vol. III, 1889, p. 213.—F. A. D.

wit, *Tarucus telicanus*, Lang, ♂; *Everes cissus*, Godt., and *Catochrysops malathana*, Boisd. (= *asopus*, Hopff.), the last-named sitting head downwards.

Somewhat unexpectedly we found Skippers commoner within the range of the spray than outside, the following presenting themselves: *Parnara mathias*, Fabr., a male and two females; *Gegenes zetterstedti*, Wallgr. (= *hottentota*, Latr.), three; *Parosmodes morantii*, Trim., one, a species represented in the National Collection by a single specimen from Mashonaland presented by Mr. G. A. K. Marshall; and one *Baoris fatuellus*, Hopff.

It is curious that two Humming-bird Moths of different species were taken close together, and within a minute or two, *Macroglossa trochilus*, Hübn., and *Aellopus commassiæ*, Walk. It is also curious that no smaller moths were brought from the Rain Forest. On the other hand *Diptera* were numerous; of these the most striking were two species of the strange stalk-eyed genus *Diopsis*; one, near to *dubia*, Bigot, was to be got in abundance by sweeping in the drier parts of the Forest, the other Mr. G. H. Verrall thinks may be *ichneumonea*, Linnæus' long-lost type of the genus. Of another fly, distinguished by its apple-green abdomen, *Odontomyia* sp., several were obtained by sweeping in moister places. The same method produced other flies, among them a specimen which Mr. Verrall thinks may be a local race of *Syrphus balteatus*, Deg., and four *Sepedon* sp.

A species of *Plecia*, with a reddish thorax, was flying lazily about the *Eugenia* trees in large numbers, with its legs trailing behind just as *Bibio marci*, Linn., does in English woods in April. Then there was a pretty black-and-white *Tabanus* sp.; a pair *in cop.* of another *Plecia*; two specimens, a ♂ and a ♀, of an Asilid that is perhaps *Promachus rüppelli*, Liv., but may be new, unfortunately taken without prey; a Syrphid, *Helophilus* sp., near to but not identical with *africanus*, Verrall; lastly, something extremely like *Musca domestica*, Linn., was taken!

As might have been expected Dragon-flies were fairly numerous, prominent amongst them the large and handsome *Pseudomacromia torrida*, Kirby, flying in the open swampy space between the belt of *Eugenia* trees and the edge of the chasm; other species were *Phyllomacromia trifasciata*, Ramb., and (by sweeping) the Agrionid, *Brachybasis rhomboidalis*, Beauv., which appears to have a wide distribution in Africa.

Two wasps were taken, *Eumenes tinctor*, Christ, and *Ammophila beniniensis*, Pal. de Beau., both females, while sweeping produced an Ichneumon. Ants were represented by a solitary *Camponotus* sp., of which Col. C. T. Bingham writes, "New, but as a single specimen I cannot venture to describe it: allied to *C. sericeus*, Fabr."

The *Orthoptera* if not numerous were variously represented by a *Mantis* larva obtained by sweeping; four *Blattæ* of the genus *Ischnoptera* n. sp. (near to *bimaculata*, Gerst.), found under stones and running very rapidly away when disturbed; sweeping yielded also many grasshoppers, one of which had head and thorax conspicuously marked by two lateral yellow stripes. The locust *Prototettix impressus*, Stål., was taken on a tree.

Two very active little bugs were found under stones or leaves when looking for beetles, another was adorned with a red abdomen. Sweeping as usual yielded sundry Homoptera. The same operation produced a few beetles: a *Lagria* sp., in the collection at South Kensington, but unnamed, of which five specimens were obtained; a single *Cryptocephalus callias*, Suff.; two of the Phytophagid *Lesna chalcoptera*, Lac.; six *Haltica indigacea*, Illig.; two *Hispa* sp., also one *H. bellicosa*, Guér., of which the National Collection has specimens from the Gold Coast only. Lastly three Staphs, *Osorius rugiceps*, Boh., were found under dead wood.

In such a spot it was but seemly to find an Amphibian, accordingly we may note that a toad-like frog was abundant among the marshy spray-drenched grass between the Rain Forest and the Chasm. Many of these were extremely small, hardly larger than blue-bottles. A large specimen evacuated a mass of elytra, etc., of *small* beetles, apparently mostly geodephagous but some perhaps phytophagous; this was interesting, in so far as it bore out our experience that the Coleoptera of the Forest were very small.

Three species of land-snails were found in the Rain Forest; two turreted forms, *Opeas octona*, Chem., under stones, and the transparent *O. mamillata*, Craven, in like situations, both gregarious. Sweeping grass yielded the delicate, transparent, horny *Succinea ? badia*, Mor., very near to the British *S. putris*, Linn.

A Barotse boy, a servant of Mr. Allen's, collected for us a number of *Paludina capillata*, Frauenfeld, but exactly where he found them is not on record.

INSECTS TAKEN ON THE RAILWAY JOURNEY FROM THE VICTORIA FALLS TO EAST LONDON.

September 20th, 1905.

MATETSI STATION. 230 m. from Bulawayo.

Precis cebrene, Trim., seen.
Lycæna (*Castalius*) *hintza*, Trim., ♂, one.
Pseudagrion ? deckeni, Gerst. A small dragonfly, the colour of dead grass.

KATUNA STATION.

Precis cebrene, Trim., one, ♀.

NORTH OF DEKA STATION.

Glyphodes negatalis, Walk., a Pyrale of very wide distribution (of the sub-genus *Dysallacta*, Led.), taken in the train by Mr. D. Gunn.

DEKA STATION.

Limnas chrysippus, Linn., ♀.
Lycæna osiris, Hopff., ♂, at water.
Lycæna asopus, Hopff., ♂, do.
Eumenes lepeletieri, Sauss., ♀, at water, a yellow wasp with a black cross on the abdomen.

WANKIE STATION. 212 m. from Bulawayo. 2,450 feet.

Teracolus antigone, Boisd., ♂.

LUKOSI STATION. 196 m. from Bulawayo.

Anisodactylus nitens, Pér., Carabid beetle, under a stone.

INYANTUE STATION. 177 m. from Bulawayo.

Sphingomorpha chlorea, Cram., a Noctua that truly deserves its generic name, caught at light in the train by Mr. D. Gunn.

S. OF INYANTUE.

A Dipteron, *Argyramœba* sp., in the British Museum unnamed.

MALINDI STATION. 147 m. from Bulawayo.

An Ant-lion, *Myrmeleon* sp., at light in the train.

September 21st, 1905.

BULAWAYO. Lat. 20° 9′ S. Alt. 4,470 feet. Near the railway station.

Acræa doubledayi, Guér.; also the widely distributed Lady-bird *Exochomus nigromaculatus*, Goeze, a bug, and some unnamed *Orthoptera*, all taken by sweeping.

PLUMTREE STATION. S. RHODESIA. 4,560 feet. 65 m. S. of Bulawayo.

Acræa doubledayi, Guér., ♀, fluttering close to the ground.

Axiocerces harpax, Fabr., on the flowers of a yellow composite.

September 22nd, 1905.

TSESSEBE STATION. 94 m. S. of Bulawayo. 3,900 feet.

The ant *Camponotus fulvopilosus*, De Geer, running on the ground.

SHOSHONG ROAD STATION. Near the tropic. 3,250 feet.

A number of the ant *Camponotus maculatus*, Fabr., under the bark of a log.

ARTESIA STATION. BECHUANALAND. Lat. circa 24° S. 3,100 feet.

Teracolus antigone, Boisd., ♂.
Zeritis simplex, Trim., ♂.
Spindasis ella, Hew.
Stugeta bowkeri, Trim.
Syrichthus [*Pyrgus*] *sataspes*, Trim.
Gomalia albofasciata, Moore, a dwarf.

The two Skippers were taken at water, as well as the wasp *Eumenes lepeletieri*, Sauss., ♀, and the common bee *Apis mellifica*, of the usual S. African form.

MOCHUDI STATION. BECHUANALAND. Lat. 24° 22′ S. 3,100 feet.

Acræa anemosa, Hew., ♀, drinking at the drip of a tap.
Zeritis molomo, Trim., ♀.
Hesperia spio, Linn., at the flowers of a small yellow *Hibiscus*.

Crocodile Pools Station. About Lat. 24° 40′ S. 3,300 feet.

A beetle, *Zophosis* sp., not in the British Museum Collection, was taken running rapidly over the sand, which when alive it exactly matched in colour.*

Ootsi Station. Lat. 25° 0′ S. 3,620 feet.

Axiocerces harpax, Fabr., a female taken and another seen at a shrub with flowers forming yellow tails. A bug and a small Lady-bird, *Scymnus* sp., taken at *Combretum* flowers.

Pitsani Station. Lat. 25° 26′ S. 4,420 feet.

Semiothisa brongusaria, Walk., a boarmid, at light in the train.

The two beetles *Lyctus* sp. and *Bostrychus brunneus*, Murray, a Malacoderm, were taken this day somewhere in British Bechuanaland, but the exact locality was not recorded.

Mafeking. Lat. 25° 56′ S. 4,190 feet.

Sterrha sacraria, Linn. (1), *Crambus tenuistriga*, Hmpsn. (1), and two other moths, taken at lamps in the town. The S. African specimens of the first-named are much less beautiful than the European, as they lack the crimson.

Warrenton Station. 28° 11′ S. 3,930 feet.

Sept. 23, 1905. *Hesperia* (*Syrichthus*) *spio*, Linn. [= *vindex*, Cram.], one at water.

Pokwani. 28° 43′ S. 3,650 feet.

The ubiquitous *Utetheisa* (*Deiopeia*) *pulchella*, Linn.

Sept. 23, 1905. Orange River Station, Cape Colony, lat. 29° 38′, S.; alt. 3,540 feet, an ichneumon, and at Kranskuil, lat. 29° 51′ S.; alt. 3,700 feet, a number of Phycids were taken at the train lights.

* Many black beetles cover themselves with fine particles of the sand on which they live, and so easily escape observation. This I frequently noted in 1905 among the many *Heteromera* that are found on the outskirts of the Sahara at Biskra. Whether the fine particles merely fill in the interstices of the sculpture, or are attached by a secretion, I was not able to determine, but in any case they were easily rubbed off in the killing-bottle, or when handled.—G. B. L.

Sept. 24, 1905. SHANKS STATION (E. of Steynsburg Junction), c. 5,000 feet; a cricket was found under a stone, and in like situations six beetles, *Trigonopus*, sp., not in the National Collection; the Carabids, *Harpalus xanthographus*, Wied., and *H. sub-aëneus*, Dej.; and the Chrysomelid, *Polysticta 24-signata*, Thunb., three specimens; as well as a number of the pungent ant, *Acantholepis vestita*, Smith.

HANNINGTON STATION., alt. 5,170 feet; the same *Trigonopus*, another *Polysticta 24-signata*, Thunb., and *Harpalus fusco-aëneus*, Dej., were found under stones.

CONTAL STATION, a few miles East of Hannington, alt. c. 5,200 feet; under an old sleeper, three beetles were taken: the same *Trigonopus* that had been met with earlier in the day, *Harpalus rufo-cinctus*, Chaud., and a Carabid near to *Percus*, not in the British Museum.

STORMBERG JUNCTION, lat. 31° 28′ S.; alt. 5,300 feet; a few hundred yards from the station we saw swarms of a purplish-grey locust with yellowish-drab wings and yellow hind tibiæ, *Acridium pardalinum*, Walk. We had seen several flights shortly before reaching the station, but now we got amongst them. They did not fly very far, and the swarms were many rather than excessively large. The wings of those captured were much frayed, presumably by long flight and knocking against obstacles, but it is quite possible that individuals with damaged wings were more easily caught than the sounder specimens.

Turning over stones was fairly productive, as it yielded *Harpalus rufo-cinctus*, Chaud. (= *rufo-marginatus*, Boh.), seven; *H. natalensis*, Boh., four; *H. clavipes*, Boh., two; *H. sub-aëneus*, Dej., two; *H. fusco-aëneus*, Dej., three; the red and black *Hister cruentus*, Erichs., four under one stone; two other Carabids not yet named; *Polyhirma gracilis*, Dej., one; the two weevils, *Rhytirrhinus lituratus*, Fåhr., and *Stramia* ? *fåhræi*, Fst., one each, as well as an immature female of *Blatta orientalis*, Linn., and two very large ants, *Acantholepis vestita*, Smith. A specimen of *Pyrameis cardui*, Linn., was taken on the hill-side, but the day was scarcely fitted for butterflies.

LOWER INCLINE STATION, c. 4,500 feet; five or six specimens of *Polysticta 24-signata*, Thunb., were found close together under a stone.

QUEENSTOWN, Cape Colony, lat. 31° 50′ S.; alt. 3,500 feet. In the Public Gardens just before dark a large

? *Plusia*, or small ? *Sphinx* was seen at Verbena flowers, but missed. Shortly after leaving the station two of the widely distributed Crambid, *Eromene ocellea*, Haw., flew to the lights of the train.

East London. Lat. 33° S. Sea level.

SECOND VISIT. Sept. 25–29.

Six weeks had elapsed since our first flying visit to this place. After an unusual drought it had rained the day before our arrival, and it was blowing a violent gale when early in the morning we came to the end of our long railway journey of six days and six nights. The gale terminated with heavy rain that greatly damaged the condition of the butterflies. One victim of the flood, a female Saturnid, *Arina forda*, Westw., was rescued from drowning.

A good deal of our time was spent on our old ground in the Queen's Park. The Poinsettia flowers were over: energetic sanitary reformers had nearly completed the covering in of the unsavoury stream, but the operations of the Kaffir workmen had wrought sad havoc in some of the best collecting ground.

Mylothris agathina, Cram., did not appear to be nearly so common as before, but perhaps this was owing to the absence of Poinsettia flowers to assemble them. There was however no doubt that the closely allied *M. rüppellii*, Koch., was common enough. The males of both these allied species have a strong and seemingly identical sweet-briar-like scent. The very local and singularly elegant *M. trimenia* was quite common, both sexes being well represented.

Belenois severina, Cram., and *B. zochalia*, Boisd., were both very common; of the latter the females seemed to be more numerous than the males, perhaps because more distinctly coloured.

The beautiful *Eronia cleodora*, Hubn., was quite common. A few *Pinacopteryx charina*, Boisd., were taken, all "dry"; a male *Byblia goetzius*, Herbst, significantly a very fresh specimen, was distinctly of the wet form, but, with this possible exception, there was no evidence that the recent rains had produced any change of type, probably there had not been sufficient time. The only *Teracoli* noticed in the park were a male *achine*, Cram., and several *omphale*, Godt., of both sexes. These *Teracoli*, with one exception that was intermediate, were decidedly "dry," but not so extremely so as our Rhodesian specimens. *Colias electra*, Linn., was seen but not taken.

Of *Papilio nireus*, Linn., form *lyæus*, Dbl., we secured two males, but we met with both sexes of *P. demodocus*, Esp. Of *P. dardanus*, Brown, perhaps the commonest of the three Papilios, two males and one female were taken, the latter of the form *cenea*, which mimics *Amauris echeria*, Stoll. Of the last-named species four specimens were taken, also three of the closely allied *A. albimaculata*, Butl. Both forms are very hard to kill. *Limnas chrysippus*, Linn., was fairly common.

Lycænids were not so numerous as might have been expected in the Park, either as regards species or individuals. Of *Zizera lysimon*, Hübn., and *Cacyreus palemon*, Cram., single specimens were taken; females of *Argiolaus silas*, Westw., were fairly common, they flew high and settled on the tops of trees, but also visited flowers. A few of the widely ranging *Tarucus telicanus*, Lang, were to be seen, two of them whilst at rest were observed to move the hind-wings alternately backwards and forwards in their own plane.

On the occasion of our former visit we saw no Satyrids, but this time two specimens of *Pseudonympha cassius*, Godt., turned up, as well as two females and a male of *Mycalesis safitza*, Hew.

With the exception of *Charaxes varanes*, Cram., which was fairly common, though worn, the Nymphalines were not very prominent. *Eurytela hiarbas*, Dru., was less plentiful and in less good condition than on our first visit; of *Byblia goetzius*, Herbst, only a single male was seen, while a *Precis archesia*, Cram., was taken settled on the ground. Several fine *Pyrameis cardui*, Linn., were observed.

Among the flowers introduced into the garden portion of the Park, and tending to run wild, was the "Pride of Madeira," *Echium fastuosum*, a remarkable plant of the natural order *Boraginaceæ*, whose small white or blue flowers form solid spikes, often six feet high or more, the apparently simple spikes being made up of innumerable densely packed scorpioidal cymes. This proved very attractive to insects of all orders; among the numerous butterflies that fed upon the flowers was a single example of the pretty Vanessid, *Hypanartia hippomene*, Hübn. The following insects were also taken on the spikes:—*Apis mellifica*, Linn., race *adansonii*, Latr., as was only to be expected; a Longicorn *Syssita vestigialis*, Pascoe; the Cetoniids *Oxythyrea marginalis*, Schönh., *Comythovalgus fasciculatus*, Schönh., and *Strengophorus flavipennis*, G. and P.; the first was abundant, the creamy white spots on a dark ground-colour greatly aiding its concealment.* In addition there were on the same flowers a fly of the genus *Catabronta*, three of the genus *Idia*, and another fly, the latter held in the clutches of a green spider with red-brown markings, which was practically invisible among the crowded flowers; the very small bee *Prosopis sandaracata*, Bingh., was abundant, as was also the prettily marked *P. 5-lineata*, Cameron; but of *Prosopis simplex*, Bingh., n. sp., unfortunately only a unique example was secured; finally there was a sawfly, *Athalia himantopus*, Klug, ♀.

Two specimens of *Gegenes zetterstedti*, Wallgr., were the only Hesperids noted; this species settles with the fore-wings raised, the hind-wings nearly horizontal, like several of our English Skippers.

The following moths were taken, but doubtless the list might easily have been lengthened especially if we had worked at night:—*Macroglossa trochilus*, Hübn., at flowers in the late afternoon; *Syntomis kuhlweini*, Lefebr.; the day-flying Lymantriads *Laelia punctulata*, Butl., and *Aroa discalis*, Walk., males of the latter species were very common on the outskirts of the Park; the Geometers *Zerenopsis leopardina*, Feld., fluttering near the ground; *Craspedia internata*, Guen. (= *strigulifera*, Walk.), and the variable *Semiothisa brongusaria*, Walk.; we also kicked up a Pyrale, *Pyrausta incoloralis*, Guen., and two specimens of the Boarmid *Obocola inconclusaria*, Walk., one of each sex.

As usual the most obvious representatives of the *Hymenoptera* were the handsome Carpenter-bees, *Xylocopa caffra*, Linn., ♀; *X. fraterna*, Vachal, a male said by Col. Bingham to be not typical; *X. divisa*, Klug, ♀; and *X. flavo-rufa*, De Geer, four females; the last two species were practically confined to the purple flowers of a Leguminaceous shrub; *flavo-rufa* has a strong odour like our English Bumble-bees. Other Aculeates taken were the long-

* See Longstaff, Trans. Ent. Soc. Lond. 1906, pp. 91–93.

pedunculated wasps *Belonogaster praunsi*, Kohl (said by Col. C. T. Bingham to be not typical); the slender dark-blue-winged *Eumenes tinctor*, Christ, of both sexes, one male specimen, very starved, of Saussure's variety; the dull grey *Icaria cincta*, Lepel., ♀; *Pompilus ruficeps*, Smith, a female; a male *Pompilus* which is possibly new; *Polistes marginalis*, Fabr., ☿; *Larra agilis*, Smith, a female, taken on a bank of dry earth; a Scoliid, *Chalicodoma cœlocera*, Smith, a male, taken at the purple flowers along with the *Xylocopæ*. To these must be added ants from a community of *Camponotus maculatus*, Fabr., and a fine specimen of the coral-red Braconid *Iphiaulax whitei*, Cameron.

The handsome *Eristalis tæniops*, Wied., was conspicuous among the flies, which were not very numerously represented; another fly to which Col. Yerbury has been able to assign a name is *Chætolyga dasyops*, Wied. Other flies were ? *Syrphus* sp., *Idia* sp., and two *Bibio*-like *Plecia* sp., which floated in the air almost stationary with their long legs hanging down; sweeping yielded a *Diopsis*, but in this case only a solitary example which Mr. Verrall thinks distinct from the others.

The wide-ranging grasshopper *Catantops melanostictus*, Schaum, was abundant. On the leaves of "Pride of Madeira" were marshalled a number of immature specimens of a gregarious dark orange-striped Acridian, the same species that was seen at Bulawayo.

Although beetles were not numerous in the Park, we took, in addition to the Cetoniids previously mentioned, the following species:—*Macroma cognata*, Schönh., a handsome dark olive and yellow Cetoniid, flying at flowers; a Lycoid, *Haplolycus*, sp., a Cetoniid, *Gametis balteata*, De Geer, with similar colouring to the last, taken flying around or settled on the flowers of the same tree, together with a similarly Lycoid-coloured Braconid, *Zombrus* sp.; the Longicorns, *Promeces iris*, Pascoe, and *Alphitopoda maculosa*, Pascoe, var., by beating; *Trigonopus marginatus*, Wied., several under stones; also under a stone the Staph *Xantholinus hottentotus*, Sachse; a Phytophagid not in the National Collection, *Atechna inenærabilis*, Vogel, var.; *Apoderus nigripennis*, Fabr.; the metallic green *Colasposoma flavipes*, Har.; the Cassid *Aspidomorpha silacea*, Boh. [=*tecta*, var. Boh.]; and a weevil, *Balaninus apicalis*, Fåhr, var. B., was obtained by beating.

Two bugs complete the list of insects taken in the Queen's

Park:—a black Pentatomid with red-tipped antennæ, *Aspongopus lividus*, Dist., and a large Coreid, *Carlisis wahlbergi*, Stoll, dark brown with red-ringed antennæ, a very striking thing on the wing, but very stinking in the net.

On Sept. 27, by the kindness of Mr. John Wood, accompanied by Mr. Rattray we spent a very pleasant afternoon on the NAHOON RIVER, a few miles to the north-east of the town. We were somewhat late in the day and a strong wind was another adverse condition, so that we got very few butterflies.

On the island where we lunched *Belenois severina*, Cram., was abundant, and *Mylothris rüppellii*, Koch, the only representative of the genus, was common; *Pinacopteryx charina*, Boisd., *Eronia cleodora*, Hübn., and *Atella phalanta*, Dru., also occurred. A geometer, *Ectropis spoliataria*, Walk., a small Noctua, *Metachrostis corniculans*, Wallgr., and a very handsome Agaristid, *Xanthospilopteryx africana*, Butl., taken off a tree-trunk, completed the Lepidoptera on the island. Sunning itself on another tree-trunk close by was a beautiful green Hymenopteron, *Ampulex mutilloides*, Kohl, ♀. Mr. Rattray caught a specimen of the scarlet Braconid, *Iphiaulax whitei*, Cameron, which appears to be common in South Africa.

Mr. Wood set a stalwart Kaffir to work with an axe to hack to pieces dead trees. This did not prove a very productive operation; moreover of the creatures found but a small proportion have yet been named. Among the beetles were single specimens of the Longicorn, *Promeccidus chalybeatus*, White; the Sternoxid *Alaus mœrens*, Germ., and a species of *Notiophygus*. *Blattæ* were numerous, Mr. R. Shelford has named for us *Hyposphæria stylifera*, Burm., immature; *Derocalymna ? brunneriana*, Costa, several; also *Pseudoderopeltis albilatera*, Stål., two specimens, and *P. wahlbergi*, Stål., a male. Bugs were represented by a singularly flat form, well adapted to its life under bark. It goes without saying that woodlice were plentiful.

Taking a boat the Kaffir pulled us a mile or two down the river and we landed on the eastern bank, where rich flowery meadows promised great things, but the rising of the wind and the lateness of the hour led to disappointment. A single *Teracolus achine*, Cram., ♂, a Boarmid moth, *Osteodes turbulenta*, Guen., and a Pyrale, *Antigastra morysalis*, Walk., were the only *Lepidoptera* that we brought away from a spot which under more favourable conditions should swarm with them. Beetles are somewhat less susceptible, and we took on flowers the pretty Cetoniid *Oxythyrea hæmorrhoidalis*, Fabr., together with the commoner *O. marginalis*, Schön., also the Longicorn *Hylomela sexpunctata*, Fabr., which closely mimics a species of *Mylabris* (or ? *Ceroctis*) that we met with in South Rhodesia.

Sweeping added to the list the Lady-birds *Atechna hebe*, Clk., and *Cryptocephalus flavago*, Suff., the Weevil *Ellimenistes squamifer*, Boh.; and the *Phytophaga*, *Ootheca lævipennis*, Jac., *Gynandropthalma malvernensis*, Jac., var.; *Luperus inconspicuus*, Jac., as well as a rather pretty bug *Veterna sanguineirostris*, Thunb., the common grasshopper *Catantops melanostictus*, Schaum, and the locust *Prototettix impressus*, Stål.

We took two pedunculated wasps, *Belonogaster praunsi*, Kohl, and *Ammophila ferrugineipes*, Lepel., a male; also an Ichneumon, and a number of ants, *Cremastogaster sordidula*, Nyl., var., and *Pheidole irritans*, Smith, of which last the soldiers alone have big red heads.

Turning over stones yielded the beetles *Trigonopus marginatus*, Wied., and *Lissogenius conspersus*, Burm., as well as the common South African Reduviid bug *Physorhynchus crux*, Thunb., and two scorpions.

A specimen of the Scarab *Syrichthus spurius*, Burm., was picked off the ground, while Mr. Rattray found a specimen of the large thick-legged Coreid bug *Rhyticoris terminalis*, Burm., also a large weevil with very hard integuments, *Mecorhynus loripes*, Schönh., and two millipedes whose integuments turned the point of a No. 16. pin. Mr. Wood found lying dead on the left bank of the Nahoon a Carabid beetle, *Haplotrachelus* sp., which is not in the National Collection.

The Kaffir boatman caught several of a *Psammodes* unrepresented at South Kensington, they were crawling over the rocks by the lower landing-place, nearly opposite the Boat Club House.

Lastly, on the west bank when it was quite evening a Hesperid was netted, *Sarangesa motozi*, Wallgr. (= *pato*, Trim.).

An old termitarium on the high ground above the Club House yielded, besides sundry ants, *Cremastogaster weitzecheri*, Emery, a "night-adder," a small serpent said to be very poisonous.

Since our return to England, we have been much concerned at hearing of a disastrous flood at East London, which seems to have devastated the island in the River Nahoon where some of our collecting was done, and to have caused the death by drowning of several natives, including our Kaffir boatman and his family. Much damage has been done on the banks of the Nahoon and Buffalo rivers, and part even of the Queen's Park is reported to have been washed away.

Acting on the advice of Messrs. Wood and Rattray, we spent the next day, Sept. 28, on the "SECOND CREEK" of the BUFFALO RIVER, a delightful locality. It is approached by a pleasant walk over open downs where we met our old friends *Synchloë hellica*, Linn., *Colias electra*, Linn., and *Teracolus omphale*, Godt.; after a mile or so the path enters a wood, and descends rapidly to a brawling stream, which follows an impetuous course to a fall into a tidal pool, beyond which is a flowery meadow forming the delta of the creek. The wider tracks through the upper part of the wood had a home-like feeling, and one almost expected to see "Pearl-bordered fritillaries" disporting themselves about the flowers, but instead of these we found in moist places the pretty Satyrid, *Pseudonympha cassius*, Godt. These butterflies were of less "dry" form than most that we had met with, the majority of them might be better described as "intermediate." The more generally distributed and dingy *Mycalesis safitza*, Hew., was also common; a female exhibited a supplementary ocellus on the fore-wing.

The commonest White was *Pinacopteryx charina*, Boisd., but *Eronia cleodora*, Hübn., *Belenois zochalia*, Boisd., and *Mylothris agathina*, Cram., were all present in some numbers, and one *M. trimenia*, Butl., was taken. *Teracolus omphale*, Godt., and *T. achine*, Cram., occurred in the more open places.

The *Acræinæ* were conspicuous by their absence, but the *Danainæ* were represented by *Amauris echeria*, Stoll, and *A. albimaculata*, Butl., as well as by *Limnas chrysippus*, Linn.

The only Nymphalines taken were *Byblia goetzius*, Herbst; *Atella phalanta*, Dru., and a solitary *Precis archesia*, Cram., a species which according to Mr. Brooking of East London frequents dark holes in rocks.

Lycænids were not common, a solitary *Tarucus telicanus*, Lang, and a couple each of *Axiocerces harpax*, Fabr., and *Phasis chrysaor*, Trim., one settled head downwards, were taken.

We took four Hesperids, viz. one each of *Hesperia spio*, Linn. (= *vindex*, Cram.), *Eretis djælælæ*, Wallgr., *Gegenes zetterstedti*, Wallgr., and *Pterygospidea flesus*, Fabr. The last named after dashing about wildly settled on the *upper* side of a leaf.

But few moths were seen, and two specimens of *Osteodes turbulenta*, Guen., and the Syntomid mentioned below were all that we took.

Beetles, on the other hand, were fairly numerous. Two species of *Heterochelus* (*Hopliinæ*) were common on yellow composite flowers, buried head downwards so as to leave the hypertrophied hind-legs alone protruding like the mandibles of an ant-lion, the resemblance being increased in that by their adduction they could inflict a very respectable pinch.*

The greenish-white flowers of a climbing composite (? *Senecio* sp.) that spread in dense mats over some of the bushes by the stream were very attractive to insects. Two Aculeates, *Xylocopa divisa*, Klug, ♀, and *Eumenes tinctor*, Christ, ♀, 2, one of them a starved dwarf; the moth *Syntomis kuhlweini*, Lefebr. (one found to be in the tender embraces of a spider); the fly *Eristalis tæniops*, Wied.; the Reduviid bug *Harpactor erythrocnemis*, Germ.; two Lycoid beetles, *Acantholycus* sp. and *Haplolycus* sp., the latter numerous,† and clearly mimicked by the Cetoniid *Gametis balteata*, De Geer, were all taken off this plant, together with a Mantis that was presumably attracted by the insects rather than the flowers.‡

A soft-skinned Cantharid, *Decatoma lunata*, Pallas, looked conspicuous enough on a pale straw-yellow liliaceous flower.

The meadows by the estuary yielded a different lot of

* See Longstaff, Trans. Ent. Soc. Lond. 1906, pp. 93–95.

† A pair remained *in cop.* for at least six hours.

‡ Another small Mantis, taken on a tree, bright leaf-green in colour, was kept alive for over a week. It was seen to catch a fly by a motion of lightning-like quickness and eat it, rejecting the wings and abdomen. When approached it would smartly assume the "praying" attitude, sometimes also turning its head in the direction of the visitor. It used to clean its eyes by passing its fore-legs over them, with an action like that of a cat cleaning its face. It also cleaned its antennæ in its mouth, bringing them down by its fore-legs.—F. A. D.

things, especially Phytophaga and Weevils. Thus *Malacosoma polita*, Jac., was abundant in the flowers of an Iris, while sweeping yielded *Ootheca lævipennis*, Jac., *Cryptocephalus polyhistor*, Suff., *Trochalus* sp., 2, and the Cetoniid *Oxythyrea hæmorrhoidalis*, Fabr., as well as the following small Weevils:—*Eremnus gyrosicollis*, Boh., *Sciobius o'neili*, Mrshl., ♀, *S. pullus*, Sparr., *Strophosomus* sp., and two new species which Mr. G. A. K. Marshall has described* under the names *Elliministes callosicollis*, Mrshl. (4), and *Myorrhinus longstaffi*, Mrshl., the latter in abundance. With the beetles in the sweeping net was a Bombylius *Systœchus* sp., and two bugs, a black yellow-spotted *Stenozygum* that is possibly new, and the large pale ochreous fetid Pentatomid, *Basicryptus distinctus*, Sign.

Other beetles taken in the same locality were the Lady-birds *Chilomenes lunata*, Fabr., and *Polysticta macularis*, Dej.; *Melyris ciliatus*, Oliv., *Thysodactyla africana*, Chap.; a *Trochalus* apparently undescribed; a *Telephorus*; a *Lagria*; and a Scarabeid, *Syricthus spurius*, Burm., the last found in rotten wood.

Among *Orthoptera* were the big locust *Phymateus leprosus*, Serv., the common *Catantops melanostictus*, Schaum, *Prototettix impressus*, Stål., the handsome *Acridium ruficorne*, Fabr., so named from the red tips to the double row of white spines on its black tibiæ, and two unnamed grasshoppers, one grass-green, the other a curiously soft species, black with scarlet rings and blotches.

The only flies taken were two Bombyliids of the genus *Systœchus*, one at flowers, the other by sweeping.

A few Aculeates complete the list, viz.:—*Xylocopa flavo-rufa*, De Geer, a male; *X. divisa*, Klug, a female; the prettily variegated *Polistes fastidiosus*, Sauss., a female; the grey *Icaria cincta*, Lepel., ☿; two small black bees *Halictus deceptus*, Smith, females; lastly a fine distinct red, yellow and black wasp, which Col. C. T. Bingham has described as *Odynerus longstaffi*, from a specimen in the National Collection from Natal, hitherto unnamed, making our specimen a co-type. Lastly an example of the blue-green Chrysid *Hexachrysis simillimus*, Grib., was taken settled on a bare rock.

On our return walk we kicked up a Noctua in the wood, and as we reached its upper edge at about 3.0 p.m.,

* Marshall, Proc. Zool. Soc. Lond. 1906, pp. 922 and 932.

we found Termites on the wing in swarms; five specimens were brought home alive in separate pill-boxes, on reaching the hotel it was found that one had cast off a wing, another all four wings. Later in the afternoon *Syntomis kuhlweini*, Lefebr., was found in some numbers flying about, or settled upon a particular species of tree. The large Reduviid bug *Physorhynchus crux*, Thunb., was also taken on the wing. This insect usually carries its wings so closely appressed to the abdomen that when first seen it was thought to be apterous.

On the morning of sailing, Sept. 29, a somewhat hurried visit was paid by one of us to the scrub-crowned SANDHILLS seen from the ship that August morning when we first anchored at East London, but this expedition did not add much to our list.

Two ants turned up, *Camponotus cosmicus*, Smith, also taken at Estcourt, and *Polyrachis gagates*, Smith, of which but a single specimen was met with in this land of ants; there were also the following Aculeates: *Polistes marginalis*, Fabr., ☿, *Belonogaster guerini*, Sauss., ☿, var. *dubius*, Kohl (a very large specimen), *Eumenes tinctor*, Christ, ♀, *Icaria cincta*, Lepel., ☿, the big Carpenter bee *Xylocopa flavo-rufa*, De Geer, ♂, and two of the pretty little bees *Prosopis 5-lineata*, Cameron, taken at a red flowering shrub. The only other Hymenopteron was an Ichneumon with Lycoid colouring.

A fly that seemed to mimic a pedunculated wasp Col. Yerbury says may be the ♂ of *Baccha picta*, Wied., of which that author has only described the ♀ from the Congo and Guinea. Another fly taken would appear to be *Sarcophaga ? carnaria*, Linn.

Beetles proved less numerous than might have been expected: two tiger-beetles, the first we had seen in S. Africa, *Cicindela candida*, Dej., and *C. capensis*, Fabr., were common close to the sea on the bare sand, which they so closely resembled in colour as to be scarcely visible save when on the wing. Also running on the sand was a nameless *Zophosis* and an equally nameless *Anoplochilus*. The flowers of a species of Iris produced, besides abundance of *Malacosoma polita*, Jac., *Camptolenes fastuosa*, Lac.

Lissogenius conspersus, Burm., was taken flying in the sun, as was also *Scarabæus convexus*, Hausm., and the Cassid *Aspidomorpha tecta*, Boh., the latter looking like a golden spangle floating in the light. The Hopliine

Khoina bilateralis, Thunb., was found on flowers, and *Eurynotus muricatus*, Kirby, under bark.

The Coreid bug *Scrinetha amista*, Germ., seems to mimic a *Lycus*. Another bug taken was the Reduviid *Harpactor segmentarius*, Germ.

Locusts were rather common, conspicuous among them was a very fine specimen of the large, heavy and sluggish *Phymateus leprosus*, Serv., more glaucous than those taken at Ladysmith, so as to match more closely the light-coloured sand. The beautiful apple-green *Tryxalis ståli*, Boliv., darker above, paler beneath, as is so often the case, was found at the verge of vegetation, while an abundant grasshopper found on the bare sand was highly cryptic. A curiously formed small Hemerobiid Neuropteron, *Mantispa ? tenella*, Erichs., was taken on the wing; when seen for the first time its resemblance to a Mantis is very striking.

Perhaps the locality was too much exposed for butterflies, at all events they were neither numerous nor remarkable:—*Amauris albimaculata*, Butl., ♀; *Eurytela hiarbas*, Dru., within 100 yards of the sea; *Byblia goetzius*, Herbst, ♀, dry; *Pseudonympha cassius*, Godt.; *Argiolaus silas*, West., ♀; *Mylothris rüppellii*, Koch, ♀; *Pinacopteryx charina*, Boisd.; *Colias electra*, Linn.; *Teracolus omphale*, Godt., ♀, and the Skipper *Eretis djælælæ*, Wallgr. A Geometer, *Obocola inconclusaria*, Walk., ♂, and the Lymantriad *Aroa discalis*, Walk., which was common flying about the scrub, were the only moths.

The lights at the hotel yielded only *Dorylus helvolus*, Linn., ♂♂; the very widely distributed Acidaliid *Idæa fibulata*, Guen., and one or two moths not yet named.

The cosmopolitan *Dermestes vulpinus*, Fabr., shared the hotel accommodation with us, while *Acanthia lectularia*, Linn., was even more intimate!

Thus ended our delightful collecting at East London, a place less known entomologically than many others in South Africa.

Port Elizabeth, Cape Colony. Second Visit.

Lat. 34° 0′ S. Sept. 30, 1905.

The stoppage on the return voyage gave us a long morning's collecting; but an accident separated us, so that while one visited Humewood, about a mile and a half to the south-east, the other spent his time, more profitably as it turned out, on the more sheltered slopes of the left bank of Baaken's River, just north of FORT FREDERICK. At this spot butterflies were plentiful. The males of *Colias electra*, Linn., were common, as were both sexes of *Synchloë hellica*, Linn., while *Pyrameis cardui*, Linn., was in abundance, some worn, but many in fine condition. The Skipper *Cyclopides metis*, Linn., was fairly common, but only two were taken; one *Gegenes zetterstedti*, Wallgr., a female, was taken; but out of many Lycænids seen flying about only a single specimen of *Zizera lysimon*, Hübn., was secured. This blue was found by us over a wide range of country, but nowhere in any numbers except in the Rain Forest, Victoria Falls.

A grasshopper, *Epachromia thalassina*, Fabr., with head, thorax and jumping legs green, otherwise yellowish-brown, was also taken.

On the north wall of the Fort itself, or on the ground close by, considerable numbers of the red and brown bug *Scantius forsteri*, Fabr., were found, for the most part paired. Many of them exuded a drop of clear liquid when pinned, and in one or two a slight, somewhat offensive odour was detected.

The swampy heath-like waste beyond HUMEWOOD and the woods at the back of it proved very barren of insect life, perhaps partly from the uniformity of the vegetation, partly from exposure to the sea-winds. A few *Synchloë hellica*, of both sexes, and three or four *Pyrameis cardui*, were the only butterflies seen.

Stone-turning yielded a small beetle which Mr. L. Péringuey believes to be a new species of *Anaulacus*, but possibly a *Microus*; four *Eurynotus muricatus*, Kirby; another species of the same genus that may be new; one larva of *Luceola* sp.; also the Cockroach *Deropeltis erythrocephala*, Fabr., which, as is so common with the group, was very local and markedly gregarious.

Five specimens of an undetermined beetle were found on composite flowers. Sweeping produced a red-winged Homopteron, two dragonflies, *Sympetrum sanguineum*, Müll. (a common species), and the large and beautifully-coloured *Anax mauricanus*, Ramb.; all took some catching. A common-looking "Greenbottle," *Lucilia* sp., was taken, but the species, or others like it, was abundant throughout our journey.

The flowers of a yellow *Chrysanthemum* in the garden of the Humewood Hotel attracted a certain number of insects: *Apis adansonii*, Latr., ☿; the active green Longicorn *Promeces linearis*, Linn.; and the Hopliine *Dicranocnemus squamosus*, Burm., the last-named in abundance buried in the flowers (and in other *Compositæ*); but it was noted that their hind-legs did *not* mimic jaws.

Cape Town. Second Visit.

Lat. 34° S. October 2, 3.

One day was devoted to the ascent of Table Mountain by way of The Gorge.

Most of the collecting was along the road at about 1,200 feet above the sea. Very few butterflies were seen, a few *Pyrameis cardui*, Linn., also a few *Pseudonympha vigilans*, Trim., and a few of the Lycænid *Cacyreus palæmon*, Cram.

The fine black and white Carabid, *Anthia* 10-*guttata*, Fabr., was not uncommon running on the path;* when handled it emitted a very pungent odour (one specimen of this beetle was taken in a pine wood just above the outskirts of the town). Under stones five specimens of *Microlestia tabida*, Fabr., were taken. But the greatest numbers of beetles were found on, or actually *in* composite flowers, especially those of a species of *Senecio*. The most abundant species was the Hopliine *Heterochelus forcipatus*, Burm., a species in which the posterior legs are enormously developed in the male sex; no females were seen. With these were a few (3 ♂, 1 ♀) of the allied *Dichelus dentipes*, Fabr., of which the males have large posterior legs. There were also a number of *Encyophanes* sp. (unnamed in Brit. Mus.) of both sexes. All these were buried in the disks of the flower with only the hind-legs protruding.† A specimen of the hairy Hopliine *Anisonyx lynx*, Fabr., was taken in another composite flower (? *Gazania* sp.).

By shaking the flowers of a *Senecio* (?) into the net the following were obtained: *Ootheca tricolor*, Fabr., two; ? *Hedybius* sp., six; a very small weevil, an Erirrhinid of uncertain genus, one; *Oosomus* sp., seven; several *Telephori* and a Cricket.

* Not so swift in its movements as the Biskra species *A. sexmaculata*, Fabr. Probably the struggle for existence is not so severe on the Cape Peninsula as on the Sahara.—G. B. L.

† See Longstaff, Trans. Ent. Soc. Lond. 1906, pp. 93–95

At the flowers of a yellow leguminous shrub two workers of *Apis adansonii*, Latr., were taken, together with three bees of the genus *Megachile*, all males, all distinct species and all apparently new! However, Col. C. T. Bingham says that it is useless in that genus to name or describe males without females. It was noted with surprise that the beautiful strong-scented golden yellow blossoms of the *Protea*, a shrub characteristic of the Cape Peninsula, attracted nothing but a few flies. At about 1,400 feet *Bombylius lateralis*, Fabr., was met with, and the Satyrid *Pseudonympha vigilans*, Trim., up to 1,500 feet.

The summit, 3,600 feet, was in dense cloud, for the "table-cloth" was spread, and the only insects taken at that altitude were hairy Hopliines; two *Anisonyx lynx*, Fabr., and one *A. ursus*, Fabr.; of these two were on flowers, one on the wing.

Turning over stones at the foot of the LION HILL, c. 300 feet, yielded two ants, *Acantholepsis capensis*, Mayr.; the beetle *Oncotus tardus*, Sol.; a larva of *Luciola* sp.; and the cockroach *Temnopteryx phalerata*, Sauss.

The next day we took the train to SIMON'S TOWN, which lies about fifteen miles to the south of Cape Town. Here our collecting was confined to a strip of sandy ground with eastern aspect, close to the shore and at the foot of the line of hills capped with sandstone crags perhaps 3,000 feet in height, which overlook Simon's Bay.

As we came out of the station a large blue-black Carpenter bee, *Xylocopa capensis*, Lepel., dashed at the head of one of us; forthwith his companion made violent efforts to catch the bee, and for some time the bewildered entomologist was in considerable peril between the swoops of the net and the assaults of the Aculeate!

The Heteromerous beetle, *Opatrum* ? *arenarium*, Fabr., was common in a very sandy place under stones, and in like situation were single specimens of *Harpalus fuscipennis*, Wied., and the black and red Reduviid bug *Acanthaspis lythrodes*, Germ., of which the British Museum possesses but a solitary example.

The dry sandy soil, scorched by the sun and exposed to the sea winds, is thoroughly suited to the taste of a *Mesembryanthemum*, which grew luxuriantly, its handsome flowers attracting many insects. Among these was a Hopliine beetle, *Lepitrix lineata*, Fabr., which was very abundant at one spot close to the railway-station. Unlike the *Dichcli* and *Heterochcli* they do not bury themselves among the stamens of the flowers, but are as active as bees, flying very readily. A few specimens were also found in the spathes of the white arum, these curiously enough did not attempt to fly. On the other hand, some small black bees with white-ringed abdomen, *Halictus albofasciatus*, Smith, ♂, did bury themselves in the *Mesembryanthemum*, but nevertheless were so active as to be difficult to catch; associated with them, closely mimicking them, and almost equally hard to catch, were some flies, ? *Ploas* sp. and ? *Prorachthas* sp. The mimicry, especially in habits, was very striking during life, yet in the cabinet the insects look distinct enough.

On other flowers such small things were found as six green beetles, ? *Hedybius* sp., the tiny *Eurysthenes balyi*, Chap., a *Eutrapela* sp., which stands without a name at South Kensington; *Attagenus* sp.; *Harpalus xanthoraphus*, Wied.; *Telephorus* sp.; the Hopliine *Pachycnema obscurepurpuria*, De Geer, a ♀, also one of each sex of a small bee, *Dasypoda* sp., which Col. Bingham says is near to *bœtica*, Spin., but distinct, and the little *Halictus terminalis*, Smith, ♀. A yellow liliaceous flower was tenanted by a small beetle, *Notoxus inconstans*, Lafert.

The black and yellow *Ceroctis capensis*, Linn., was found in the yellow flower of a prickly composite, while in the flowers of *Senecio* ? *concolor* (a species with purple ray-florets) were numbers of a small Heteromeron, *Notoxus* sp.

Close to the beach, running swiftly over the sand and taking the short flights so characteristic of the genus, were several *Cicindela brevicollis*, Wied. An Asilid, ? *Dysmachus* sp., was also fond of settling on the bare sand. The Elater *Œdistoma cuprea*, Linn., was also taken on the sand; during life it was of an iridescent bronze colour, which proved very fugitive.

On a tuft of grass, above the ground, a semi-papyraceous nest was found to be tenanted by a numerous community of ants, *Cremastogaster stadelmanni*, Meyr.

Lastly, on the heathy scrub on the hillside at Glencairn two Lycænids were taken, *Phasis thero*, Linn., and *Cacyreus thespis*, Linn. With them was a fly, *Hæmatopota* sp.

Just before embarking we drove down to The Flats, near Claremont, but the weather conditions were unfavourable and the results wholly disappointing. *Pyrameis cardui* and *Pseudonympha cassius* were the only butterflies obtained; the latter was worn and appeared to be of the wet-season form. An as yet undetermined moth (? *Pseudosterrha* sp.), a grasshopper and a few very ordinary flies, *Eristalis tenax*, Fabr., *Catabomba* sp., and *Calliphora vomitoria*, Linn., were the only other things taken.

Thus ended our eight weeks in Africa, resulting in the capture of some 2,500 specimens of all orders. So extensive is the fauna and so far from being exhausted that even in this scamper (for our journey may well be so designated), several new species were taken, while there remain a number of insects not yet worked out which almost certainly include several other novelties.

Our sincere thanks are due to Professor E. B. Poulton, F.R.S.; to the assistants of the Hope Department; to Mr. C. O. Waterhouse and all the staff of the Entomological Department of the Natural History Museum; to Commander J. J. Walker, Colonel J. W. Yerbury, Mr. W. L. Distant, Mr. R. Trimen, F.R.S., Mr. M. Jacoby, Mr. G. H. Verrall, and Mr. L. Péringuey, for their assistance in naming our specimens. To Sir George F. Hampson, Bart., Col. C. T. Bingham, Mr. Guy A. K. Marshall, and Mr. R. Shelford, our special thanks are due for describing new species.

Explanation of Plate XXV.

[*See Explanation facing the* Plate.]

September 26th, 1907.

XX. *A List of the* Coleoptera *of the Maltese Islands.* By Malcolm Cameron, M.B., R.N., and A. Caruana Gatto, LL.D.

[Read March 20th, 1907.]

In publishing this contribution we trust that it may be of some service to collectors and those interested in the distribution of species.

We must acknowledge our indebtedness to the following gentlemen, who have been good enough to examine some of the species:—MM. Fauvel, Reitter, Pic, Régimbart, Desbrochers des Loges, Dr. David Sharp, and Mr. E. A. Newbery; also to Mr. G. C. Champion, who has kindly allowed us to see many species from the collection of Commander J. J. Walker, R.N., which had not been obtained by us, and which in the list are noted as Coll. J. J. W., or *teste* J. J. W. Names of species in brackets are those which have not come under our notice, although recorded by others.

The order and nomenclature adopted throughout is that of the "Cat. Col. Europæ" of Heyden, Reitter, and Weise (1891 edition).

The figures refer to the months.

General Description of the Maltese Islands.

The group of the Maltese Islands consists of the two islands of Malta and Gozo, and of the small islets of Comino, Cominotto, and Filfola.

Malta, which is the main island, is 17½ miles in length and 8½ miles in breadth, its area being 95 square miles; Gozo is 9 miles in length, 4½ in breadth, and has an area of 20 square miles; Comino has an area of about 1 square mile, and Cominotto and Filfola are even smaller.

They are situated almost at the centre of the Mediterranean; the distance from Capo Passero in Sicily is about 60 miles, and from the nearest point in Africa about 200 miles. Close to the African shore lies the island of Lampedusa, and further west, midway between Sicily and Africa, the islands of Linosa and Pantelleria. Both with regard to the flora and fauna all these islands bear a great affinity to the Maltese group, but, as may be supposed, the productions of the latter are even more allied to those of Sicily. As a matter of fact, the Maltese Islands, in their general appearance, are very much like the southern part of Sicily and the country about Syracuse, the only difference being the greater flatness of the land in Malta, and the want of trees and water-courses.

The climate, as lately well described by Mr. T. B. Fletcher, R.N., F.E.S.,[1] may be divided roughly into a wet and a dry season, the former beginning in October and ending in March, the latter including the remaining months. Showers of rain occur also in April, May, and September, but in June, July, and August they are much rarer. The average rainfall is over 20 inches, and the mean annual temperature is 65·6° Fahr.

The appearance of the islands in summer is extremely sterile and barren, mainly because, even where the soil is cultivated, the small fields are enclosed by numberless stone walls of loose stones, and the rocky wastes are almost devoid of all vegetation. The heat is then almost tropical, the temperature ranging from 75° to 90° in the shade.

In Malta there are no mountains, rivers, or marshes. The highest point in the islands is 758 feet above sea-level; the limestone cliffs on the west and south very often rise abruptly from the sea to a height of 300 or 400 feet. In Malta the land slopes gradually on the east to the water edge, forming numerous bays and harbours, and drops suddenly on the other side by a large "fault," which crosses the island from end to end at right angles to its long axis.

The place of rivers is taken by deep valleys, called "Wieds" in the Maltese language; and in these "wieds" during the rainy season water runs at the bottom, and pools of water may be found even afterwards, but in summer they are perfectly dry.

Some of these valleys, particularly those which are less cultivated, are very good collecting-grounds, and in the proper season trips to such valleys as L'Imtahlep, Jneina, Inquisitor's Palace, Bishop's Garden, Ta Baldu, Encita, Babu, El Ghasel, in Malta, and Migiarro, Xlendi, Ducira, in Gozo, besides affording a good harvest in insects and plants, are always very interesting and pleasant excursions.

[1] "Entomologist," vol. xxxvii, pp. 274–5.

One of the most noteworthy features of the islands is the want of trees. There must have been a time at some remote epoch in which trees and shrubs were not so scarce, and a certain amount of "bush," of which traces are still left, must have existed. At present the only indigenous trees and shrubs to be seen in some of the valleys just mentioned, not to speak of the rarer species, are the following:—*Cratægus oxyacantha* and *azarolus*, on which feeds *Rhamphus pulicarius*, Herbst; *Populus alba*, *Salix alba* and *pedicillata*, from which we obtained *Smicronyx cyaneus*, Gyll., a few *Quercus ilex*, *Pistacia lentiscus*, *Rosmarinus officinalis*, *Vitex agnus-castus*, *Tamarix africana*, (these two latter in Gozo), *Euphorbia dendroides*, *Erica multiflora*, *Rhamnus oleoides*, and *Cineraria maritima*, and *Inula crithmoides* on rocks near the sea. *Rubus fruticosus*, *Smilax aspera*, *Lonicera implexa*, *Clematis cirrhosa*, *Hedera helix*, and *Asparagus acutifolius* represent the climbing shrubs. Of cultivated trees, the Carob, *Ceratonia siliqua*, is generally spread, and with its dark evergreen foliage and low spreading branches marks in a characteristic way every Maltese landscape. Fig trees (*Ficus carica*) in several varieties and prickly pears (*Opuntia vulgaris*) are also widely grown by the walls in fields and country tenements. The cultivation of orange trees, which used to yield the finest and most luscious fruit in the world, is at present much neglected, on account of the scale-insect disease, and of the extensive free importation of oranges to Malta from Sicily and elsewhere. Vines are very abundant, and so are almond trees in some places, but though vineyards are to be met with in some places, woods, parks, and extensive groves are absolutely wanting.

The obvious result of this want of trees on Coleoptera, as may be seen in the list which follows, is the small number of Longicorns, other tree-borers and dendrophilous species. Considering that rivers, lakes, or any other permanent water-courses or open reservoirs are absolutely wanting, the presence of water-beetles may appear a puzzle. They are certainly not very numerous, but until the pools or streamlets at the bottom of the valleys dry up, the collector may successfully work for them among the *Charæ*, *Nitellæ*, and the fresh-water *Algæ* which then grow, or under stones at the water's edge. Chadwick's Reservoir or Wied el Klia, Fiddian, Marsa, Jneina, S. Martin, Boschetto, Ghirghenti, may be pointed out as good localities for water and for water-loving beetles.

Cicindelæ, *Scarites*, *Dyschirius*, *Bembidia*, *Pogonus*, *Anisodactylus*, *Acupalpus*, *Dichirotrichus*, *Bledius*, *Phaleria*, *Trachyscelis*, *Opatrum*, *Clitobius*, and several *Anthici* are found in sandy and marshy places like Marsa, Salina, Melleha Bay, Marsa Scala, Birzebuggia, and Jneina. Umbellifers, *Chrysanthemum coronarium* and other composites, the Sulla (*Hedysarum coronarium*) yield a good harvest of *Anthrenus*, *Attagenus*, *Colotes*, *Ebæus*, *Attalus*, *Dasytes*, *Psilothrix*, *Haplocnemus*, *Dasytiscus*, *Sitones*, *Ceuthorrhynchus*, *Lubidostomus*, and *Mylabris*; whilst on *Cynara horrida* the *Larini*, *Tillus transversalis*, and the *Cetoniæ* may be collected. On Asphodel *Agapanthia asphodeli* is found; on *Rumex*, *Apion æneum* and *meridianum*; on *Asparagus*, *Crioceris paracenthesis*. *Podagrica* and *Apion malvæ* are found on Mallows, *Emenadia* on *Crithmum*, *Chrysomela grossa* on *Nigella*, *C. bicolor* on *Thymus capitatus*, *C. americana* on *Rosmarinus*, *C. quadrigemina*, Suff., on *Hypericum crispum*, *Epilachna* on *Ecbalium*, *Longitarsus strangulatus* on *Cineraria maritima*, and *Epicometis squalida* and *Leucocelis funesta* on all sorts of flowers.

A great number of species like *Pimelia*, *Tentyria*, *Stenosis*, *Akis*, *Scaurus*, *Asida*, *Phylax*, *Pentodon*, *Hypera*, *Gonocephalum*, *Silpha* and others are found in the country by the road-sides, and on waste ground, crawling about or under stones.

Every one knows where to look for *Ateuchi*, *Aphodii*, *Onthophagi*, *Histeridæ*, *Saprini*, and many *Staphylinidæ*. The best time for collecting is, for autumnal species, from September, after the first rains, to the middle of November, and for spring species from February to June.

From February to April vegetation is at its best; Pheasant's-eye, Asphodel, *Ranunculi*, *Helianthemi*, Chrysanthemums, Poppies, Mallows, the introduced but abundant *Oxalis cernua*, and the *Hedysarum coronarium* in fields are in full bloom. A great nuisance in sweeping plants and beating the small bushes is the extraordinary abundance of young snails to which beetles are found to be sticking in the net or on the tray.

By July all herbage is dried up, and on account of the burning sun and the parched-up soil, the collector has to limit himself to beating trees in some shady valley, or in gardens and cultivated fields. *Aulacophora abdominalis* is then found on melon and cucumber plants. *Longitarsus, Aphthona, Phyllotreta, Sphærroderma, Demetrias atricapillus,* and many *Apions* may thus be obtained.

In autumn, besides stone-turning and looking in the débris washed down by rains, a ready way to obtain some good species is by beating or shaking on the tray the bundles of *Inula* and other plants which are bound together to dry, and left by the country people on the ground in fields or rocky places.

The distribution of species is very irregular; some of the most interesting and special forms are quite common, others have a very limited area of distribution, being local and very rare. Thus there is no difficulty in getting at the proper season—*Dasytiscus melitensis, Tentyria lævigata,* v. *leachi, Asida melitana, Phylax melitensis,* while *Læmosthenes picicornis, Bruchus duvali, Thylacites beloni* are harder to obtain, and *Eurynebria complanata, Zuphium olens, Drypta distincta, Calosoma maderæ, Anthaxia umbellatarum, Saperda punctata, Callidium violaceum, Rhopalopus clavipes* have been found only in single specimens.

Very little information has been published about the Maltese Coleoptera.

George Waring, in his "Letters from Malta and Sicily" (1843), refers to a collection of beetles which in 1833 was being made in Malta by Dr. Leach, but it appears that unfortunately nothing was ever published about it.

In 1857 Prof. Gavino Gulia delivered a course of entomological lectures at St. Antonio, which were published in 1858; the determination of all species mentioned, however, is so doubtful, to say the least, that the list of species cannot be taken into any account.

One of us contributed to "The Mediterranean Naturalist," in 1893, an article on "The Common Beetles of the Maltese Islands," in which mention is made of about 135 species.

The only other published information which we know of is scattered through various entomological works, and consists mainly of the descriptions of several endemic species.

Far from pretending that the following is a complete list of Maltese beetles, we are sure that further researches and studies will bring out more species, especially among the Micro-Coleoptera; we believe, however, that we may state that the bulk of the Maltese Coleopterous fauna is very fairly represented in our list, the more so considering that this is the first attempt to give a list of the beetles.

LIST OF COLEOPTERA OBSERVED IN THE MALTESE ISLANDS.[1]

CICINDELIDÆ.

Cicindela (*campestris*, L., teste Gulia) *littoralis*, F.*, Marsa, Mistra, Birzebuggia, Marsa Scala, Marsa Scirocco, Melleha, Ramla, Gozo, 4–9; *melancholica*, F., Marsa, 7, sunrise till 8 A.M.

CARABIDÆ.

Calosoma maderæ, F., Marsa, 7, Valletta, 7, two only. *Carabus morbillosus*, F.*, general throughout the year. *Eurynebria complanata*, L., Melleha, 11, one only. *Nebria andalusiaca*, Ramb., general, 1–4, 11. *Notiophilus geminatus*, Dej.*, general throughout the year. *Scarites arenarius*, Bon., St. George's Bay, 4–11, rare; *buparius*, Först., Melleha, Marfa, 3, 4, 5, 11, not common; *planus*, Bon.*, Marsa, Fiddian, Melleha, Jniena, 4–11. *Dyschirius nitidus*, Schaum, Melleha, 11, common; *macroderus*, Chaud., Marsa Scala, 6, rare; *cylindricus*, Dej., St. George's Bay, 8, one only; *apicalis*, Putz., Marsa, Birzebuggia, 8, common. *Siagona europæa*, Dej., Melleha, 5, one only. *Bembidion ambiguum*, Dej.*, general throughout the year; *præustum*, Dej.*, Marsa, L'Imtahlep, Jniena, Marsa Scala, 5, 6, not common; *normannum*, Dej., Marsa Scala, Marsa Scirocco, St. George's Bay, 8, 9, common; *obtusum*, Sturm*, general, 3–10; *guttula*, L., Jniena, Gnien el Gbir, 5, common; *biguttatum*, F.*, Melleha, 4, 11, common. *Ocys harpaloides*, Serv., Gbir, Makluba, Attard, 5, 10, 11, common. *Tachys hæmorrhoidalis*, Dej.*, El Klia, Gozo, 6, common; v. *socius*, Schaum, with type; *unicolor*, Ragusa, El Klia, 6; *parvulus*, Dej., Valletta, spring; v. *quadrinævus*, Reitt., with preceding; *fulvicollis*, Dej.*, Marsa, Ghirghenti, 6–10, common; *bistriatus*, Duft, Marsa, 8, 9, 10, common; v. *gregarius*, Chaud., Marsa, 9, 10, common; *scutellaris*, Steph.*, Marsa, Marsa Scala, St. George's Bay, Melleha, 4, 5, 9, 10; *algiricus*, Luc.*, Jniena,

[1] The species marked with an asterisk, as well as those specially noted, were obtained in Malta by Mr. J. J. Walker in 1874-5-6, almost exclusively between the months of October and March.

11. *Trechus subnotatus*, Dej., Marsa, 5, common. *Pogonus chalceus*, Marsh., Marsa, Fort Manoel, Melleha, St. George's Bay, common all the year. *Agonum atratum*, Duft., Gbir, Jniena, 4–11, common. *Olisthopus fuscatus*, Dej.*, common throughout the year. *Bedelius circumseptus*, Germ., general, 4–10. *Calathus mollis*, Marsh., common throughout the year. *Læmosthenes picicornis*, Dej., Valletta, Wied Encita, Marsa, Boschetto, Melleha, Zurico, Gozo, 11–3, not common; *barbarus*, Luc., ex. Coll. J. J. W. *Amara ænea*, De G., Coll. Walker; *eurynota*, Panz., Gbir, 10, one example; *dalmatina*, Dej., Jniena, Ricasoli, Melleha, 10, 11, rare. *Acinopus ambiguus*, Dej.*, Corradino, Tigné, Fort Manoel, Binjemma, Salina, Ricasoli, St. George's Bay, Attard, Gozo, not common, 4, 5, 9, 10, 11. *Aristus clypeatus*, Rossi*, Corradino, El Klia, Naxaro, Marsa Scirocco, 4, 5, 10, not common. *Ditomus cordatus*, Dej.*, San Martino, 11, two specimens; *calydonius*, Rossi*, Jniena, L'Imtahlep, Encita, Wied Dalam, 1–4, 11, not common; *tricuspidatus*, F.*, Ghirghenti, Gbir, 5, rare. *Carterus fulvipes*, Dej., Imtarfa, L'Imtahlep, 7, common. *Scybalicus oblongiusculus*, Dej., Jniena, 11, Gbir, 7, 9, rare. *Ophonus meridionalis*, Dej.*, everywhere, 3–6, 10, 11; *pubescens*, Müll., Gbir, 6, 7, 9; *griseus*, Panz., Gbir, 6, 8. *Harpalus tenebrosus*, Dej., Jniena, Attard, Ricasoli, Salina, Notabile, 5, 8, 10, not common. *Anisodactylus pœciloides*, Steph.*, Marsa, Melleha, 3–6, not common. *Dichirotrichus obsoletus*, Dej.*, St. George's Bay, Marsa Scirocco, Jniena, Melleha, 1, 4, 9, 10, 11, not rare. *Bradycellus verbasci*, Duft., Coll. Walker. *Stenolophus teutonus*, Schr., everywhere, 2–11; *skrimshiranus*, Steph., Gozo, 7, one example; *marginatus*, Dej.*, Marsa, El Klia, St. George's Bay, 7, 8, rare. *Acupalpus brunnipes*, Sturm, Salina, 6, one example; (*bistriga*, Rttr., "Cat. Col. Europ."); *dorsalis*, F.*, Jniena, 10; v. *discus*, Rttr., El Klia; *immundus*, Rttr., Jniena; *lucasi*, Gaubil*, damp places everywhere, 8; *flavipennis*, Luc., Marsa, 10, one example. *Amblystomus levantinus*, Rttr., Melleha, Marsa Scirocco, 11, not common; *cephalotes*, Rttr., Jniena, 11, one example. *Licinus brevicollis*, Dej.*, common throughout the year. *Chlænius azureus*, Duft.*, Marsa, 6, 7, 8, rare; *variegatus*, Fourc., general, 2–10; *festivus*, F.*, Ta Baldu, 11; *velutinus*, Duft.*, El Klia, 7; *circumseptus*, Duft., El Klia, 7, rare. *Metabletus exclamationis*, Mén., Gbir, 5, 6, rare. *Blechrus glabratus*, Duft.*, everywhere throughout the year; *plagiatus*, Duft.*, Marsa, Melleha, El Klia, 7, 8, 11, not un-

common. *Dromius linearis*, Ol., Fort Manoel, St. George's Bay, 10; *quadrimaculatus*, L., Jniena, rare. *Demetrias atricapillus*, L.*, everywhere, 4–11. *Cymindis suturalis*, Dej., Fort Manoel, 5, one only. *Zuphium olens*, F., Jniena, 11, one only. *Drypta dentata*, Rossi, Ta Baldu, 11, rare; *distincta*, Rossi, Jniena, 11, one only.

Dytiscidæ.

Haliplus lineatocollis, Marsh., Marsa, St. George's Bay, El Klia, Gozo, 3, 4, 9, common. *Cœlambus confluens*, F., El Klia, 10, common. *Deronectes ceresyi*, Aubé, Salina, 7, common. *Hydroporus varius*, Aubé, St. Paul's Bay, El Klia, Fidian, Gozo, 6, 8, 11, common; *tessellatus*, Drap., v. *humilis*, Klug, general, 1–5, 10. *Laccophilus interruptus*, Pz., v. *testaceus*, Aubé, El Klia, 10. *Agabus nebulosus*, Först., El Klia, Melleha, 4. *Cymatopterus fuscus*, L., El Klia, 6. *Meladema coriaceum*, Lap., El Klia, St. Paul's Bay, 5, 8, 10, common. *Dytiscus circumflexus*, F., a single specimen was found alive in the Grand Harbour in 1890.

Hydrophilidæ.

Helochares dilutus, Er., El Klia, common, 6–10. *Anacæna ovata*, Reiche, Jniena, Melleha, Gozo, 5, 6. *Laccobius bipunctatus*, F., El Klia, Gozo, 7, 10. *Berosus affinis*, Brull., El Klia, Mistra, St. George's Bay, common, 6, 9, 10. *Cercyon depressus*, Steph., Marsa Scala, 7, 8, common; *ustulatus*, Preyss., Coll. J. J. W.; *flavipes*, F., Coll. J. J. W.; *quisquilius*, L.*, everywhere, 3, 4, 6, 7; *centrimaculatus*, Sturm, Coll. J. J. W. *Sphæridium bipustulatum*, F.*, general, 1, 3, 7. *Cœlostoma orbiculare*, F., Gozo, Migiarro, 6, 7, common. *Dactylosternum insulare*, Lap., Ghirghenti, 10, rare. *Helophorus rugosus*, Ol.*, El Klia, 3, not common; *porculus*, Bedel, Gbir, 4, 5, 6, rare; *alternans*, Gené*, El Klia, 3; *aquaticus*, L.*, general, 3–11; *dorsalis*, Marsh.*, v. *emaciatus*, Kuw., St. Paul's Bay, 10, 11, rare; *algiricus*, Bach., St. Paul's Bay, 11; *pallidipennis*, Motsch., v. *reitteri*, Kuw., Wied Ghormor, Gbir, L'Imtahlep, 3–5. *Ochthebius quadricollis*, Muls., L'Imtahlep, 5, common; *subinteger*, Muls., L'Imtahlep, 5, rare; *foveolatus*, Germ., Marsa Scala, 8, common; *exaratus*, Muls., Jniena, 11, rare; *lanuginosus*, Reiche, one example; *maculatus*, Reiche, ex. from J. J. W.; *impressicollis*, Lap., Ta Baldu, 10, common; v. *imperfectus*, Kuw., Boschetto, 7, rare. *Hydræna nigrita*, Germ., Ta Baldu, 11, rare.

Parnidæ.

Parnus algiricus, Luc., L'Imtahlep, Ghirghenti, Fiddian, Gbir, 3, 4, 10, 11, not common.

Heteroceridæ.

Heterocerus melitensis, Rttr.*, general, 5, 6, 7.

Staphylinidæ.

Chilopora longitarsis, Er., Salina, 5. *Calodera hierosolymitana*, Saulc.*, Jniena, Ta Baldu, 3. *Phlœopora corticalis*, Grav. var., Coll. J. J. W. *Ocyusa nigrata*, Fairm., Coll. J. J. W. *Oxypoda ambigena*, Fauvel, Coll. J. J. W.; *umbrata*, Gyll., L'Imtahlep, 5, not common; *sericea*, Heer, Coll. J. J. W.; *recondita*, Kr., Coll. J. J. W.; *hæmorrhoa*, Sahlb., Melleha, 11, rare. *Aleochara clavicornis*, Redt.*, Melleha, 6, not common; (*aurovillosa*, Jek.); *puberula*, Klug, Coll. J. J. W.; *bipunctata*, Ol.*, Marsa, 5; *crassa*, Baudi, Jniena, 6, not common; *morion*, Grav., Coll. J. J. W.; *crassiuscula*, Sahlb.*, general, 10; *tristis*, Grav., Coll. J. J. W.; *nigerrima*, Kr., Jniena, 6; *mœsta*, Grav. var. ?, ? locality; *nitida*, Grav.*, general. *Myrmœcia rigida*, Er., Ta Baldu, Jniena, Ghirghenti, rare, 5, 6. *Alianta plumbea*, Wat., Jniena, 6. *Halobrectha atricilla*, Er.*, Melleha, 11; *algæ*, Hardy, Melleha, 11. *Colpodota sordida*, Marsh.*, Melleha, 11, common; *aterrima*, Gr., ? locality; *nigerrima*, Aubé, Jniena, 7; *fungi*, Grav.*, v. *orbata*, Er., general, 2–5, 9–11. *Amischa analis*, Grav., El Klia, 10, not common. *Geostiba plicatella*, Fauv.*, Jniena, 11, not common. *Atheta pertyi*, Heer*, general, 10; *oraria*, Kr., Coll. J. J. W.; *xanthopus*, Thoms., Coll. J. J. W.; *oblita*, Er., Melleha, 11, rare; *meridionalis*, Rey, Jniena, 11, common; *atramentaria*, Gyll., general; *nigricornis*, Thoms.*, teste J. J. W.; *zosteræ*, Thoms., Ta Baldu, 5, one example; *amicula*, Steph.*, Binjemma, Jniena, 10, 11, common; *longula*, Heer, Jniena, 6, common. *Aloconota gregaria*, Er.*, everywhere. *Tomoglossa luteicornis*, Er., L'Imtahlep, 6, rare. *Dilacra luteipes*, Er., Ta Baldu, 5. *Gnypeta labilis*, Er., Concessione, 5, El Klia, 6. (*Tachyusa cingulata*, Jek.) *Myrmecopora læsa*, Er., Marsa, Marsa Scala, 6; *uvida*, Er., Marsa Scala, 6; *sulcata*, Kies., Jniena, 6. *Falagria sulcata*, Payk.*, Boschetto, 6; *obscura*, Grav.*, everywhere. *Actocharis marina*, Fauv., Jniena, 9. *Pronomæa rostrata*, Er., Ghirghenti, 6, rare. *Myllæna kraatzi*, Sharp, L'Imtahlep, Ta Baldu, 5, Jniena, 10. *Oligota pusillima*, Grav.*, Gbir, Jniena, Binjemma, 10, common. *Hypocyptus seminulum*, Er., St. Paul's Bay, Boschetto, 6, common. *Leucoparyphus silphoides*, L.*, St. Paul's Bay, 6, rare. *Tachyporus hypnorum*, F.*, general; v. *meridionalis*, Fairm., general; *nitidulus*, F.*, general. *Conurus pubescens*, Payk.*, Fort Manoel, Marsa, 5; *pedicularius*, Grav.*, Binjemma, 10, not common. *Mycetoporus nanus*, Er., Gbir, 10, rare; *punctipennis*, Scriba, Coll. J. J. W.; *reichei*, Pand.*, ex Coll. Walker. *Quedius molochinus*, Grav.*, Gbir, Ghirghenti, 6, 9, common; *obliteratus*, Er.*, general, 9, 10. *Creophilus maxillosus*, L., general. *Ocypus olens*, Müll., everywhere; *æneocephalus*, Deg., general, 4, 10, 11; *edentulus*, Block, Gbir, 10, common. *Cafius xantholoma*, Grav., Marsa Scala, 6, Melleha, 11; *sericeus*, Holme, Marsa Scala, 6. *Philonthus politus*, L., Gbir, 6, rare; *sordidus*, Grav.*, Boschetto, 5, common; *ventralis*, Grav.*, Melleha, 6, not common; *discoideus*, Grav.*, Fiddian, 10; *corruscus*, Grav., not common; *ebeninus*, Grav., everywhere; *fimetarius*, Grav.*, Coll. J. J. W.; *nigritulus*, Grav., everywhere; *thermarum*, Aubé*, v. *maritimus*, Motsch., Jniena, Marsa, 10, not common; *laticollis*, Fauv., Boschetto, 6, Gbir, 10, common; *longicornis*, Steph.*, Boschetto, L'Imtahlep, 5, 6, common; *varians*, Payk.*, not common; *agilis*, Grav., Boschetto, 6, not common. *Othius læviusculus*, Steph., here and there, not common. *Leptacinus parumpunctatus*, Gyll., St. Paul's Bay, El Klia, 6, rare; *batychrus*, Gyll.*, Marsa, 7, rare. *Eulissus fulgidus*, F.*, general, 3–10. *Xantholinus punctulatus*, Payk., general; *hesperus*, Er., Zurico, 12, two examples. *Lathrobium lusitanicum*, Er.*, Jniena, 10, not common. *Achenium striatum*, Latr., Jniena, 10, not common; *tenellum*, Er., Jniena, not common; *brevipenne*, Qued., teste J. J. W. *Medon piceus*, Kr., Coll. J. J. W.; *nigritulus*, Er.*, general; *ochraceus*, Grav.*, general. *Scopæus gracilis*, Sperk, El Klia, 10, Marsa, 8, rare; *debilis*, Hoch., El Klia, 10, rare; *lævigatus*, Gyll.*, Ghirghenti, 6, rare. *Domene stilicina*, Er.*, Jniena, 11, not common. *Stilicus orbiculatus*, Payk., general. *Sunius*, n. sp., Ta Baldu, 11, one example; *uniformis*, Duv., Coll. J. J. W.; *bimaculatus*, Er., common, 7; *melanurus*, Küst.*, not common, 9; *walkeri*, Fauv.*, Binjemma, 10, Fort Manoel, 10, very rare; *angustatus*, Payk.*, common, 5, 7, 11. *Stenus melanopus*, Marsh.*, Marsa, Melleha, 4, 5, 10, 11, common; *nigritulus*, Gyll.*, v. *lepidus*, Ws., common, 6; *languidus*, Er.*, common, 6, 10. *Platystethus cornutus*, Gyll., Coll. J. J. W.; *spinosus*, Er.*, Jniena, 10, not common;

nitens, Sahlb.*, Jniena, 11, Marsa, 10, common. *Oxytelus sculptus*, Grav.*, Boschetto, 5, Marsa, 11; *inustus*, Grav., common; *sculpturatus*, Grav., Coll. J. J. W.; *nitidulus*, Grav., common; *complanatus*, Er.*, Jniena, 10; *speculifrons*, Kr.*, common. *Bledius furcatus*, Ol., St. George's Bay, 8, not common; *graellsi*, Fauv., Coll. J. J. W.; *tricornis*, Hbst., Marsa, 9, 10, not common; *corniger*, Rosenh., Salina, 6, common; *unicornis*, Germ.*, common; *debilis*, Er., Melleha, 11, one example. *Trogophlœus riparius*, Lac., L'Imtahlep, Jniena, 6; *bilineatus*, Er., Coll. J. J. W.; *memnonius*, Er.*, Marsa, 7, common; *corticinus*, Grav.*, Gbir, 9, common; *troglodytes*, Er.*, Melleha, 11, rare; *punctipennis*, Kies., L'Imtahlep, Marsa, 6, 7, common; *alutaceus*, Fauv., Marsa, 7, common; *pusillus*, Grav., El Klia, 5; n. sp., El Klia, 5, Melleha, 11, two examples. *Omalium allardi*, Fairm., Coll. J. J. W. *Pycnoglypta rufula*, Er.*, Valletta, Zurico, Gozo, 1, 11, 12. *Protinus atomarius*, Er.*, here and there. *Megarthrus affinis*, Mill.*, Encita, 4, rare.

Micropeplidæ.

Micropeplus porcatus, Payk.*, Encita, 4, rare.

Pselaphidæ.

Bryaxis cameroni, Rttr., 5–9, common; *globulicollis*, Rey, Salina, 6, Marsa Scala, 6, common; *opuntiæ*, Schmidt, Jniena, 11, common. *Euplectus brunneus*, Grim., Coll. J. J. W.

Scydmænidæ.

Cyrtoscydmus, n. sp.*, Fort Manoel, 10, rare. *Scydmænus tarsatus*, Müll.*, Gbir, 5, rare; *antidotus*, Germ.*, Marsa Scala, 11, rare; ? sp. n., Marsa, one example.

Silphidæ.

Catops morio, F*, Marsa, rare; *Ptomophagus sericatus*, Chaud., Fort Manoel, 5, one example. *Silpha olivieri*, Bedel*, general, 1–6, 11, 12.

Anistomidæ.

Hydnobius demarchii, Rttr., one example. *Agathidium lævigatum*, Er., Coll. J. J. W.

Clambidæ.

Calyptomerus dubius, Marsh., Binjemma, 10. *Cybocephalus politus*, Germ., Boschetto, 5, Gozo, 6, common.

Corylophidæ.

Parmulus nanus, Rey, general; *densatus*, Rttr., general. *Sericoderus lateralis*, Gyll., L'Imtahlep, 5.

Trichopterygidæ.

Ptenidium pusillum, Gyll., Ghirghenti, St. Paul's Bay, 6, common. *Actidium aterrimum*, Motsch., Birzebuggia, 7. *Actinopteryx fucicola*, Allib., Marsa Scala, M. Scirocco, 8, common. *Trichopteryx brevipennis*, Er., L'Imtahlep, 5; *sericans*, Heer, Melleha, 7, common.

Phalacridæ.

Phalacrus fimetarius, F., general, 3–11; v. *minor*, Guill., Coll. J. J. W.; *substriatus*, Gyll., Marsa Scala, 7, rare. *Olibrus bimaculatus*, Küst., general, 5, 9, 10; *liquidus*, Er., Marsa Scala, 8, common; *affinis*, Sturm*, common; *pygmæus*, Sturm*, not common. *Stilbus testaceus*, Panz.,* very common.

Endomychidæ.

Myrmecoxenus picinus, Aub., St. Paul's Bay, 6, common. *Symbiotes gibberosus*, Luc.*, Gbir, 10.

Cryptophagidæ.

Cryptophilus integer, Heer*, Boschetto, 6. *Leucohimatium elongatum*, Er., Coll. J. J. W. *Cryptophagus thomsoni*, Rttr., Jniena; *scanicus*, L., Ta Baldu, 6; *vini*, Panz., Ghirghenti, 6. *Atomaria unifasciata*, Er., Valletta; *scutellaris*, Motsch, Melleha, 11. *Ephistemus globulus*, Payk., Jniena, 9.

Lathridiidæ.

Merophysia formicaria, Luc., Fort Manoel, 5, rare. *Holoparamecus bertouti*, Aub., Marsa Scala, 6, common; *niger*, Aub.*, Melleha, 11, common; *caularum*, Aub., Coll. J. J. W.; *singularis*, Beck, on board in Grand Harbour. *Enicmus minutus*, Er., Coll. J. J. W.; *transversus*, Ol.*, common throughout the year. *Cartodere elegans*, Aubé, Gbir, 5, one example. *Melanophthalma sericea*, Mann., Fort Manoel, 10; *distinguenda*, Com.*, common throughout the year; *fulvipes*, Com.*, common throughout the year.

Tritomidæ.

Litargus coloratus, Rosh.*, common throughout the year. *Typhæa fumata*, L., Fort Manoel, 5.

Nitidulidæ.

Cercus rufilabris, Latr., Ta Baldu, 5, common. *Brachypterus glaber*, Newm.*, common, 5; ? n. sp., one example. *Carpophilus immaculatus*, Luc.*, Boschetto, 6; *mutilatus*, Er., common throughout the year; *hemipterus*, L., common throughout the year. *Nitidula flavomaculata*, Rossi, Marsa, 10, one specimen. *Pria dulcamaræ*, Scop., Gozo, 7, not common. *Meligethes picipes*, Sturm*, Boschetto; *lugubris*, Sturm, Jniena, 6. *Rhizophagus bipustulatus*, F.*, Zurico, 2.

Trogositidæ.

Tenebrioides mauritanicus, L., common near granaries throughout the year.

Colydiidæ.

Ditoma crenata, F., Coll. J. J. W. *Aglenus brunneus*, Gyll., Jniena, 10.

Cucujidæ.

Læmophlœus ferrugineus, Steph.*, very common throughout the year; *hypobori*, Perr., L'Imtahlep, St. Paul's Bay, 3, 4, 5, common. *Hypocoprus quadricollis*, Rttr., St. Paul's Bay, 6, common. *Xenoscelis costipennis*, Fairm.*, Jniena, 10, not common. *Silvanus surinamensis*, L., common throughout the year. *Cathartus advena*, Waltl, Coll. J. J. W. *Monotoma spinicollis*, Aub.*, St. Paul's Bay, 6, not common; *picipes*, Herbst*, one example.

Dermestidæ.

Dermestes frischi, Kug.*, very common, 4–10; *undulatus*, Brahm, Gozo, Encita, 3, 4, rare. *Attagenus piceus*, Ol.*, v. *dalmatinus*, Küst., Valletta, 5, not common; *marginicollis*, Küst., not common; *bifasciatus*, Rossi*, common, 3–6. *Anthrenus fasciatus*, Hbst., common, 3–6; *biscrensis*, Rttr., very common, 6, 7, 8; *verbasci*, L.*, Boschetto, 6, not common; *fuscus*, Latr., Boschetto, 6, rare.

CISTELIDÆ (= BYRRHIDÆ, olim).

Syncalypta, ? n. sp., Coll. J. J. W.

THORICTIDÆ.

Thorictus grandicollis, Germ.*, general.

HISTERIDÆ.

Hister major, L.*, here and there; *ventralis*, Marsh., Marsa, 5; *bimaculatus*, L., v. *morio*, Schmidt, here and there. *Carcinops minima*, Aub.*, Marsa, 6; *14-striata*, Steph., St. Paul's Bay, 6. *Saprinus semipunctatus*, F., Melleha, Marsa Scala, 6; *chalcites*, Ill., Marsa Scala, 8; *nitidulus*, Payk.*, Marsa Scala, 8; *pulcherrimus*, Web.*, Salina, 3; *algericus*, Payk., rare; *spretulus*, Er., rare; *cribellaticollis*, Duv., Marsa, 7; *rubripes*, Er., Melleha, 11; *apricarius*, Er., rare; *dimidiatus*, Ill., rare. *Onthophilus exaratus*, Ill., Valletta, 11. *Acritus seminulum*, Küst.*, St. Paul's Bay, 6.

SCARABÆIDÆ.

Scarabæus semipunctatus, F., Melleha, 10–12, 1–3; *variolosus*, F., general. *Copris hispanus*, L., not uncommon. *Bubas bison*, L., Marsa, Ghirghenti, Melleha, early months of year; *bubalus*, Ol., Coll. J. J. W. *Chironitis hungaricus*, Hbst., Corradino, Wied el Klaja, 6, 8. *Onthophagus taurus*, Schreb., not uncommon, Jniena, 10; *andalusiacus*, Waltl, not uncommon, Jniena, 10. *Oniticellus fulvus*, Goeze, not uncommon, Jniena, 7. *Aphodius fimetarius*, L., Attard, 10, Jniena, 6; *granarius*, L.*, common; *hydrochæris*, F.*, Marsa; *nitidulus*, F.*, Jniena, Zibbih; *longispina*, Küst., Marsa, 9, Jniena, 6; *tersus*, Er., Marsa, 4; *lineolatus*, Ill.*, Marsa, Corradino, 2: *consputus*, Creutz., Coll. J. J. W.; *unicolor*, Ol., Marsa, 5; *lividus*, Ol., Notabile, 8; *quadriguttatus*, Hbst., Coll. J. J. W. *Pleurophorus cæsus* *, Panz., general. *Rhyssemus arenarius*, Costa, Coll. J. J. W. *Psammodius sulcicollis*, Ill., Fort Manoel, 10; *porcicollis*, Ill., Melleha, 10. *Diastictus vulneratus*, Sturm, Coll. J. J. W. *Trox hispidus*, Pont.*, v. *asiaticus*, Fald., here and there. *Geotrupes douei*, Gory *, general; *lævigatus*, F.*, general. *Pentodon punctatus*, Villers *, general. *Phyllognathus silenus*, F., Attard, 9. *Oryctes grypus*, Ill., Attard, Marsa Scirocco, 10. *Epicometis squalida*, Scop.*, general. *Leucocelis funesta*, Poda*, general. *Potosia metallica*, F., v. *cuprea*, Gory, flowers of *Cynara horrida*, common, 6;

angustata, Germ.*, flowers of *Cynara horrida*, rare. *Æthiessa floralis*, F., flowers, 6.

BUPRESTIDÆ.

Capnodis tenebrionis, L.*, Ghirghenti, 6, rare. *Anthaxia umbellatarum*, F., Gozo, 6. *Acmæodera discoidea*, F., Coll. J. J. W. *Agrilus obscuricollis*, Kies., Musta, Boschetto, 6.

ELATERIDÆ.

Drasterius bimaculatus, Rossi, Marsa, 10, 11, common. *Cardiophorus argiolus*, Gené *, Ta Baldu, 6, common; *maculicrus*, Desbr.*, v. *beloni*, Desbr., Gozo. *Athous castaneus*, Fairm., Attard, Gbir, Salina, 9, 11. *Isidus moreli*, Rey, Melleha, 6, rare.

CEBRIONIDÆ.

Cebrio gigas, F., Ghirghenti, Attard, Melleha.

CANTHARIDÆ.

Lampyris lareynici, Duv., general, 6. *Malthinus scapularis*, Mars., not uncommon, St. Paul's Bay, 4. *Malthodes malcolmi*, Pic, Boschetto, 5; sp., Ta Baldu, 6; *ragusæ*, Fiori*; *cameroni*, Pic, Gbir, 5, rare. *Drilus flavescens*, Rossi *, Gozo. *Charopus apicalis*, Kiesw., Salina, 5. *Colotes maculatus*, Lap., general; *punctatus*, Er., St. Paul's Bay, 6. *Hypebæus flavicollis*, Er.*, Ta Baldu, Boschetto, 5. (*Ebæus cyaneus*, Lap.) *Attalus melitensis*, Peyr., general, 5; var. with all femora testaceous,[1] Marsa, Ghirghenti, 5, 6; *erythroderus*, Er., Ta Baldu, 5. (*Malachius dissimilis*, Baudi.) *Henicopus scutellaris*, F., Salina, 6; v. *rufotestaceus*, Salina, 6. *Dasytes ærosus*, Kiesw., Barracca, 4. *Psilothrix cyaneus*, Oliv.*, Gbir, 4, 5; *melanostoma*, Brull.*, Gbir, 4, 5. *Haplocnemus melitensis*, Schilsky, Ta Baldu, 6. *Dasytiscus melitensis*, Bourg.*, El Klia, Fiddian, 3, 6. *Danacæa pallipes*, Panz., Boschetto, 6.

CLERIDÆ.

Tillus transversalis, Charp., L'Imtahlep, 5. *Necrobia ruficollis*, F.*, here and there, 6, 10; *rufipes*, Degeer *, general, 10.

BRUCHIDÆ (= PTINIDÆ, olim).

Gibbium boieldieui, Levr., Valletta, 4, 5. *Niptus*

[1] This is the var. *testaceipes*, Pic, Ech. 1903, 169.

(*Microptinus*) *reitteri*, Pic, L'Imtahlep, 5. *Bruchus* (*Ptinus*) *spitzyi*, Villa, Jniena, 11; *affinis*, Desbr., Valletta, 3; *variegatus*, Rossi *, Valletta; *duvali*, Lareyn., Coll. Gatto; *brevipilis*, Desbr., Boschetto, 6, Attard, 9; *reichei*, Boield., Jniena, 10.

BYRRHIDÆ (= ANOBIIDÆ, olim).

Byrrhus nitidus, Hbst., Boschetto, 6; *hirtus*, Ill., Coll. Gatto; *paniceus*, L.*, Valletta. *Oligomerus reyi*, Bris.*, Valletta. *Metholcus cylindricus*, Germ., St. Paul's Bay, 6. *Lasioderma hæmorrhoidale*, Ill.*, Ta Baldu, 6; *bicolor*, Schauf., L'Imtahlep, 6; *bubalus*, Fairm., general; sp., Boschetto, 6; *testaceum*, Duft, Binjemma, 10.

LYCTIDÆ.

Lyctus brunneus, Steph., Valletta.

BOSTRYCHIDÆ.

Xylopertha pustulata, F., Coll. Gatto.

TENEBRIONIDÆ.

Erodius neapolitanus, Sol., Melleha, 10–12, 1–3. *Tentyria sardoa*, Sol., Fort Manoel, Ricasoli; *lævigata*, Stev.*, v. *leachi*, Baudi, everywhere. *Stenosis melitana*, Rttr.*, pretty general. *Dichillus pertusus*, Kies.*, Porto Reale, 3, very rare. *Helenophorus collaris*, L.*, here and there. *Akis melitana*, Rttr., common. *Scaurus striatus*, F.*, common. *Blaps gigas*, L., not uncommon; *mucronata*, Latr.*, not uncommon; (*foveicollis*, All.). *Asida melitana*, Rttr.*, Valletta, Notabile, 10, 12. *Pimelia sardoa*, Sol., v. *subscabra*, Sol.*, general. *Ocnera angustata*, Sol.*, 5–9, here and there. *Crypticus cameroni*, Rttr., Melleha, 10–12, 1–2. *Dendarus carinatus*, Muls., Ta Baldu, 10. *Phylax littoralis*, Muls., v. *melitensis*, Baudi *, common. *Scleron abbreviatum*, Reiche, Coll. J. J. W. *Opatrum melitense*, Küst., Melleha, 11. *Gonocephalum setulosum*, Fald.*, Marsa Scala; *rusticum*, Ol., Marsa, 8. *Penthicus punctulatus*, Brull., Ricasoli, 10. *Ammobius rufus*, Luc., Melleha, 7, 11. *Trachyscelis aphodioides*, Lat., Melleha, 11. *Phaleria acuminata*, Küst., Jniena, 6. *Pentaphyllus testaceus*, Hellw., Coll. J. J. W. *Tribolium ferrugineum*, F., Valletta, 10. *Corticeus castaneus*, F., Coll. J. J. W.; *bicolor*, Ol., Coll. J. J. W. *Phthora crenata*, Germ.*, Marsa, 8. *Echocerus cornutus*, F., general.

Alphitobius diaperinus, Panz.*, Coll. Gatto. *Clitobius ovatus*, Er.*, Fort Manoel, 10. *Cossyphus insularis*, Lap., Jniena, 11. *Tenebrio molitor*, L., Imtarfa, 7, 8. *Calcar elongatum*, Hbst., Jniena, 11. *Helops pygmæus*, Küst., Gbir, Jniena, 10, 11. *Gonodera nitidula*, Kiesw., Ta Baldu, 6. *Omophlus melitensis*, Baudi (*championi*, Rttr.), pretty general, 4.

MORDELLIDÆ.

Mordellistena micans, Germ., 4, 5, 6, general. *Anaspis varians*, Muls., Jniena, 6.

RHIPIPHORIDÆ.

Emenadia flabellata, F., S. Giorgio, 8, 9.

MELOIDÆ.

Meloë violaceus, Marsh.*, here and there, 4, 5; *purpurascens*, Germ.*, Musta, Marsa; *tuccius*, Rossi*, here and there, 1, 2, 3, 5; *rugosus*, Marsh.*, here and there, 2, 3. *Hapalus bimaculatus*, L., v. *caruanæ*, Rttr.*, Marsa, Marsa Scirocco, Attard, 1, 2.

ANTHICIDÆ.

Euglenes populneus, Panz., Ta Baldu, 10. *Anthicus rodriguesi*, Latr.*, Melleha, 11; *humilis*, Germ.*, Marsa, 8; v. *lameyi*, Marsh., Marsa, 8; *minutus*, Laf.*, Marsa, 8; *formicarius*, Goeze *, Fort Manoel, 10; *instabilis*, Schm.*, general; *opaculus*, Woll., Ghirghenti, 8, Fort Manoel, 10; *velox*, Laf., general, 5; 4-*guttatus*, Rossi *, Marsa, St. Paul's Bay, 8; *hispidus*, Rossi *, Marsa, Gbir, 10; *fenestratus*, Schm., Melleha, 7. *Aulacoderus melitensis*, Pic, flowers, 5, 6. *Ochthenomus tenuicollis*, Rossi *, Jniena, Melleha, 10.

ŒDEMERIDÆ.

Nacerdes melanura, L., here and there. *Œdemera simplex*, L., general, 6; *unicolor*, Schm., district uncertain, 6; *barbara*, F., L'Imtahlep, 5. *Stenostoma melitense*, Cam.,[1] Jniena, 6.

CURCULIONIDÆ.

Otiorrhynchus affaber, Boh., Jniena, rare; *lugens*, Germ.*, general; *cribricollis*, Gyll., general. *Sciaphilus siculus*, Boh., ex. Coll. J. J. W. *Barypithes mollicomus*, Ahr. *Strophomorphus porcellus*, Sch., Jniena, Binjemma, 10, 11, rare.

[1] Ent. Mo. Mag. 1907, p. 226.

Sitona cachecta, Gyll., v. *setulifer*, Fahrs., Melleha; *intermedius*, Küst., Ta Baldu, 6; *cambricus*, Steph., Gbir, 5; *ocellatus*, Küst., Melleha, 5; *crinitus*, Hbst., locality unknown; *sericsetosus*, Fahrs., pretty general, 4, 5; *tibialis*, Hbst., Melleha, 5; *flavescens*, Marsh., v. *cinnamomeus*, All., Jniena, 6; *humeralis*, Steph., v. *discoideus*, Gyll., common; *virgatus*, Fahrs., Jniena, 5; *lineatus*, L.*, common. *Trachyphlœus laticollis* *, Boh., St. Paul's Bay, 8; n. sp., Floriana. *Thylacites belloni*, Desbr., Marsa, 8. *Brachycerus algirus*, F.*, general; *albidentatus*, Gyll., here and there; *undatus*, F.*, general. *Cleonus maculicollis*, Chev.*, Melleha, 5, not common; *mendicus*, Gyll., Fort Manoel, 10; *excoriatus*, Gyll., general; *cinereus*, Sch., Zibbih, 10; *madidus*, Ol.*, Birzebuggia, 7. *Lixus anguinus*, L.*, Coll. Gatto; *algirus*, L.*, general, 7; *junci*, Boh., Marsa, 8. *Larinus vittatus*, F., Boschetto, 5; *cynaræ*, F., v. *glabrirostris*, Sch., general on *Cynara horrida*; *flavescens*, Germ., general. *Rhinocyllus conicus*, Fröl., L'Imtahlep, 5. *Gronops lunatus*, F.*, Marsa, 10. *Rhytideres plicatus*, Oliv.*, general. *Hypera philanthus*, Oliv.*, pretty general, 7, 8; *crinita*, Boh., pretty general, 7, 8; *pastinacæ*, Rossi, Melleha, 10; *murina*, F., TaBaldu, 10; *variabilis*, Hbst.*, pretty general, 7, 8; *nigrirostris*, F.*, Jniena, 6; *jucunda*, Cap., Coll. Gatto. *Limobius borealis*, Payk., Ta Baldu, 5. *Pachytychius squamosus*, Gyll., Salina, 5. *Smicronyx cyaneus*, Gyll., Gbir, 10; *jungermanniæ*, Reich.*, general. *Orthochætes setiger*, Beck, Coll. J. J. W. *Chærorrhinus squalidus*, Fairm., Coll. J. J. W. *Mesites pallidipennis*, Boh., Valletta, 6; *curvipes*, Boh., Ghirghenti, 8. *Codiosoma spadix*, Hbst.*, Boschetto, 6. *Acalles ptinoides*, Marsh., Coll. J. J. W.; *diocletianus*, Germ., Jniena, 10. *Cœliodes cardui*, Hbst., rifle range, 5. *Ceuthorrhynchidius troglodytes*, F.*, rifle range, 5. *Ceuthorrhynchus peregrinus*, Gyll., L'Imtahlep, 5; *rugulosus*, Hbst.*, rifle range, 5; *melanostictus*, Marsh., rifle range, 5; *quadridens*, Panz.*, rifle range, 5; *melitensis*, Schultze*, rifle range, 5. *Baris timida*, Rossi, Coll. J. J. W.; *spoliata*, Boh.*, Marsa, 5, Melleha, 11; *cœrulescens*, Scop., Coll. J. J. W.; *picturata*, Mén., Marsa, 7, one example. *Sphenophorus piceus*, Pall., here and there; *abbreviatus*, F., Ghirghenti, 3, El Klia, 6. *Calandra granaria*, L., general; *oryzæ*, L.*, general. *Anthonomus ornatus*, Reiche, Zibbih, 6. *Tychius grenieri*, Bris., Coll. J. J. Walker; *meliloti*, Steph.*, general; *tomentosus*, Hbst., Ta Baldu, 6. *Sibinia primita*, Hbst.*, Boschetto, 6; *arenariæ*, Steph.*, Marsa, 6; *attalica*, Gyll., ex J. J. Walker's Coll. *Rhamphus pulicarius*, Hbst., Ta Baldu, 5. *Mecinus pyraster*, Hbst.*, Floriana, rifle range, 5; *circulatus*, Marsh., an example in Mr. E. A. Newbery's Collection obtained by P. de la Garde. *Gymnetron simum*, Rey *, Coll. Gatto. *Nanophyes hemisphæricus*, Ol.*, El Klia, 7; *nitidulus*, Gyll., Boschetto, 6. *Apion carduorum*, Kirb., v. *galactitis*, Wenck.*, common everywhere; v. *meridianum*, Wenck., common everywhere; *penetrans*, Wenck., Boschetto, 7; *detritum*, Rey, Gozo, 6; *robusticorne*, Desbr., Coll. J. J. W.; *brisouti*, Bed., Jniena, 6; *semivittatum*, Gyll.*, everywhere; *rufescens*, Gyll., everywhere; *æneum*, F., Coll. Gatto; *radiolus*, Marsh., Gozo, 7, Ta Baldu, 5; *pubescens*, Kirb., Ghirghenti, 8; *rufirostre*, F.*, L'Imtahlep, 5, Marsa, 6; *dentipes*, Gerst., Jniena, 5; *apricans*, Hbst.*, everywhere; *pisi*, F., Boschetto, 5; *vorax*, Hbst., Boschetto, 5; *frumentarium*, L., near Valletta, one example; *malvæ*, F.*, Gbir, L'Imtahlep, 5; *violaceum*, Kirby*, Jniena, 6. *Rhynchites præustus*, Boh., Ta Baldu, 6.

Anthribidæ.

Urodon canus, Küst.*, L'Imtahlep, 5; *Cercomorphus duvali*, Perris, Ghirghenti, 5, one example.

Mylabridæ (= Bruchidæ, olim).

Mylabris (*Bruchus*) *pisorum*, L.*, general; *pallidicornis*, Boh., Coll. J. J .W.; *ulicis*, Rey, L'Imtahlep, 5; *tristis*, Boh., L'Imtahlep; *sertata*, Ill., Jniena, 6; *rufipes*, Hbst., general; *rufimana*, Boh.*, general; v. *velutina*, Rey, Coll. J. J. W.; *laticollis*, Boh., L'Imtahlep, 5; *chinensis*, L., Coll. Gatto; 5-*guttata*, Ol., Ghirghenti, Salina, 6; v. *meleagrina*, Gené, Ghirghenti, Salina; *seminaria*, L., v. *picipes*, Germ.*, Boschetto, L'Imtahlep, 5, 6; *albolineata*, Blanch., Coll. Gatto; *biguttata*, Ol., Jniena, Concessione, 6; v. *fulvipennis*, Germ., Jniena, Concessione, St. Paul's Bay, 6; v. *mendicans*, Ws., Jniena, Concessione, 6; *murina*, Boh., Ghirghenti, 8; *bimaculata*, Ol.*, Marsa Scala, 8; *imbricornis*, Panz., everywhere; *anxia*, Fahrs., ? district, 5; *pygmæa*, Boh., Coll. J. J. W.; *ovalis*, Blanch., L'Imtahlep, 5. *Spermophagus cardui*, Boh., Ghirghenti, Marsa, 8.

Scolytidæ.

Hylesinus fraxini, Panz.*, Ghirghenti. *Scolytus scolytus*, F., Coll. J. J. W. *Phlœotribus scarabæoides*, Bern., Marsa Scirocco, 8, 9. *Hypoborus ficus*, Er.*, Marsa Scirocco, 9.

Cerambycidæ.

Cerambyx cerdo, L., dockyard; *miles*, Bon.*, Marsa Scirocco, Jniena, 6. *Hesperophanes cinereus*, Villers, Notabile, Marsa Scirocco, 9. *Callidium violaceum*, L., very rare. *Hylotrupes bajulus*, L., dockyard, 5. *Rhopalopus clavipes*, F., very rare. *Liagrica timida*, Mén., here and there. *Clytanthus varius*, F., Boschetto, 6. *Parmena solieri*, Muls., Marsa Scala, 11. *Niphona picticornis*, Muls., Marsa Scala, 8. *Calamobius filum*, Rossi, Ta Baldu, Ghirghenti, L'Imtahlep, 5. *Agapanthia asphodeli*, Lat.*, common, 1, 2; *cynaræ*, Germ., Fort Manoel, Corradino, 2, 3; *cardui*, L., L'Imtahlep, 6. *Saperda punctata*, L., Valletta. (*Oberea erythrocephala*, Schr., v. *melitana*, Reiche).

Chrysomelidæ.

Lema melampa, L.*, pretty general. *Crioceris paracenthesis*, L., Marsa Scirocco, 6. *Labidostomis taxicornis*, F.*, pretty general. *Cryptocephalus signaticollis*, Suff.*, Jniena, 6; *ochroleucus*, Fairm., Marsa Scala, 8. *Pachnephorus impressus*, Rosh., Jniena, 10; *cylindricus*, Luc., Jniena, 11. (*Timarcha melitensis*, Ws.) *Chrysomela banksi*, F., here and there, 10, 11; *variolosa*, Pet.*, here and there, 10; *erythromera*, Luc.*, Melleha, 11, rare; *quadrigemina*, Suff., Gbir, 11; *didymata*, Scrib., Zibbih, 10; *bicolor*, F., Coll. Gatto; *americana*, L.*, here and there, 3, 6; *grossa*, F.*, Notabile, 9. *Prasocuris distincta*, Luc., v. *marginicollis*, Suff., Jniena, 11. *Aulacophora abdominalis*, F.*, general. *Podagrica semirufa*, Küst.*, general. *Crepidodera impressa*, F., Jniena, 6. *Ochrosis ventralis*, Ill., general. *Chætocnema tibialis*, Ill., Melleha, 10, 11; *aridula*, Gyll.*, Gbir, 10. *Psylliodes inflata*, Reiche*, Fort Manoel, 10; *chrysocephala*, L., L'Imtahlep, Boschetto, 5; v. *nucea*, Ill., Coll. J. J. W.; *napi*, F., Jniena, 6: *pallidipennis*, Rosh.*, Binjemma, 10. *Phyllotreta rugifrons*, Küst., Ta Baldu, 6; *lativittata*, Kütsch.*, Ghirghenti, 9; *cruciferæ*, Goeze, Ta Baldu; *consobrina*, Curt., Gozo, L'Imtahlep, 5; *procera*, Redt.*, general. *Aphthona flaviceps*, All.*, Marsa Scala, 8; *nigriceps*, Redt.*, Ta Baldu, 10; *pygmæa*, Kütsch.*, general: *euphorbiæ*, Schr., Ghirghenti, 8. *Longitarsus echii*, Koch*, 5; *æneus*, Kütsch.; *corynthius*, Reiche*, 5; *brunneus*, Duft., St. Paul's Bay, 4; *luridus*, Scop., St. Paul's Bay, 11; *stragulatus*, Foudr.*, Coll. Gatto; *lateripunctatus*, Rosh., Ta Baldu, 10; *exoletus*, L., L'Imtahlep; *lycopi*, Foudr.*, Jniena, 6; *pratensis*, Panz., Gbir, 10; v. *minima*, Kütsch., Gbir; *tabidus*, F., Birchicara, 7; *æruginosus*, Foudr., L'Imtahlep, 6; *ochroleucus*, Marsh., L'Imtahlep, 5; *pellucidus*, Foudr., Birchicara, 7; *membranaceus*, Foudr., general, 5; *cerinus*, Foudr., Gbir, 5. *Dibolia occultans*, Koch, L'Imtahlep, 6. *Sphærođerma testaceum*, F., Boschetto, 10; *ocularia*, All., Ghirghenti, 8. *Cassida vittata*, Vill., on *Atriplex*, 5, 6; *hemisphærica*, Hbst., Ghirghenti, 8.

COCCINELLIDÆ.

Epilachna chrysomelina, F., common. *Coccinella 7-punctata*, L.*, common; 11-*punctata*, L., Barracca, 5; 10-*punctata*, L., Boschetto, Ta Baldu, 10. *Chilocorus bipustulatus*, L., pines, Boschetto, 6. *Exochomus 4-pustulatus*, L., Floriana, 10. *Rhizobius litura*, F., general; v. *discomacula*, Costa*, Jniena, 10. *Scymnus subvillosus*, Goeze, v. *pubescens*, Panz., and *pallidivestis*, Muls., general; *arcuatus*, Rossi, v. *hausmanni*, Gredl., Gozo, 6, rare; *punctillum*, Ws., Gbir, 9; *interruptus*, Goeze, everywhere, 7; v. *basalis*, Redt., Salina, Gozo, 6; *kiesenwetteri*, Muls., here and there, rare; *pulchellus*, Hbst., St. Paul's Bay, 8; *bipunctatus*, Kugel., Binjemma, 10.

XXI. *Life History of* Cydimon (Urania) leilus, L. By L. Guppy, jun.

[Read April 10th, 1907.]

Plates XXVI, XXVII.

In "A Handbook to the Order Lepidoptera," by W.F.Kirby, vol. iii, p. 45 ("Lloyd's Natural History"), it is stated, "The earlier stages are unknown, for it is not possible that the larva figured by Madame Merian, with long branching spines as hard as iron wire, can belong to a *Cydimon*, in view of MacLeay's description, etc., of *C. boisduvalii.*"

This statement is correct, as my description and figures of the early stages will show.

I have observed *C. leilus* carefully for years past, especially in 1901, when they swarmed all over the island, and I have netted numbers of females in a fresh and immaculate condition, and from their appearance it would seem they had not come from far; however, it always occurred to me, whatever the larvæ fed upon, if they were properly established on this island, from their numbers there would surely be some indication from the state of the vegetation to betray their whereabouts, in the shape of trees, creepers, etc., denuded of their leaves.

I may here observe, however, that as the creeper on which they *do* feed is often so much concealed by other similar and parasitic plants, that the destruction of this particular creeper might pass unnoticed; and the lofty trees in the forests on which these grow are not sufficiently under observation anyhow, especially as the season in which I discovered the eggs and larvæ is the wettest and stormiest time of the year.

In a spot about eight miles inland (due east from the town of Port of Spain), situated at the foot of the northern hills of Trinidad, on the southern side, there are a few big trees, the remnant of the virgin forest which was cut down to form the present cacao plantation, overgrown, as is always the case with our forest trees, by parasites and creepers, till there is hardly anything to be seen of the trees themselves. Amongst this tangled growth *Omphalea megacarpa*, Hemsley, holds a prominent place; it is known locally as the "Hunterman's Nut," the fruit being very palatable, in flavour somewhat like a Brazil nut. This creeper climbs from the ground and clings to the trunk of the trees, growing over the topmost branches and hanging down in festoons.

In September 1901, numbers of the imagines of *C. cilus* were observed by my brother, Mr. Eric Guppy, flying up and down these trees, and his statement that he saw some of them depositing eggs on the creeper during the day was subsequently verified.

On the 15th of September I made a thorough search, and was rewarded by finding about eighteen eggs; they were deposited under leaves within six feet of the ground, and the majority were found on small creepers that grew on a thick hedge near by, evidently seedlings of the large ones. The eggs are usually laid singly or in pairs on the underside of a leaf, though I found subsequently one lot of seven and another of eight, laid irregularly, fairly close together but not touching.

I was not able to examine to any height up these trees, both on account of the masses of foliage that grew on their trunks, and the ants, scorpions, tarantulas, etc., that make their homes in the hidden recesses of the bark.

Description of Egg.

Egg spherical, and when freshly laid nearly white, suffused with a pale yellowish tint, and there are twenty about longitudinal ribs or ridges. Two or three days before hatching the eggs turn yellow.

Larva.

The newly-hatched larva, which has sixteen legs, consumes the greater part of the egg-shell. Head in proportion, black and shining, like a small bead. Body white with a faint bluish tint; there are eleven black transverse lines or belts, and a sparse down which is only evident on close examination.

At this stage and after the first moult they are particularly active, and spring madly about when touched.

After the first moult the head becomes yellowish-red with black dots, and a few fine hairs. Eight long black hairs appear on the body, rising fine but becoming slightly clubbed towards the tip, which ends in a fine white point. These long hairs are situated as follows:—two on the 2nd, four on the 3rd, and two on the 10th, segment. The legs are black, and the white on the body shows up distinctly in contrast with the black transverse lines. The 3rd and 10th segments are almost entirely black.

After the second moult two more long black hairs appear; they are situated on the 11th segment and incline backwards. The general appearance is much the same as after the first moult, black, however, predominating. The segments appear to be divided by transverse white lines when viewed laterally.

After the third moult two more long hairs appear on the 12th segment, projecting over the anal portion like a pair of tails. There is a lateral row of eight or nine white spots from the 3rd to the 11th segments, those just over the first pair of abdominal legs being larger, those on the other segments being mere specks; these spots appear on all the larvæ after the third moult. There are also from two to four reddish spots on the 1st segment, which is otherwise black; sometimes there is more of a pattern than decided spots.

As will be seen from my illustrations, the larvæ are apt to vary a good deal after the third and fourth moults.

The body generally is black and white, but irregularly and differently placed in different larvæ. Generally there is a transverse wavy black line about the middle of each segment edged with white anteriorly; sometimes there are irregular white areas edged with black, and occasionally the ground colour is greyish-lilac with broad black transverse lines, with white spots. The thoracic legs are yellowish-red, the same colour as the head, and the others whitish or flesh-coloured. The number of long black hairs on the body may differ in many larvæ at the fourth moult; two long hairs appear generally on each of the segments from the 4th to the 9th, hitherto only covered with a few fine hairs, in addition to the others on the other segments—these are straighter and finer and project laterally, the others are inclined to curl at the tips.

Pupa.

The pupa is light yellowish-brown, glossy, with black dots and lines; the lines on the thorax just where the wings of the future insect are encased are in imitation of neuration marks. It lies inside a roomy cocoon of yellowish-red silk, which is like a network and through the meshes of which it can be seen. Two leaves of the creeper are fastened one above the other, and the cocoon formed between.

The transformations from the egg to the imago occupy a period of nearly six weeks, of which two are in the pupa state.

The imago as a rule emerges during the night or early morning.

Habits of the Larvæ.

They are solitary, and consume cast-off skin after each moult, which takes place generally during the night or early morning.

They feed as a rule from the underside of a leaf, more often by eating a hole somewhere near the centre, and are very active, dropping immediately on being alarmed, suspended by a silken thread, and they remain suspended until the alarm is over, when they swarm up again quickly. To get from one place to another, if they discover any obstacle to their movements, or that their position is not satisfactory, they cast themselves off after making fast by a silken thread, and lower themselves until an object is reached from which it is possible to explore further.

Habits of the Imago.

I am of opinion that although this moth may be seen here throughout the year, its real home is in the forests of Venezuela, from whence it migrates here annually, more or less according to favourable seasons, during the months of July, August and September; a few females here and there, however, do deposit their eggs in an erratic manner in favourable places in Trinidad, but the majority return to the continent.

In the spot where I discovered their larvæ, judging by the appearance of the creepers they were found on, there could not have been many of the larvæ about, as, though there were leaves slightly eaten here and there, there was nothing to draw attention to the fact that there were any larvæ of such a plentiful insect as *C. leilus*, especially when one considered the immense numbers that appeared in the year I made this discovery.

I am indebted to Mr. Edgell Johnstone, of Messrs. Tennants' Agency, San Fernando, for the following information in connection with their movements in the southern parts of this island:—

"As far as my observation of the 'Green Page' moth (local name of *C. leilus*) is concerned, I noticed them flying both eastward and westward, and I have seen them a mile or so out to sea. . . .

"From the early part of September we had them here by the thousands, lasting for about five weeks. My boys said they were specially numerous about the hospital way, myriads being on or about some trees there. . . ."

The hospital is situated on an elevated piece of land on the sea-coast, in the town of San Fernando.

Mr. Potter, the warden of La Brea, where is situated the famous "Pitch Lake," states that they flew in thousands past the pier at La Brea, and that they congregated in numbers in the woods around there.

Might not these immense flocks that collect at these points, being suitable meeting-places on the sea-coast, assemble there to return to the continent?

It would seem that they have suitable meeting-places along the coast, from whence they return homewards, congregating in vast numbers till, like swallows, they homeward fly, in a similar manner to *C. fulgens*, which, Kirby writes, "is remarkable for its migratory habits."

They are very fond of the blossoms of a plant known locally as "Black Sage," which grows in abundance on all the waste lands in the island, and also another white flowering plant which grows in similar situations and flower at the same period, from July to September, when the moths are most numerous.

The remarks that apply to *C. sloanus*, as quoted by Kirby in "Lloyd's Natural History," in respect to their habits when feeding and sporting around, are also applicable to *C. leilus:* "When one alights, unless it is to suck the blossom, it chooses a leaf or other surface that is nearly vertical and instantly turns head downwards, and rests with the wings expanded in the plane of the body, the anterior pair, however, inclined backwards, so as to form an angle with each other, and partly covering the posterior."

They chase each other about playfully, half-a-dozen or more sometimes joining in the gambols.

I have never observed a pairing, though there has been a lot of gambolling, and I have often observed pairs pursuing one another about most perseveringly.

In the month of September the greatest number appear, though they are plentiful in July and August; and while not very easy to capture, yet by waiting for them on a savanna or open field, as they fly low down and all in one direction, and somewhat leisurely, until alarmed, it is possible by standing up quietly, as each one comes within reach of the net, by a rapid swoop, to catch and kill them as fast as possible.

They do not fly in flocks, but singly, and rise over all obstacles, generally in an easterly direction, and *vice versâ.*

In October only solitary specimens are seen here and there. I found three eggs in the latter part of October 1901, which gave me the same number of imagines early in December 1901.

Since 1901 these moths have not been plentiful. I have seen single specimens here and there, and this may be the case for a few years to come, when quite unexpectedly they will again invade us in immense numbers.

Mr. J. H. Hart, F.L.S., was kind enough to identify the creeper on which they feed—*Omphalea megacarpa,* Hemsley.

I regret not having been able to obtain any more larvæ since 1901, as I shall be anxious to continue observations, especially in regard to the reasons for such a variety in the ground colour of the larvæ, etc.

[A very brief description of the early stages of *Urania leilus,* communicated by Herr Kappler, was published by Dr. E. Hoffman in Stett. Ent. Zeit. xlii, p. 487 (1881). The larva of the Madagascan *Urania rhipheus* has been described by Camboné, Report Int. Congress of Zoology, 1892, II, p. 180.]

Explanation of Plates XXVI, XXVII.

[*See Explanation facing the* Plates.]

XXII. *The Hibernation of* Marasmarcha. By T. A. Chapman, M.D., F.Z.S.

[Read October 2nd, 1907.]

Plate XXVIII.

I have found a good deal of interesting matter in trying to work out the less-known items in the life histories of our British Plume Moths, with a view to assisting Mr. Tutt in making as complete as possible his account of that group in his "British Lepidoptera." Amongst these points, the question as to how each species passed the winter was one, to which the answers varied somewhat in each species and made the research very attractive.

With regard to a good many species much was already known, though often in a rather vague way, such as the hibernation of the imago of *monodactylus*, of the full-grown larva of *microdactyla*, and of the half-grown larvæ of most of the *Aciptiliines*.

Amongst the additions to our information, we have found that most of the Platyptilids hibernate (in the interior of the food-plant usually) in the second instar. The hibernation of *lithodactylus* as an egg, or more accurately, perhaps, of the young larva within the egg-shell, was something of a surprise, and so on.

There is not much difficulty in following out such observations, if sufficient material can be obtained, but *Marasmarcha lunædactylus* (*phæodactyla*), a fairly common species, of which plenty of material was available, defied our (Bacot and others as well as myself) efforts to discover how it passed the winter. I got moths to lay their eggs on growing plants, and afterwards found the empty egg-shells, but no traces of their larvæ. I placed the newly-hatched larvæ on living plants and tried to follow them in their travels, without success; only this summer I placed a number of larvæ in a sleeved plant, and later found that eggs had been laid and larvæ hatched, but a careful dissection of the plant and examination of it, above and below the soil, was without result. This seemed, however, to quite disprove the suspicion that the larva followed Platyptiliid habits and reached the second instar in autumn, but, except for this guess, it left us in the position stated at length in Tutt's "British Lepidoptera," Vol. V, pp. 391–3.

It has given me, therefore, great satisfaction to have succeeded at length in solving this problem, which had puzzled us so much, and the satisfaction is the greater in that the solution is rather unexpected and certainly somewhat extraordinary; nor is it much diminished that the clue to it was afforded in an almost accidental manner.

Marasmarcha tuttidactyla (or *agrorum*, var. *tuttidactyla*) was found commonly at Gavarnie, and a ♀ laid some eggs. These were placed in a glass tube quite alone, under a sort of general idea that something might be done with them if they would refrain from hatching till I got home. However, when I got home they had not only hatched, but most of them had made their arrangements for the winter. Having no better place in which to do it, they had wedged themselves between the glass and the paper covering the cork and spun themselves small cocoons of white silk, several together. The latter circumstance is no doubt accidental, as naturally the eggs are laid singly, and is therefore due to there being practically only these spots available to them. [Pl. XXVIII, fig. 5.]

I was naturally anxious to ascertain whether *phæodactyla* had precisely the same habit. This seemed almost certain from the similarity of the species, and that the larva of *phæodactyla* certainly hibernates very small. I therefore examined with great care the potted plant of *Ononis* already referred to, on which I had left sleeved a number of larvæ of *phæodactyla* on leaving home. The experiment was so far successful that I found a number of empty egg-shells on the plant, but I failed utterly to find the young larvæ in their cocoons, although they were almost unquestionably there somewhere.

Very luckily I picked up about mid-August on our downs a very belated ♀ *phæodactyla*, who very kindly supplied me with a moderate store of eggs. These I divided into two portions. One I placed in a glass tube with a dead leaf or two of *Ononis* and some portions of glass slide covers; the other I put on a comparatively small piece of *Ononis* with a bit of root, which I put in a glass jar in clean sifted sand.

These hatched in due course. About August 29th those in the tube spun themselves cocoons exactly like *tuttidactyla,* between the slide covers and bits of leaf and between the glass of the tube and bits of leaf. A bit of leaf seemed much more to their taste than two glass surfaces.

On September 6th I examined the piece of plant in the sand, and at first was very unsuccessful. By searching on the plant above ground I could find nothing, then on that below I was equally unsuccessful. I finally, however, succeeded in finding half-a-dozen cocoons. These were found, as regards at least four of them, in the sand, with some attachment to dead leaves of *Ononis* that were on or partially buried in the sand; the two others were probably in similar places, as, though free in the sand when I found them, it was at the same time as I found the others, and a search in the sand all round the plant afforded no others. [Pl. XXVIII, figs. 1, 2, 3.]

Later, however, having waited till the sand was quite dry, I carefully sifted it, and obtained by so doing eight further little cocoons, minute aggregations of sand particles on that side with the cocoon in the midst. [Pl. XXVIII, fig. 4.]

These cocoons had sand attached to them, so that the contents were not easily seen. But those built against glass were so thin on that side that the glass formed practically the wall of the cocoon. The cocoon is of course very small, and the larva is coiled up in it, so that it occupies hardly more space than it does in the egg.

The larvæ of *Marasmarcha* (*phæodactyla, fauna, tuttidactyla*) always occur on plants that form a considerable mass, and I imagine that the young larvæ form their hibernating cocoons amongst the dead leaves and other material of the plant close to the ground, and not on the plant itself, but have, owing to the density of the plant, little difficulty in finding a growing point when they come out in the spring.

The examination of the piece of *Ononis* planted in sand, as well as the futile searches made on previous occasions, make me feel certain that the little cocoon is never made in touch with the living plant, but somewhere sufficiently close by. It is so small that one might easily go on for years experimenting on plants growing in an ordinary way in a flower-pot without being able to discover it, and easily explaining our previous want of success.

This habit of hibernating as a newly-hatched larva, without feeding, is quite new amongst the Plume Moths; it is extraordinary, indeed, that such a minute larva should be able not only to pass the winter before eating, but should also be able to afford to secrete silk and spin a cocoon. I cannot remember, indeed, any other similar case amongst the Lepidoptera. The Argynnids and Satyrids afford some larvæ that hibernate before feeding, but they spin no cocoon. Many young larvæ, however, are fully formed before winter within the eggs, and pass the winter there before hatching. We may assume that an egg-shell is a better protection for the winter, under most conditions, than a cocoon, or the habit of hibernating within it would not be so much more frequent than the one I have just related as occurring in *Marasmarcha.*

Explanation of Plate XXVIII.

[*See Explanation facing the* Plate.]

November 20th, 1907.

XXIII. *The Life History, and Occurrence as British, of* Lomechusa strumosa, F. By H. St. J. Donisthorpe, F.Z.S., F.E.S.

[Read November 6th, 1907.]

The life history of this remarkable beetle, which has been worked out by Father Wasmann, is of the greatest interest both to the student of insect bionomics as well as the scientific entomologist.

Lomechusa strumosa is a dweller in the nests of the blood-red robber-ant *Formica sanguinea* (our most interesting indigenous species of ant both on account of its practice of making slaves and its highly intelligent habits), of which the beetle is a guest in the truest sense of the word, as it is both fed and licked by its hosts. *Lomechusa* possesses short aborted labial palpi, and patches of golden hairs on the abdomen whence the ants obtain a sweet secretion, of which they are very fond. I may here mention that I kept some *Lomechusas* in small plaster nests with glass tops, in which were also ants and other insects found in various ants' nests, including several *Myrmetes piceus*, a small Histerid found with *Formica rufa*. These artful little beetles discovered that *Lomechusa* possessed this secretion, and would frequently climb up the legs of the beetle on to its back, where they would remain sucking at these patches for some time, often to the evident discomfort of the *Lomechusa*, which appeared somewhat agitated.

In studying living specimens of *Lomechusa* one may continually see the ants both feed the beetle and also lick it on these patches. If the plates of the abdomen be removed and put under a high power, the orifices under the hairs, whence the secretion exudes, can be well seen. The beetles also ask to be fed, by tapping the ants with their antennæ. I find, however, that they can also feed themselves. I have seen them suck at honey given to the ants, and bite at dead ants, and larvæ given to, or killed by, the latter. One beetle sucked for a long time at a cut-up *Eryx ater* larva, another attacked and sucked a live caterpillar. When a lot of ants are feeding at the honey given to them, *Lomechusa* will come and sit amongst, and crawl over, them. In fact, the beetle is always to be found where the ants are thickest, and then it becomes practically invisible; the reason being, as pointed out by Father Wasmann, that the light which is reflected from the concave sides of the thorax appears to the eye like the narrow back of an ant, and the rolled-up abdomen of the beetle reflects the light in the same way as the rounded abdomen of a fat ant.

I was fortunate enough to observe the courtship of *Lomechusa*; as it has not been recorded before I took careful notes, and it is here described for the first time. I first saw it on the evening of May 19th this year, and subsequently noticed it on many occasions till June 9th. The ♂ and ♀ faced each other, touching their antennæ and mouths together, and tapping each other quickly. The ♂ slowly sidled round to the back of the ♀, touching her all the time with his antennæ, the ♀ moving convulsively the posterior part of her body; the ♂ tapped the posterior parts with his antennæ and mouth, then pushing his head under the body of the ♀, he raised himself on the tips of the front legs, and nearly standing on his head he bent the body right over his back and made desperate endeavours to meet the end of the female's body, when she put up her tail, the posterior part of his body opened

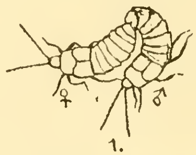


Fig. 1. *Lomechusa strumosa*, in cop.

and clasped hers like a hand and coition took place. The ♂ is then carried hanging back in the air, or walking on the tips of his front pair of legs. They separated, and after caressing each other for a short time, the same process was repeated and copulation resumed. The process of copulation lasts about half-an-hour. I introduced several pairs *in cop.* into the bowl which contains my observation nest of *Formica sanguinea*; when they separated the ♀♀ at once entered the nest, where the eggs are laid.

The only external difference in the sexes is that the antennæ are slightly longer in the ♂; as the legs are not used in any way to grasp or hold the ♀, it can be understood why they are simple in both sexes, and not modified in the ♂.

The perfect insects appear to die off about the middle of June. I took my first specimen this year on April 27th; I exhibited it at the Royal Society on May 8th, and it died on May 30th. I was able to account for all the beetles in my observation nest, as they either came out of the nest to die, or were brought out by the ants; the last died on June 21st.

On September 8th I noticed two new *Lomechusas* out, and have since counted seven specimens altogether; these must have hatched from pupæ, or full-grown larvæ, already in the nest. Of course my study is much warmer than out of doors, and in nature these specimens would hibernate with the ants in their winter quarters by the end of September.

I introduced specimens of *Formica rufa*, *fusca*, and *exsecta*, *Lasius fuliginosus*, and *Formica sanguinea* from different nests at different times into the plaster nests with *Lomechusa*, as all my experiments * have shown that true ants'-nest dwellers are protected from the ants even of another

2.

3.

4.

FIG. 2. Glands of *Lomechusa*. N.B.—The position of the glands is disturbed through dissection.
„ 3. Labium.
„ 4. Dorsal segment of Abdomen.

species, and I found that, though attacked at first, the beetles were able to protect themselves. They shook themselves, stamping with the feet and putting up their

* Cf. Ent. Record, 1901, pp. 349–353; 1903, pp. 11–12; 1906, p. 288, and 1907, p. 256.

tails, and the ants left them alone. I have discovered that when seized *Lomechusa* gives off the same smell as the species of *Myrmedonia*, and having dissected both under the microscope I found they possessed similar glands, which lie in the posterior part of the abdomen underneath the genitalia and alimentary canal, and contain the product which causes this smell.

The larva of *Lomechusa* is very like an ant-larva in appearance, and although it possesses six legs it does not use them, but mimics the attitudes of an ant-larva. The

5

Fig. 5. Larva of *Lomechusa*.

ants value it very much, and on any danger threatening the nest they carry it first into safety. That the ants feed it has been proved by giving them coloured sugar, when the colour can be traced in the digestive canal of the beetle-larva through the delicate white skin. They also place it on their own larvæ, of which it devours large numbers, and Wasmann has shown that its voracity causes the production of "Pseudogynes," or false females, in the nest. These are neither perfect females nor perfect workers, but of an intermediate form which does not work or bite. They are brought about in the following way: The numbers of worker-larvæ consumed by *Lomechusa* causes a decrease in the workers produced in the nest. Now, as is well known, ants can create females by feeding their larvæ on special food, and to make up for the loss of workers they try to turn larvæ which they have started to bring up as females into workers, the result being these "Pseudogynes."

"Pseudogynes" only occur in nests where *Lomechusa* has been for some years, and they will not be found in all nests where *Lomechusa* is present, though of course the beetle will be found where "Pseudogynes" occur, and these nests are the centres from which the beetle spreads to other nests.

At first the beetle is kept in check by the ants digging up its pupa and carrying it about as they do their own, which of course kills a delicate beetle pupa, but as more

" Pseudogynes " are produced fewer pupæ are dug up, till at last the destruction of the colony is brought about.

In North America a beetle, *Xenodusa cava*, closely related to *Lomechusa*, occurs with *Formica rubicunda*, a race of *Formica sanguinea*. Father Wasmann stated that " Pseudogynes " must occur in those nests; at first they could not be found, but after some time his correspondents succeeded in finding them in nests which contained the beetle, a veritable triumph for his theory.

The distribution of *Lomechusa strumosa* embraces the whole of Europe, North and Central Asia as far as Tibet.

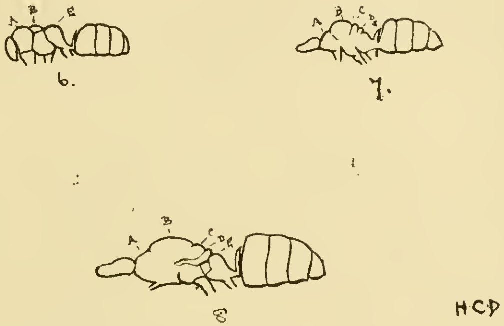


FIG. 6. *Formica sanguinea*, ☿.
" 7. " " Pseudogyne.
" 8. " " ♀.
A. Pronotum. B. Mesonotum. C. Scutellum.
D. Post-scutellum. E. Propodeum.

The history of *Lomechusa* as a British species is as follows:—In Stephens' " Illustrations, Mandibulata, Vol. iv, p. 108 (1832), we read : " Very rare : I have hitherto seen two specimens (which are in the British Museum) only, one of which, I was informed by Dr. Leach, was taken by Sir H. Sloane, on Hampstead Heath in 1710; the other was captured by himself while travelling on the mail-coach between Cheltenham and Gloucester about twenty years since." These two specimens are still in the Museum at South Kensington. It is given as British in G. R. Waterhouse's catalogues of 1858 and 1861, and Rye's of 1866. In Crotch's catalogue of 1863 it is " reputed British," and in his second edition, 1866, as " doubtfully indigenous." After this it is altogether omitted from all our catalogues and books on Coleoptera. On May 25th, 1906, it was re-discovered by me at Woking. I was collecting with the Rev. F. Morice at the time, and we were looking for nests of *Formica sanguinea*, Mr. Morice having asked me to show him how I took beetles in ants' nests. My companion found a nest under an old boot, which drew blank. I subsequently found two more nests near together, on another part of the common, and whilst examining one of them I met with the first specimen of this very fine beetle. On the 29th I went down again and dug up the other nest, when seven more of the beetles were taken. These nests were in a bank, and the ants had covered them with short cut grass, a type of nest very difficult to be found by the uninitiated. These are summer quarters ; in the winter the ants go deep down under the ground. The beetle was again found sparingly in the autumn.

This year diligent search in the spring for nests was rewarded, a large number being found, and the beetle was turned up in numbers; indeed in one nest alone over sixty specimens were taken, plenty of material being thus obtained to supply other Coleopterists with examples for their collections, as well as for my own observations and experiments. Several nests were established on suitable private ground near at hand, where I had previously found both the ant and the beetle, and where they would be undisturbed for future observation. One nest with eight queens was brought home to my study and fixed up in a large glass vessel to act as an observation nest. I may mention that *Lomechusa* was found again this autumn, though not in such numbers as in the spring. The only other species of beetles I found in these nests were *Dinarda dentata* in plenty (a new locality for it) and *Myrmedonia limbata*.

In conclusion I should like to express my best thanks to Sir Charles Dilke for his kindness and courtesy in allowing me to make use of his property at all times for the observation and study of this beetle in nature, as well as for a natural preserve for the ants and their nests; to Father Wasmann for his kind encouragement of my studies in Myrmecophilous Entomology ; to my friend Dr. H. Armit for kind assistance in dissecting and chemical experiments ; and to my friend Mr. Hereward Dollman for his admirable drawings.

XXIV. *On a large series of* Nycteribiidæ, *parasitic* Diptera, *from Ceylon.* By HUGH SCOTT, B.A. (Cantab). Communicated by J. E. COLLIN, F.E.S.

[Read November 6th, 1907.]

THE main object of this paper is to state to what extent variation occurs in a series of 100 specimens of *Cyclopodia sykesi*, Westwood. One of the chief difficulties in the study of Nycteribiidæ has arisen from the fact that they are usually found only in small numbers, and consequently uncertainty as to the limits of species has often arisen. For the opportunity to examine the specimens under consideration, I am indebted to the kindness of Mr. T. Bainbrigge Fletcher, Paymaster of H.M.S. *Scalark*. They were all obtained by him from 11 male specimens of *Pteropus medius* Temminck * at Barberyn Island, off the west coast of Ceylon, on February 23rd, 1907.

The series, consisting of 57 males and 43 females, is sufficiently large to enable one to form some opinion of the amount of individual variation exhibited by these insects. As an example of the difficulty which has arisen in previous cases from the smallness of the number of specimens obtained, the following words, written by Dr. Enderlein,† in describing a *Cyclopodia* from the Maldive Islands, may be quoted : "Ob die vorliegenden Verschiedenheiten aus individuellen Schwankungen hervorgegangen sind, kann ich nicht entscheiden. Dazu wäre ein grösseres Material nothwendig." Dr. De Meijere ‡ also, in describing *C. horsfieldi* and speaking of Westwood's species of the genus, expresses some uncertainty as to whether he is dealing with specific, or only with varietal, differences; saying: ". . . thut sich die Frage auf, ob wir es nicht vielleicht mit Varietäten einer Art zu thun haben. Doch ist zur Entscheidung dieser Frage zunächst mehr Material nöthig."

For comparison with these specimens I have had Westwood's original type female of *C. sykesi*, described by him in his paper §; also a male and a female of *C. horsfieldi*,

* *Pteropus medius* (Temminck, Monogr. Mammal. I, 1827, p. 176) = *Vespertilio gigantea* (Brünnich, Dyrene's Historie, I, 1782, p. 45).

† Arch. Naturg. 67. 1 (1901), p. 176.

‡ Tijdschr. Ent. 42. (1899), p. 157.

§ Tr. Zool. Soc. London, 1. (1835), p. 275.

de Meij., the property of the Cambridge Museum, which were obtained by the Skeat expedition to the Malay Peninsula, and determined by Dr. Speiser. I owe my best thanks to Professor Poulton for kindly lending the type of *C. sykesi* from the Oxford Museum.

A close comparison of the Ceylon female specimens with Westwood's type has left no doubt that they are *C. sykesi.* (The male sex was described by Westwood (*op. cit.*) as a separate species, *C. hopei.*) They are distinctly larger and darker than the type; the latter has the long bristles on the end of the abdomen conspicuously reddish, whereas in the Ceylon specimens these are more fuscous. Nevertheless, investigation has revealed no clear character separating the Ceylon females from the type of *C. sykesi.* It must be mentioned, too, that all the Ceylon specimens are preserved in spirit, while the type is in a dried condition. Though the species is not new, a description of the Ceylon series may not be out of place.

FEMALE.—Dark reddish-brown; coxæ somewhat lighter; femora much lighter, testaceous, except at the apices, where they are dark; the three cross-furrows of the tibia lie in its proximal portion. Head bearing short bristles, palps with long bristles. Thorax dorsally greyish-white at the sides; the central part darker. Underside of the thorax covered with short, not very strong, bristles.

Basal abdominal segment. Dorsal plate with its extreme base whitish and bearing a group of very short black bristles; remainder of the plate dark red-brown, more anteriorly without bristles, the posterior portion with 3 or more irregular rows of rudimentary dark bristles at some distance from one another; hind margin of the plate with $\pm$ 6 conspicuous moderately long bristles, on either side of the body, at the lateral angle. Ventral plate with a few rudimentary bristles at its extreme base; posterior to these, 3 irregular rows of short dark bristles (the bristles become longer towards the hind margin of the segment); margin of the plate bearing the characteristic ctenidium of strong black teeth.

Penultimate abdominal segment. Whitish, covered with black tubercles ("Dornenrudimenten"). On the ventral and lateral surfaces these tubercules bear short bristles. The mid-ventral part of the hind border of the segment bears $\pm$ 7 long bristles. On the dorsal surface, the tubercles of the anterior two-thirds bear only exceedingly minute rudimentary bristles; in the middle is a bare space, having a group of much larger tubercles, of the number of which I shall speak later; on the posterior one-third the tubercles are large, and bear the very long and strong fuscous-reddish bristles. It appears that Enderlein * had some doubt as to the number of these bristles, as Westwood's Fig. 3 † does not show clearly whether one or several rows are present. It may be stated that there are 5 or 6 rows, not very regularly arranged, and behind them a narrow part of the segment without either bristles or tubercles. There is no apparent arrangement of the tubercles in definite transverse lines, such as is mentioned by Westwood.‡

Terminal segment. The chitinous plates on either side of the anus are smooth, dark, and shining; each one bears on its free margin a row of 8 long and very strong dark bristles, and immediately within this outer row is an inner row of very fine short bristles. The plate covering the genital opening is slightly broader than long; smooth, brown and chitinous, bearing short bristles; the centre of its basal portion is whitish, and of the same soft consistency as the penultimate segment. The margin of this plate has a slight median emargination, on either side of which it bears a row of about 8 short black teeth, forming a kind of ctenidium.§

The females vary greatly in appearance according to the period of gestation, as often noticed previously. Those in a less advanced stage have the abdomen greatly contracted, the posterior bristles lie together projecting backwards, the black tubercles on the integument are crowded together, and the ctenidium can be seen from above widely projecting on either side of the body. Such females sometimes measure only 4½ mm. in length. Those in an advanced stage have the penultimate abdominal segment much swollen, with a marked constriction just behind its base; the long posterior bristles are erected, the black tubercles at some distance from one another owing to expansion of the integument; and the ctenidium is hardly visible at the sides of the body from above, since the hardness of the basal ventral plate prevents it from sharing in the expansion of the rest of the abdomen. Gravid females such as these measure 5 mm., or over, in length.

VARIATION IN THE FEMALE. When allowance is made for difference in appearance due to difference in the stage of gestation, the 43 females are remarkably constant in almost all their characters. The only appreciable variation which has been found, is in the number and arrangement

* loc. cit. † op. cit. ‡ op. cit., p. 283.

§ These ctenidia are present also in our ♀ specimen of *O. horsfieldi*.

of the large tubercles on the bare space in the centre of the dorsal surface of the abdomen. Westwood described and figured them as being 4 in number, arranged as at the corners of a square. This is the most usual condition, and is found in some allied species. Sometimes, however, one tubercle is out of place, and the grouping irregular; and the number is not constant. Thus out of the 43 Ceylon females (see Text-fig. 1):—

34 females have the big tubercles 4 in number (Fig. 1, *a*), in some cases irregularly arranged.

4 females have 5 big tubercles (Fig. 1, *b*), with a more or less regular pentagonal arrangement.

1 female has 6 big tubercles (Fig. 1, *c*), irregularly arranged.

1 female has 7 big tubercles (Fig. 1, *d*), very irregularly placed, in an anterior group of 4 and a posterior group of 3.*

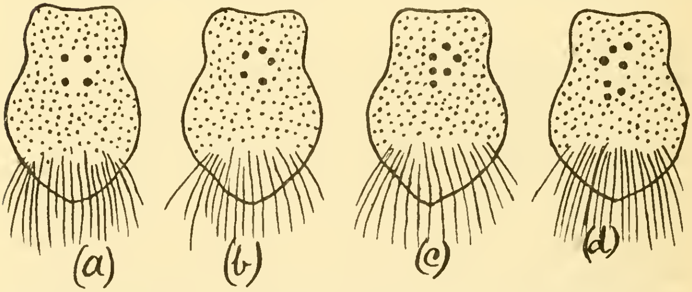


Fig. 1.—Diagrams of the dorsal surface of the penultimate abdominal segment, ♀ of *C. sykesi* Westw. to show variation in the arrangement of the large black tubercles.

These varying specimens show no departure from the normal condition, except in regard to the number and position of these tubercles. The result of the investigation is important, since it shows that the number of the tubercles cannot be relied on as a specific character. Enderlein has described the only female out of 7 specimens from the Maldive Islands. According to his description, it corresponds closely to a typical female of *C. sykesi*, except in having 5 tubercles instead of 4 on the

* The number of big tubercles is also sometimes reduced by variation to below the normal. I have examined 7 other specimens of *C. sykesi* now in the Cambridge Museum, collected in Ceylon in 1877. Three are females, and while 2 of them have the normal 4 tubercles, the third has only 2 big tubercles, placed transversely.

bare patch.* But since out of the 43 Ceylon females, 6 are abnormal with respect to these tubercles; and since 4 out of those 6 exhibit the condition found in the Maldive female; it is possible that the latter is merely a specimen of the 5-tuberculated variety of *C. sykesi.*

It seems that some writers, judging from Westwood's figures † of *C. sykesi*, have supposed that there are 3 large tubercles on either side of the abdomen, in addition to the 4 in the middle of the dorsal surface. Kolenati, in his writings on the subject (Horæ Soc. ent. Ross., II, pp. 1–109), speaks (p. 85) of the female *C. sykesi* as having 10 large tubercles, of which 4 are in the middle of the dorsal surface of the abdomen, while the other 6 "drei jederseits am Aussenrande stehen." Enderlein also, in describing the female from the Maldives, states that "Die in der Westwood'schen Figur bei *C. sykesi* angegebenen seitlichen grösseren Dornenrudimenten fehlen vorliegendem Thier." But Westwood's type of *C. sykesi* has no large lateral tubercles on the abdomen, neither have the Ceylon females. Moreover Westwood (op. cit., p. 283) only says of the abdomen that "its coriaceous part . . . is covered . . . with minute shining black tubercles, 4 of which, on the centre of the abdomen, are of a larger size." But though he makes no mention of 3 large tubercles on either side, yet he has in his figures drawn the 3 *spiracles* of each side in such a manner that they exactly resemble the large tubercles in the centre. This is the case in his Figs. 3, 17, and 18 (op. cit.). He says of the abdomen that "at each side above, between the basal corneous articulation and the setose terminal portion, 3 circular spiracles are to be observed." Again, in his Fig. 20, similar objects are shown, and these in the explanation of the figures are called spiracles ("Fig. 20, . . . showing . . . the two posterior pairs of spiracles." p. 293, op. cit.).

Now Kolenati, at the time of writing his paper referred to above, appears not to have seen actual specimens of *C. sykesi*, but states (op. cit., p. 82) with regard to his figures of that species, that they are "Alles copien aus Westwood's On Nycteribia" (that is, Westwood's paper referred to here). It appears to be almost certain, therefore, that Westwood's figuring of the spiracles has given

* op. cit., p. 176, Text-fig. 1.
† op. cit.

rise to the erroneous conception that *C. sykesi* has 3 large lateral tubercles on either side of the abdomen in addition to the 4 central ones.

One may say, then, that the females of this series are remarkably constant, except with regard to the large dorsal tubercles. There is no variation sufficient to cause hesitation in referring all the individuals to the same species. When a distinct species, *C. horsfieldi*, is compared with the specimens, it is at once seen to be separated from them by perfectly well-marked characters. These are, the different arrangement of the long bristles on the posterior part of the abdomen: and the presence of a group of conspicuous moderately long bristles, placed ventro-laterally on either side of the penultimate abdominal segment, and extending backwards some way from its base;* the bristles in this region are not conspicuously elongated in *C. sykesi*.

MALE.—Length $4\frac{1}{2}$–$4\frac{2}{3}$ mm. Head dark red-brown, bearing short bristles; palps with long bristles. Sides of the thorax whitish, the central portion darker posteriorly. Under-side of the thorax reddish-brown, covered with short bristles. Coxæ, trochanters, and femora distinctly lighter in colour; the femora dark apically, as in the female. Some immature specimens have the integument in a soft condition, and are very light-coloured, the legs and under-side of the thorax being especially pale.

Dorsal surface of abdomen. Very dark red-brown (excepting base of first segment), the anal segment slightly lighter and more shining. Extreme base of the basal segment whitish, bearing a group of dark rudimentary bristles; behind this a portion of the segment free from bristles; posterior portion with 4 rows of very short bristles at some distance from one another. Second and third segments almost equally long, the third often slightly more stretched out, their surfaces bearing scantily-distributed very short bristles. Fourth and fifth segments short, their surfaces free from bristles. Anal segment described below. Hind margin of the first segment without bristles except at the lateral angles, where there are on either side about 7 long bristles. Hind margins of the 2nd, 3rd, 4th and 5th segments bordered with long bristles at the sides, free from bristles for a considerable space in the middle.

Ventral surface of abdomen. First segment bearing a short basal row and 3 long rows of short bristles, and bearing the

* De Meijere, op. cit., Text-fig. 1.

strong black teeth of the ctenidium on its hind margin. 2nd and 3rd segments each bearing on its surface 3 rows of somewhat longer bristles, and on its hind margin a row of moderately long bristles quite continuous across the body. 4th segment somewhat elongated, its median portion without bristles, the lateral parts bearing bristles; in the middle of its hind margin is the small ctenidium of about 10 short, blunt, black teeth; on either side of this the margin bears long bristles. At the sides of the body, on segments 2, 3, and 4, are some stiff bristles projecting outwards.

Anal segment (Text-fig. 2). Narrow, long, tapering towards apex. Length $1\frac{1}{2}$, or more, times as great as breadth at base; breadth at apex $\frac{1}{2}$ as great as that at base. Median part of dorsal surface bare; lateral portions with bristles, which extend on to the ventral surface; apical angles bearing longer bristles. Claspers long, narrow, narrowly-pointed; reaching back almost, or quite, to the hind margin of the penultimate segment; bearing long bristles on their basal parts. The median portion of each clasper is slightly curved away from the body, so that a small space is sometimes left between the claspers and the abdomen; their apices rest on the surface of the abdomen.

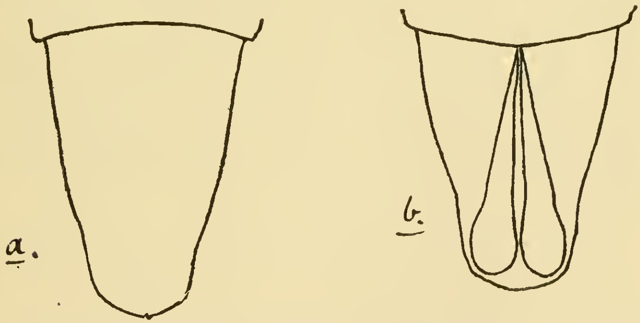


Fig. 2.—(*a*) Dorsal view of anal segment of ♂, (*b*) ventral view. In *b*, owing to curvative of the segment, the latter looks shorter than it really is.

Amount of Variation. The 57 males exhibit no appreciable variation in size, structure, or colour; except, in the case of colour, that due to differences in the degree of maturity. It can therefore be said, in summing up, of the whole series of males and females, 100 specimens, that the characters are remarkably constant. There is only one striking variation, which is that already described in the female.

In the study of *C. sykesi* and its near allies, an important point long remained undecided; that is, whether *C. hopei*, Westw., and *C. sykesi* are male and female of the same species or not. The former was originally described from 2 males from Bengal, the latter from 3 females from East India,* and Westwood then asserted the possibility of their being the same species. The characters of the males of the series discussed in this paper agree with those of *C. hopei* as given by Speiser (Arch. Naturg. 67. 1 (1901), p. 50 and Text-fig. 2*b*). He states that the characteristic feature of *C. hopei* lies in the form of its anal segment and claspers; the former being slender, tapering towards the apex, and some $1\frac{3}{4}$ times to twice as long as it is broad at the base; and the latter being especially long and narrow, and slenderly pointed. I have since been informed by Dr. Speiser, that as a result of his more recent investigations, *C. hopei* and *C. sykesi* are shown to be certainly the two sexes of a single species.

In the bottle with the *Cyclopodia* were also a large number of mites. Mr. N. D. T. Pearce, of Christ's College, Cambridge, who has kindly examined these, states that they are *Dermanyssidæ*, of the genus *Leiognathus*, Canestr.: and very closely allied to *L. arcuatus*, Berlese (Ac. Myr. Scorp. It. 53, 8), which is common on bats, especially on *V. noctula*. The mites are parasitic on the *Pteropus medius*, and are not, except by accident, on the *Cyclopodia*.

* Westwood, op. cit.

XXV. *The Butterflies of Mauritius and Bourbon.* By LIEUT.-COLONEL N. MANDERS, F.Z.S., F.E.S.

[Read October 4th, 1907.]

PLATE XXIX.

IT is now more than forty years since Mr. Trimen published his paper on the butterflies of Mauritius in the Transactions of this Society, and as far as I know nothing has been written on the subject in the interval. It is perhaps as well that the list of butterflies occurring in Mauritius should be brought up to date, and if some forty years hence another entomologist should add his experiences, the Society would be in possession of an entomological history extending over a hundred years, and of some valuable facts regarding the constant ebb and flow of butterfly life in that island. In the present paper I add five insects to Trimen's list, namely *Papilio demodocus*, *Caeyreus lingeus*, *Zizera antanossa*, *Zizera gaika* and *Nacaduba mandersi*, Druce. The specimen of *Libythea cinyras* still remains unique, and another species, *Salamis augustina*, is extinct or virtually so. One of Trimen's insects, *Catopsilia rhadia*, I have removed as being a synonym of *C. florella*, thus making the total number of Mauritius butterflies thirty. Changes of nomenclature are somewhat frequent, and I have mostly followed Aurivillius ("Rhopalocera Æthiopica," 1898). I have at the same time given the names and the number of the insects used by Trimen in the above mentioned paper, as it is still used by local entomologists who might otherwise be puzzled by my list. Trimen's list was admittedly incomplete, as his stay in the island was short and quite at the most unfavourable season of the year for collecting; it is therefore a matter of surprise that he managed to obtain as many species as he did. The investigations of the last forty years show conclusively that the whole of the butterfly-fauna of these islands is entirely African, and probably mostly derived, as we should expect, from Madagascar.

As Mauritius, and even more so Bourbon (or Réunion, as it is invariably called by the inhabitants), are but little known to English entomologists, I may perhaps give a few details, which may not prove uninteresting, regarding their physical characteristics in which they differ very materially. Mauritius is about the size of the county of Dorset, being about thirty-six miles from north to south and almost the same from east to west. It is comparatively flat, the large plateau known as Plain Wilhems at the approximate elevation of 700 feet, occupying the whole central portion of the island, and gradually spreading outwards towards the north at a decreasing elevation. The whole of this plain was covered with forest at the beginning of the last century, so thick in parts that on one occasion the Governor of the island and his party were lost for four days before making their exit. Now the forest has entirely disappeared, its place being taken by sugar-cane, which is of not much interest to an entomologist. The hills, which nowhere exceed 2,300 feet in elevation, are of volcanic origin, and mostly the remains of the walls of extinct craters. Their sides are consequently steep, frequently precipitous, and are usually covered with jungle, portions of it no doubt being the remains of the original forest. The only extensive tract of the primeval forest remaining is in the south-west portion of the island; this covers the sides and summits of the hills overlooking the sea, and spreads northwards to join the central plain in the neighbourhood of Curepipe, 1,800 feet, becoming more open and of smaller growth as it approaches the more inhabited districts. It is difficult of access and disappointingly unproductive. I have found no butterflies peculiar to it, and in fact butterflies are very distinctly scarce in it. For a considerable portion of the year it is subject to deluges of rain, the ground becomes water-logged, and immediately off the few narrow paths increasingly difficult or impassable. It is interesting, profoundly so, to a naturalist, as it is the final refuge of the few remaining indigenous birds. The climate varies, but is usually considered to be six months cool and dry from June to November, and hot and moist from December to May. Unlike Bourbon, Mauritius is entirely surrounded by a coral reef, which at places comes within a few hundred yards of the shore, at others is two or even three miles out. It is a paradise for the marine zoologist, and for those with no natural history tendencies, its calm seas, transparent water, and lovely bays with their glorious sands, can scarcely be surpassed for exquisite beauty in any tropical island. Bourbon is altogether different, deep water and heavy breakers come straight on to the beach without any natural breakwater, and the shore is covered with huge water-worn boulders and rounded pebbles, with an entire absence of marine life. In the one case we have quiet seas and intense natural beauty, in the other the whole coast, so far as I saw it, is subject to the full and eternal swell of the Indian Ocean.

In physical features Bourbon is also different to Mauritius; though very much of the same size or rather smaller, it is distinctly mountainous, and evidences of volcanic action are even more marked. One can get a good idea of the country by placing three circles in a triangle and touching each other, with the base to the west. These three circles, each about five miles in diameter, represent three extinct volcanoes; place another circle to the south of these but separated from them and this will mark the position of the present active crater which is on the coast. The centre of the easternmost crater is exactly the centre of the island, and the part where the three circles meet forms the main mountain range running north and south, the highest point, the Piton des Niéges, being over 10,000 feet above the level of the sea and covered with snow for a considerable portion of the year. This trend of the hills gives a very different character to the climate on either side of it. The trade-winds striking the cold eastern flanks of these mountains deposit their moisture in heavy rain, the western portion only receiving occasional showers on their hill-sides, the coast rarely receiving any rain at all. It is a country where I fully hoped to find species of *Teracolus* and *Acræa,* if illness had not put a very decided veto on any exploration I had contemplated. The chief villages, I cannot call them towns, are built at the bottom of the aforesaid three craters, the eastern one being Salazie, the western Cilaos, and the northern Mafitte. It is a peculiar experience living in such a situation, and though very beautiful from the verdure of the numerous smaller hills scattered over the floor of the crater, and the fantastic appearance of the cliffs forming its edge, one's view is limited to the surrounding rugged cliffs, and after a short residence I had an almost irresistible desire to climb up and peep over the other side, much like a kitten at the bottom of a basket. There is but one road to each of these craters, that up the gorge of Salazie being a good coach road for some twenty miles. This is the finest gorge it has been my good fortune to visit in any part of the world. It is a rift in the crater, and a geologist would have no difficulty in tracing the course of the erupting lava from the volcano to the sea. Now a river occupies the bottom of the rift, and the jungle-covered precipices, mostly almost perpendicular, with innumerable waterfalls of over a thousand feet in height, makes the drive out of great interest and beauty. I did not notice many butterflies here. The gorge is so extremely narrow that there is very little sunshine, and I was disappointed, as, although I did not expect many species, I fully anticipated a great number of individuals.

Cilaos is at a higher elevation, 4,000 feet, and access is difficult. One is usually carried up in a chair on the shoulders of a succession of stalwart porters, for a distance of something like thirty miles. The road or rather track is cut out of the steep hill-side, which being composed of shale is constantly slipping down, with the result that it is not at all uncommon for large portions of it to be carried away. It is far too narrow for wheeled traffic, and indeed one's chair frequently overhangs a clear drop of several hundred feet in a manner distinctly alarming. Consequently in Cilaos horses and cattle are unknown, life is primitive and I should think deadly monotonous, the only diversion so far as I could judge being a stroll to the neighbouring chalybeate spring for a draught of water. The forests, once so extensive as to cover the whole central area, are being rapidly destroyed. Dr. Jacob, who has resided in the island for fifty years, told me that he remembered when the whole of the Salazie district was a beautiful forest, and when the Bourbon starling (*Fregilupus varius*) was quite common. This bird has now been extinct for five and twenty years, and the forests are following it. The flora is in many respects different from that of Mauritius, and I should say that a Microlepidopterist would make most interesting discoveries at the higher elevations. Unfortunately illness almost entirely ruined any chances I had in this direction.

The late Dr. Vinson, Curator of the Natural History Museum, St. Denys, made two lists of the butterflies of Bourbon, one in 1891, the other in 1896 ; both are out of print and difficult to obtain. They contain many interesting notes, and I have made them the basis of the present list. The number of butterflies recorded is twenty-two, but there are probably a few more species remaining to be discovered.

Danaida chrysippus, L.

8. *Danais Chrysippus*, Linn.

MAURITIUS. Common in the low country and sometimes abundant, scarcer above 1,000 feet. It has been noticed as being particularly common after a cyclone, the rain and consequent dampness probably bringing the pupa to rapid maturity. The form *alcippus*, Cram., has not been hitherto recorded. It is exceedingly rare, and I believe I am the only individual who has noticed it; this was at Curepipe 1,860 ft., March 12th, 1907. *D. dorippus*, Klug., does not occur, and this is the more interesting as *H. misippus*, form *inaria*, does occasionally appear. Flies I–XII.

BOURBON. I found this common at St. Denys, and saw in the museum specimens of *alcippus* which had been taken in the neighbourhood. The transformations are well known.

Amauris phædon, Fabr.

7. *Danais Phædone*, Fabr.

Peculiar to Mauritius and Madagascar (Mabille) and locally known as the "Banyan butterfly." Rare in the higher elevations, locally abundant on the coast, congregating in numbers after the manner of the Danaids, usually under the shelter of "filao" trees (*Casuarina equisctifolia*). Frequently it flies high among the trees and is then difficult to take; at other times it flies low and is easily captured. I found it abundant at Morne Brabant in the extreme south-west corner of the island, in August; also at Blue Bay on the east coast and elsewhere. Flies nearly all the year round. The female is distinctly uncommon; the male is variable more particularly on the fore-wing, all variation can be found from a well-developed spot in the cell to a complete absence; the spot also in the first median interspace is very variable in size; the band on the hind-wing varies also in breadth. The larva is unknown.

Euplœa euphone, Fabr.

6. *Euplœa Euphone*, Fabr.

Abundant everywhere, except in the cold weather. Of slow flight and easily captured. I have frequently found the eggs of this and the following species on "Alamanda" (*Alamanda cathartica*), but have never succeeded in rearing the larva on this plant, neither have I found the full-grown larva at large on it, though I have frequently found and reared it on *Ficus repens*. On *Alamanda* the larva invariably dies when quite small, apparently from starvation, and I am rather under the impression that the female mistakes the food plant. The egg is undistinguishable from *E. goudoti*, it is of the usual Euplœid shape, pale yellow with perpendicular ridges. It is laid on the under margin of the smaller leaves, the young larva spins a slightly woven silken pad, and eats the under surface of the leaf in a semi-circular manner round it. The full-grown larva is pale grey with narrow black lines dividing the segments. Flies I–V.; VI–VIII, scarce; IX, becomes common; X–XII, abundant. It does not occur in Bourbon.

Euplœa goudoti, Boisd. (Pl. XXIX, fig. 1).

Not a Mauritius butterfly; but I have one specimen, the only one recorded, which was captured by Mr. J. A. de Gaye, at Post de Flacq on the north-east side of the island in August 1905. The specimen, which is in very bad condition, was probably conveyed from Bourbon by a favouring wind. Through the kindness of Mr. de Gaye this specimen is now in my collection. See "Entomologist," vol. xl, p. 185. BOURBON. Abundant on the coast, preferring hot steamy shade, where it flies slowly and is captured with ease. I found it common at St. Denys in the Botanical Gardens, and it was by no means rare in the town itself. It scarcely extends above 1,000 feet elevation. At Hell-Bourg, 3,000 feet, I saw only one specimen, evidently a straggler. The insect in its manner of flight and general appearance reminds one very much of the Indian *Euplœa core*.

Its transformations have been described. The typical species has on the forewing a small white spot on the costa at the end of the cell and another in the second median interspace. Some specimens have the wings entirely unspotted and others with an additional spot in the first median interspace, and I have one specimen with faint but decided indications of a submarginal row; the number and size of the spots also vary on the underside.

Melanitis leda, L.

16. *Cyllo Leda*, Linn.

Abundant everywhere, particularly at sunset in leafy lanes and at the corner of cane-fields. The peculiar habit of its near Indian ally *M. ismene*, of tilting to one side after settling and thus reducing the tell-tale shadow was, if I remember correctly, first brought to notice by Mr. Ernest Green. The same habit is also adopted by this insect, but it is by no means confined to the hours of sunshine, it frequently performs thus after sunset. The transformations are in all respects similar to those of *M. ismene*, and, judging by a written description of the larva, it would appear that the two are indistinguishable. I have given an account of its seasonal changes as they occur in Mauritius. (Bomb. Nat. Hist. Soc., Feb. 1905.) Flies I–XII.

BOURBON. The same remarks apply. It is described by Vinson as *C. fulvescens*, Guenée.

Mycalesis (*Henotesia*) *narcissus*, Fabr.

17. *Mycalesis Narcissus*, Fabr.

Abundant everywhere, and perhaps the commonest butterfly in the island. It is very partial to shady lanes and bamboo hedges, and is on the wing, fluttering close to the ground, even in the drenching rain and heavy squalls which are the forerunners of a cyclone. Seasonal dimorphism is decidedly noticeable in the colour of the under surface of both fore and hind wings, which changes from the light yellowish-brown of the hot and dry weather to a deep purplish-grey in the cold and wet; the size of the ocelli are not markedly affected. The species is equally abundant in Bourbon. Flies I–XII. The life history has not, so far as I can ascertain, been recorded. The female I observed ovipositing was in cabinet condition; she basked for a few minutes in the sun, and then fluttered on to the smaller leaves of the bamboo growing close to the ground; on the under-surface of these she deposited a single egg. She then flew off and basked again, returning in a few minutes to almost the same leaf, where she again went through the egg-laying process.

The egg laid 27. x. '06 is globular, pale yellow and slightly pitted and is distinctly large for the size of the butterfly.

The larva hatched 3. xi. and on emergence was very pale yellowish-green with shiny black head, tail bifid, no other markings could be made out. 12. xi. length 6 mm., head black, body pale glistening green, under a lens two small prominences on either side of the top of the head can be made out, also a green dorsal line and yellowish spiracular lines; with a bifid tail, of the same colour on the last segment. 20. xi. length 10 mm., head brown, body rather glistening greenish-white; dorsal line well-marked posteriorly, greenish-red; sub-dorsal and spiracular lines yellowish; all the legs same colour as the body. Under a lens the whole body and head is seen to be covered with short whitish hairs, and to be minutely transversely striated. The bifid tail beneath, and its base above, the same colour as the body, remainder reddish-brown. 10. xii. Full fed, length 26 mm.; pale pinkish-brown tinged with green, head darker. A dorsal catenulated line, much more pronounced posteriorly, brown, fading to greenish-brown towards the head. A waved sub-dorsal line and straight sub-spiracular line, light brown. Spiracles black, legs and prolegs the same colour as the body.

Pupa, light green with straight narrow black transverse line across the mouth parts, another similar line at base of wing-covers. Of the usual Satyrid shape.

The transformations of this insect take longer for their completion than those of the much larger *Melanitis leda*, though both are very sensitive to meteorological conditions.

Atella phalanta, Drury.

9. *Atella Phalanta*, Dru.

This is another abundant butterfly both in Mauritius and Bourbon, particularly on the sea-coast, where it sometimes swarms among the food-plant (*Flacourtia*). The life-history is well known.

Flies I–VII, abundant; VI, scarce; VIII–XII, abundant.

I have observed on more than one occasion that for twenty-four hours after shedding the larval skin the pupa hangs free like that of *Vanessa*, and afterwards by a contraction of the abdominal segments it appresses itself along the twig from which it is suspended, and becomes attached to it by I presume some glutinous material. The usual plan, however, is for it to assume this position immediately after its release from the larval skin.

Antanartia mauritiana, Manders, s. sp. n. (Pl. XXIX, fig. 2).

11. *Pyrameis Hippomene*, Boisd.

With the exception of *Salamis augustina*, quite the rarest butterfly in Mauritius and verging on extinction. It is probably a local race of the continental *A. hippomene*, Hübn., but is quite distinct from that insect. It is, however, very close to *A. borbonica*, Oberth., which is also a well-marked race of *A. hippomene*. The distinctions between the Mauritian and Bourbon races, though slight, are sufficiently defined to justify a separation of the insects. The difference, as M. Charles Oberthür has remarked to me, is more in the general facies than in any marked character, *A borbonica* being a larger and far more robust-looking butterfly than *A. mauritiana*.

Expanse 47 mm., average of 20 specimens (*A. borbonica* 55 mm., average of 4 specimens), the females rather larger than the males. Forewing.—The tranverse orange band on its inner edge is outwardly angled or waved at the median nervure forming the lower portion of the cell. In *A. borbonica* this is always straight. The outer edge of the band is also more distinctly angled or waved at the same place than is *A. borbonica*. Hindwing. There is a great diminution, generally an almost total absence, of the blue scales between the angle and the tail; this deficiency is particularly noticeable below the ocellus. Hindwing under side. The green scaling between the anal angle and the tail and below the ocellus is confined to a narrow marginal line. In *A. borbonica* this area of the wing is thickly sprinkled with green scales on a black ground, and these scales also cover the adjoining portion of the space beyond this.

The difference in size, and more particularly the greater robustness of the Bourbon insect, is, I believe, primarily due to climatic conditions. *A. borbonica* is never found below 2,000 feet. *A. mauritiana* maintains a precarious existence at 1,800 feet, there being very little of the island of this elevation and only a few hills rising above 2,000 feet. The climate is not favourable to the development of the butterfly, and what is probably more important, is too hot for the food plant. I was much struck in Bourbon with the far greater luxuriance, larger leaves and stronger growth of the *Pilea urticefolia* and its great abundance. In Mauritius all the plants I have seen, and it is not a particularly common one, are more slender, straggly and the leaves noticeably thinner and less juicy; and this diminished growth would tend to the production of a smaller and weaker insect. Consequently in Bourbon the butterfly is large, strong and abundant; in Mauritius, small, weak and very rare. I endeavoured to prove this by feeding Mauritius larvæ on Bourbon plants, but I had only two larvæ to experiment with, and it is not surprising that the results were unsatisfactory; but it is probable that investigations on a larger scale would yield interesting results.

The only known locality is Curepipe, 1,800 feet. Personally I have only once seen it on the wing, this was a dilapidated female which flew into the verandah of my house. Captain Tulloch has taken it on the summit of the Trou-aux-cerfs, where it flies between 9 a.m. and 11 a.m. I have, however, for three consecutive years found eggs, larvæ and pupæ on the same plant in the Botanic Gardens, Curepipe. There appears to be a succession of broods during the hot weather; in some seasons the butterfly appears as early as the end of September and occasionally lasts until May; but the usual months are February and March. I have found the eggs in October and March and the larvæ in October, January, March, and May.

The egg is laid on the under surface of the larger leaves of *Pilea urticefolia*. It is smooth, conical, dark olive-green with flattened top and base. The segments are marked with narrow but distinct perpendicular yellow lines, nine in number, converging towards the summit but not meeting. It has an exact resemblance to a water-melon. Egg laid ? hatched 8. x. '05; larva full-fed 28. x.; suspended before 7 a.m. 5. xi.; shed its larval skin 4 p.m. 5. xi.; emerged 16. xi. When first hatched the larva is uniform yellowish-green, with black spines and shining black head. When half-grown, it is uniformly black with a glistening appearance, with spines bright yellow or sometimes white. The full-grown larva is very variable and its colour is influenced by its surroundings. I have given a description of this in the "Entomologist."

None of the larvæ I have seen agree with Dr. Vinson's figure and description of the larva of *A. borbonica* (Oberth. "Etud d'Ent." 12, p. 17, t. 4, 1888), except that the spines are yellow with black points, set on bright yellow or dull ochreous bases. The pupæ are similar in shape, but, as I have shown elsewhere,* the colour is markedly influenced by its environment.

The larva is very easily detected by its habit of forming a tent for itself by making two scimitar-shaped incisions in a leaf right down to the mid-rib, and then bending over the tip and attaching it to the under surface of the leaf with a few silken threads. The full-fed larvæ frequently discard this method of concealment and feed openly, but invariably rest on the under surface of the leaf. I have found eggs, larvæ and pupæ on the same plant at the same time.

Antanartia borbonica, Oberth.

Common in Bourbon above 2,000 feet, abundant at Hell-bourg, Salazie, 3,000 feet. I never saw the perfect insect, but evidences of the larva were everywhere abundant on the food-plants. My only captures were one empty egg-shell and one cast larval skin, which was aggravating, but illness was responsible for my non-success. It was considered to be peculiar to Bourbon, but Mabille has lately recorded it from the interior of Madagascar.

Pyrameis cardui, L.

10. *Pyrameis Cardui*, Linn.

MAURITIUS. Rare and local. Its chief and almost only locality is the Trou-aux-cerfs, 2,000 ft. where I have occasionally found it in December, though it occurs sparingly in other months. It differs in no way from European specimens.

BOURBON. Rare, and only in the hill districts. I saw a beautifully fresh specimen at Hell-Bourg, 3,000 ft. in April.

Precis rhadama, Boisd.

12. *Junonia Rhadama*, Boisd.

MAURITIUS. Common everywhere and frequently abundant on the coast. It is perhaps the most strikingly

* "Entomologist," vol. xxxix, p. 41.

beautiful butterfly in Mauritius, the brilliant sapphire-blue of the freshly emerged male being exquisite. I have noticed dozens at a time on the steep hill-side at Port Louis leading up to the Citadel. It has the habits of our small Tortoiseshell, and its gorgeous colouring can easily be watched and admired. Pairing takes place in the hottest sunshine, all the females being freshly emerged. It was introduced into the island about the year 1857 or 1858, and soon established itself (Trimen). The species is very constant on the upper wings, though the female is slightly prone to vary in the amount of blue, which is sometimes partially replaced by fuscous; but on the under surface it varies much in accordance with the climate, the under surface of those from the Black River district on the western portion of the island which is very dry, have all the markings indistinct and blurred, and the ground colour varying shades of grey.

Flies I—VI, abundant; VII—IX, scarce; X—XII, common.

BOURBON. The same remarks apply generally. Vinson, 1891, says "that it is a recent importation due to chance." It would appear to have been introduced some thirty years later than into Mauritius, and this may be due to more irregular and infrequent communication with the outside world in the case of Bourbon. The larva feeds on *Barleria*, and is well figured and described by Vinson ("Études d'Ent." Oberthür, 1888).

Salamis augustina, Boisd. (Pl. XXIX, fig. 3).

13. *Junonia Augustina*, Boisd.

This butterfly is one of exceptional interest, as it is almost certainly extinct, no specimen having been taken for twelve years. So far as I can ascertain from extensive inquiries in this country and abroad, there are only two specimens extant; one in Mr. Trimen's collection given to him in the year 1865 by the late Mr. Colville Barclay taken in the Moka district and the other, here figured, in the Port Louis Museum. It is well therefore to put on record all that I have learnt regarding the latest captures of this rare insect. It was getting very scarce when Mr. Trimen was in the island in 1865, and it is strange that an insect whose larva feeds on the sugar-cane which covers the greater portion of Mauritius should not rather be over-abundant than otherwise. I attribute its disappearance to the depredations of the Indian Mynah* (*Aeridotheres tristis*), which was introduced some hundred years ago for the purpose of keeping in check the field-crickets and other insects which were destroying the canes. The bird is protected and is consequently over-abundant, flying in small flocks of twenty to thirty all over the country, and making themselves a general nuisance. The bird was also brought into Bourbon, but fortunately for *S. augustina* so frequently finds its way into the cooking-pots of the natives, that the butterfly survives though in greatly diminished numbers. In Madagascar where the "Mynah" is unknown, *S. augustina* is not uncommon. Man therefore

Salamis augustina; the specimen in the Port Louis Museum.

is responsible for the extinction of the butterfly. The Port Louis specimen came from the collection of the late M. Réynard, who some five-and-twenty years ago bred some half dozen specimens from larvæ found in his garden on Trianon estate in the Moka district. At his death they came into the possession of the Port Louis Museum authorities, but only the one specimen could be preserved, the remainder being in fragments. In August 1895 Dr. Bolton captured two within a few minutes of each other, at Souillac on the east coast. He tells me that he had no difficulty in catching them, as they were hovering over some vanilla plants. Unfortunately during his absence in England his collection became mouldy, and offending the æsthetic tastes of his relations was cast into the dust-heap. This is the last capture I have been able to ascertain. I

* By destroying the larvæ.

almost hesitate to record that at 9.30 a.m. March 19th, 1906 (I am particular as to the date) at Curepipe Railway Station, a butterfly flew past me which I am satisfied in my own mind was this particular insect. I was near enough to see distinctly the peculiar shape of the forewings —but I refrain from further harrowing details! let it suffice I did not capture it.

Bourbon. In this island it is becoming very rare; I saw five specimens in the museum at St. Denys, which seemed to be slightly different from the Mauritius form. Dr. Vinson says that it flies between 9 a.m. and 10 a.m., in April and May and again in September. Unfortunately M. Réynard's coloured drawings of the larvæ have been lost. I am greatly indebted to Captain Stammers, R.A.M.C., for the photograph from which the figure is made, giving an accurate representation of the appearance of the specimen in the Port Louis Museum. Also to Mr. Roland Trimen, F.R.S., for the loan of his specimen above referred to, and figured on Plate XXIX.

Hypolimnas misippus, L.

15. *Diadema Bolina*, Linn.

Mauritius. Not by any means a common insect, but widely distributed. Three forms of the female occur, the most frequent being the mimic of *D. chrysippus*, the form *inaria* I have rarely seen, and of the form *alcippoides* one specimen only in the Port Louis Museum. I have found it at Curepipe, Quatre Bornes, 500 feet, and at Mahébourg on the coast. It occurs also at Pamplemousses and in the Moka district it Flies IX–XI.

Bourbon. Rare, and only found on the coast. I saw either this or the next species in April settled on the flowers of the *Lantana* in an inaccessible spot in the bed of the river at St. Denys.

Hypolimnas bolina, L.

I have only seen two specimens of this insect in Mauritius, one, a female, in the Port Louis Museum, which was captured somewhere in the Moka district about five miles from Port Louis, and the other, a male, taken near the harbour of Port Louis by Mr. de Gaye in February 1906.* This specimen is now in my collection; it is in

* There is a third specimen in the British Museum collection captured by Capt. Tulloch.

very bad condition, and I have little doubt it was imported. Vinson records this from Bourbon, but I have no doubt he has misnamed the species, the insect occurring in Bourbon being *H. misippus.*

Neptis (Rahinda) frobenia, Fabr.

14. *Neptis Frobenia*, Fabr.

Usually common in the more wooded parts of the island, but difficult to take in good condition as it soon tatters itself from its habit of flying in and out of the bushes. It has a floating flight very similar to *L. sibylla.* I have never found the larva. Flies, I–VI, common; VII, VIII, scarce; IX, uncommon; X–XII, common.

Neptis (Rahinda) dumetorum, Boisd.

This differs from the above chiefly by the presence of several small dots of white on the fore wings which give it a speckled appearance. It is far more common than *N. frobenia*, being very abundant, sometimes almost swarming on the loquot trees. It feeds on *Tragia.* The larva and pupa have been figured and described by Vinson ("Études d'Ent." Oberth. 1888). It is an extremely pretty insect, with a most elegant flight, and is almost the first butterfly one notices in the woods. It is only found in the moister portion of the island where there is plenty of forest. Mabille reports it from Madagascar also; but for many years it was considered one of the few butterflies peculiar to Bourbon.

14. *Libythea cinyras*, Trimen (Plate XXIX, fig. 4).

I am unable to add anything to Mr. Trimen's remarks on this species. His specimen was given to him by the late Mr. Barclay, who informed him that the insect came from the Moka district, and was "very scarce in Mauritius," which implies that Mr. Barclay knew of other specimens. If it were not for this remark I should have been inclined to look upon Mr. Trimen's specimen as a casual importation. The whole of the Moka district is now under sugar cultivation, and no species of this genus is now known to occur in Mauritius; it is also absent from Bourbon. Mr. Trimen has very kindly lent me his single example for figuring.

Cupido (*Cacyreus*) *lingeus*, Cram.

Not hitherto recorded, and quite a recent introduction. I found it commonly in the Botanical Gardens, Curepipe on *Coleus hybrida*, on which the larva feeds. The Superintendent told me that these plants came from Madagascar, and there is no doubt the insect was brought with them. It was not captured by Captain Tulloch up to the year 1902, though he was constantly in the gardens for two or three years. It is now quite common, but seldom wanders far from the food plant. The males are by no means so numerous as the females. It is quite one of the most confidential butterflies I know, I have frequently boxed them off the food plant. It is of enormously wide distribution, being recorded from Sierra Leone to Delagoa Bay and Madagascar, and now still further east to Bourbon and Mauritius. The transformations do not appear to have been recorded.

The egg is laid in bright sunshine during the hottest hours of the day ; it is of the usual echinoid shape, pale whitish green, and usually laid on its edge at the base of a flower on a spike of *Coleus*. The full-fed larva is shaped like a wood-louse, length 12 mm., pale pinkish-green with pink dorsal line and deeper pink spiracular line ; between the two are two diagonal pink lines, the upper and shorter passing from before backwards and downwards, the other backwards and upwards. Body covered sparingly with short whitish hairs bending forwards. Head very small and black.

Pupa same colour as the larva but paler, covered with minute scattered hairs ; dorsal and spiracular lines light reddish-brown, a row of minute dots, the posterior the larger, between the two. A conspicuous black mark of irregular shape on either side of dorsal line at the base of the wing covers.

The larva usually feeds on the flowers, and is admirably protected when resting on the similarly coloured stem of the food plant. It usually pupates head downwards on the stem of the *Coleus*, but sometimes on the upperside and centre of the leaf. I have frequently seen ants crawling over the larva, but they appeared to pay no particular attention to it. Flies I–XII.

Bourbon. Not hitherto recorded, though I found it quite common in the Museum Gardens fluttering about the food plants, which were I believe brought from

Madagascar. I believe its advent to be quite recent, as I can scarcely credit such an excellent observer as the late Dr. Vinson overlooking it.

Cupido (Tarucus) telicanus, Lang.

20. *Lycæna Telicanus*, Herbst.

Very abundant in both islands. Flies, I–V, abundant; VI–VIII, none; IX–XII, abundant. All my specimens appear to me to be remarkably dark.

Cupido (Lampides) bœticus, L.

19. *Lycæna Bœtica*, Linn.

More common in some years than in others, sometimes abundant. The larva feeds in the interior of pea-pods, and not unfrequently gets cooked and brought to table, on which occasions it may be regarded as a nuisance. I have known it to be so abundant as to cause a serious diminution in the pea crop, and in some seasons to be quite scarce. In Bourbon it is likewise of irregular occurrence. Flies all the year round. The larva and pupa have been described frequently.

Cupido (Zizera) gaika, Trimen.

Not recorded hitherto from Mauritius, but widely distributed and usually very common, fluttering about short herbage or settled on the flowers of *Lantana*. It varies greatly in size, and the female, as is so frequently the case in this genus, varies very much in the amount of blue on the upperside. Flies, I–IV, common; VI, scarce; VII, VIII, scarce or absent; IX–XII, very common at all elevations.

Bourbon. Not previously recorded, but I found it very common on the racecourse at St. Denys, and it doubtless occurs elsewhere. The transformations have been described.

Cupido (Zizera) lysimon, Hübner.

21. *Lycæna Lysimon*, Godt.

Very abundant both in Mauritius and Bourbon. The specimens are usually very fine, and larger than the general run of Indian specimens. It is found in more or less profusion all the year round in gardens and waste lands. The transformations are well known. *Lycæna mylica* has been recorded by Guenée from Bourbon and is incorporated in Vinson's list without remark. By the figure given in Melville it is very close to and perhaps identical with *lysimon*.

Cupido (*Zizera*) *antanossa*, Mabille.

Mabille, "Bull de la Soc. Ent. de France" (1877), p. 101. Not previously recorded from Mauritius, and apparently absent from Bourbon. I think it is a recent arrival, as it was not taken by Captain Tulloch, who collected in the island until three or four years ago. It is widely distributed and not uncommon, but is quite likely to be overlooked, as it flies with *gaika* and *lysimon* and might be readily mistaken for either. It has a great resemblance to the Indian *Z. maha*, and undergoes the same seasonal changes. It has the same habits as the rest of the genus, flying low about the herbage and never resorting to bushes or trees. I give the various localities where I have taken it. I first took it at Quatre Bornes in November 1905, when it was worn. In the following month (3rd and 11th) it was in good condition and more common. On Trianon estate one specimen, XII. At Le Réduit in the Governor's Garden, iv. '06, a few. At the Citadel, Port Louis, 7. xi. '06, numerous, and one specimen in the garden of my house at Curepipe. It occurs therefore at all elevations from the coast to 1,800 feet. It is rare in Madagascar, but has a wide range in Natal and Central Africa.

Nacaduba mandersi, Druce (Plate XXIX, figs. 5, 5a).

Described and named from specimens collected by me by Mr. Hamilton H. Druce, ("Ann. and Mag. Nat. Hist." Ser. 7, vol. xx, p. 219, September 1907).

It is surprising that it has not been previously discovered in Mauritius, as it is abundant at Blue Bay, Mahéburg, a noted place for picnics; but it is never found away from the food-plant, which being of an abominably prickly nature is naturally avoided. The manner of flight is quite different from any other Lycænid found in the island, and it was this peculiarity which first attracted my attention. It flies very much like the "Holly-blue," well above the ground and sometimes to a considerable height, and indulges in frantic combats with others of its kind. With few exceptions all the other Lycænids belong to the genus *Zizera* which never fly far from the ground, and usually within a few inches of it.

There is a certain amount of seasonal dimorphism observable, the specimens in the cold weather having a more or less well-marked submarginal band on the underside of the hind-wing, pale grey or whitish. It is probably abundant wherever the food-plant occurs. I found it at Blue Bay commonly, at Morne Brabant in the extreme south-west of the island also commonly, and it occurs also at Flacq on the north-east coast. It is never found above the seacoast.

The female lays her eggs during the hottest hours of the day on the under surface of the young leaves of *Cæsalpinia bonducella,* called Cadoque by the natives. The egg is of the usual Lycænid shape, but flatter, pale green. The larva when first hatched is uniform greenish-white, head black, under a lens the body is seen to be covered with white hairs. During the day it rests concealed beneath the leaves of the food plant. When half-grown it is pale apple-green with a yellowish line on either side of dorsum and a spiracular line of the same colour. Full fed length 10 mm. varies from pale green to brownish-green with a pink tinge. On either side of the dorsum, which is darker than the ground colour, is a pale pink line and a spiracular line of the same colour; each segment is further marked by short diagonal lines rather darker than the ground colour. Legs same colour as the body, which under a lens is seen to be covered with white hairs five-rayed. Head black.

Pupa pale greyish-purple with narrow purple dorsal line and a broader but shorter line on either side most prominent on the last two segments; two deep purple circular spots in line with these at the base of the wing covers, and two other much smaller spots on either side between them and the head. Alæ pale green.

Egg hatched, 26. viii; pupa, 14. ix; imago, 24. ix, '05. The butterfly probably flies all the year round.

Catopsilia florella, Fabr.

2. *Callidryas Florella,* Fabr.

3. *Callidryas Rhadia,* Boisd.

Introduced into Mauritius probably with the food plant

(*Cassia*) which is not a native. It is usually scarce in the hill districts, but common lower down, and would be extremely abundant if it were not for the tremendous destruction of eggs and larvæ. I doubt whether one egg in five hundred ever comes to maturity. I have noticed a plant fairly covered with eggs and two days afterwards they were comparatively scarce. Ants carry them off by hundreds, and the young larvæ are eaten by a small green spider. The larvæ in the last stadium vary considerably. In many, perhaps the majority, the lateral white line is tinged with orange and the black lateral line is continued as a black collar behind the head; the last two or three segments are also more or less crossed by extensions of the black lateral lines. I may say that the sex of the perfect insect is in no way indicated by the different markings of the larva. There are two broods in the hot weather, at the beginning of December, and another in February and March; the pupæ from the majority of this brood remain over the cold weather and emerge the following December.

Bourbon. I did not meet with this insect, and Vinson says it is rare.

Terias floricola, Boisd.

5. *Terias Floricola*, Boisd.

Mauritius. Scarce above 1,000 feet; common and frequently abundant below this level, and widely distributed. The dry-weather form, *Terias ceres*, Butl., occurs sparingly, but so far as I have observed, in the low country only. Flies all the year round except in the coldest month, July. The same remarks apply to the species in Bourbon.

Terias pulchella, Boisd.

4. *Terias Rahel*. Fabr.

If it were not for the opinion expressed by Trimen ("S. Afr. Butt.," 3, p. 18, note 1 [1889]), that this is distinct from *Terias brigitta*, I should certainly consider it to be the same species, as I have specimens from Mauritius which are indistinguishable from *T. brigitta*, or rather *T. zoë*, from Natal.

It can, I think, be considered as at most a geographical race of that species. The wet-season form (*T. zoë*) is far more frequently met with than the dry (*T. brigitta*), and indeed I have not personally met with the latter, but am under the impression that I have seen one or two specimens in the Port Louis Museum. Its absence can be readily understood in the damp climate of Mauritius. It is not common, but is found at Moka and in the Botanical Gardens at Pamplemousses almost at sea-level, always in the neighbourhood of its food plant *Tephrosia*. It is absent, or very rare (once at Curepipe) above 1,000 feet, and disappears in the cold weather. It is very variable in size, those found in October being usually larger than those captured in April. The transformations of *T. brigitta* are well known, but those of *T. pulchella* have not been described.

The egg laid April 9th; hatched April 11th. Spun up April 19th, and the butterfly emerged May 2nd. The larva when first hatched is uniform pale yellowish-green, and when magnified is seen to be covered with whitish reversed hairs, which, however, disappear when the larva is full grown. The full-fed larva is green, with thin yellow spiracular, and broader purplish-brown dorsal, lines. Pupa pale apple-green, wing covers streaked with purplish-brown; dorsum and sides thickly sprinkled with small spots of the same colour. Spins up on the stem of the food plant. Larva and pupa of the usual Pierine shape.

It does not occur in Bourbon.

Papilio manlius, Godt.

1. *Papilio Phorbanta*, Linn.

This beautiful butterfly is common everywhere and excites the admiration of the least observant. It flies all the year round, though the specimens seen in the cold weather are usually tattered individuals of longer life than their fellows. The female can easily be distinguished on the wing by the absence of the white band which is such a conspicuous feature on the undersurface of the hind wing of the male. The larva feeds on citron, but I am unable to say in what respect it differs from the Bourbon species *P. phorbanta*. Dr. Vinson, writing on the butterflies of Bourbon in 1896, makes the following interesting remark. He says that in 1669 the Count of Mont de Vergne arrived with ten vessels and sowed Madagascar and afterwards "Mascareigne" and Mauritius with the seeds of various citrons which he had brought from

Brazil; and he suggests that possibly these green *Papilios*, or more probably their common ancestor, were thus introduced. He inclines to the view, however, that the citron is indigenous to all these islands. I should say that the Madagascar, Bourbon, and Mauritius green *Papilios* are probably derived from some African ancestor closely allied to *P. nereus*.

Papilio phorbanta, L. (Pl. XXIX, figs. 6, 6a).

Confined to Bourbon, where it is known as *P. disparilis*, Boisd. Common, not to say abundant, on the coast and up to about 2,000 feet. I never saw a single specimen at 3,000 feet, and its distribution is no doubt determined by the food plant. It feeds on citron, and the larva has been figured and described by Vinson. It is no doubt unpalatable in the larval stage. The female is aberrant, and is an admirable example of what Scudder calls "colourational antigeny" in which it is the female that departs from the normal colouring of the group to which the species belongs. It is presumably a mimic of *Euplœa goudoti*, and in such a small island as Réunion the exciting cause should not be difficult to discover. I may say fairly confidently, that there is no bird now existing which makes any marked ravages among the butterflies. Indeed birds are conspicuous by their absence, and are as rare in Réunion as they are in France and Italy, and for the same reason; affording a marked contrast to Mauritius, where they are protected and consequently abundant.

I was informed, however, by Dr. Jacob, who has resided for some fifty years in Réunion, that at one time the now extinct "starling" (*Fregilupus varius*) was decidedly common, especially in those parts more particularly frequented by *P. phorbanta*, and, judging by the stuffed specimen in the St. Denys Museum, I should say that the bird was entirely insectivorous. I throw out the suggestion that it was this bird that was the main cause of this case of mimicry. We have therefore in these two islands two cases of the marked effect of birds on butterflies. In Mauritius, which had no indigenous starling, the introduction of the Indian starling caused the extinction of *Salamis augustina*, and in Réunion the presence of the Réunion starling gave rise to a remarkable case of mimicry.

As habit, manner of flight and so forth is now regarded as of high importance in deciding questions of mimicry, I put on record my observations regarding *P. phorbanta* and *Euplœa goudoti.*

St. Denys, where I chiefly collected, is a town on the outskirts of which the houses are situated in the midst of gardens of considerable size, and both species are common flying about the roads. I secured all my specimens in the Botanic Gardens, which comprise an area of three or four acres laid out with avenues of palms, and extensive shrubberies of *Alamanda, Hibiscus,* and other shrubs growing to a height of ten or fifteen feet. These were intersected by narrow paths, which were consequently shady, and at the same time very hot and steamy from the fountains which were pretty numerous.

In these shady groves the *Euplœa* was abundant, with a more lazy flight than is usual even with an *Euplœa*; many were busy ovipositing on the *Alamanda* shrubs. Other parts of the gardens were laid out in flower-beds and were more open, but *Euplœa* certainly preferred the shade. *P. phorbanta* was also common in the garden. It was not difficult to catch, as it flew about ten feet from the ground across the broader drives. I should not call the flight particularly rapid for a *Papilio,* but when frightened it made off at a considerable pace. Numerous females were flying about in a similar manner to the males. I noticed two or three females at different times in the shrubberies fluttering close to the ground, and from the manner of their flight I think they were contemplating oviposition, but they did not do so, though I followed them assiduously from one citron tree to another. Under these circumstances they were on *Euplœa* ground, and I can imagine an unobservant person passing through the gardens and being under the impression that he had seen only one kind of brown butterfly.

Papilio (*Orpheides*) *demodocus,* Esp.

This abundant and conspicuous insect could scarcely have escaped Mr. Trimen's notice, so I conclude that it has been introduced into the island since he was there in 1865. It occurs all over the island in every month in the year. The larva is well known.

It is equally abundant in Bourbon, and was introduced into that island some thirty years ago by Dr. Vinson, who imported larvæ from Madagascar. Unfortunately at the very time of its arrival a Coccid attacked and destroyed large numbers of the orange trees, but the damage was not unnaturally attributed by the natives to the more conspicuous larvæ of *demodocus*, which increased alarmingly and no doubt did considerable mischief. The butterfly was consequently given the name of "Le papillon Vinson," which it still retains, and at the time of my visit the name of Vinson in this connection was still regarded with some feelings of bitterness by the more ignorant.

Rhopalocampta forestan, Cram.

25. *Ismene Florestan*, Cram.

Common on the sea-coast, where its food plant *Terminalia* grows. Stragglers may be found pretty constantly at the higher elevation, and it is not at all uncommon at Curepipe, 1,800 feet. It has a quick darting flight, but the conspicuous white band on the undersurface of the hind wing makes it easy to follow. Flies I–IV, IX–XII. The same remarks apply to the insect in Bourbon. Vinson writes in 1896, "Introduced about fifty years ago with some botanical plants into the Botanic Gardens when M. Claude Richard was director."

Eagris sabadius, Boisd.

24. *Nisoniades Sabadius*, Boisd.

Widely distributed and not uncommon. It has a wild rapid flight and soon tatters itself. It has a habit of resting with widely-expanded wings on the upper side of a leaf. The upper-surface is variable both in colour of the wings and in the size of the spots; but this is not, so far as I have observed, in any way seasonal. The larva feeds on *Hibiscus*. Flies all the year round except VII and VIII. It is recorded from Bourbon, but I did not myself meet with it.

Parnara borbonica, Boisd.

22. *Pamphila Borbonica*, Boisd.

Abundant both in Mauritius and Bourbon near sugar-cane and bamboos; the larva feeds on *Paniscum*. The insect settles with closed wings, but is quick and active like all *Hesperiidæ* and soon tatters itself. Flies I–VII, abundant; VIII, scarce; IX–XII, abundant. It is not a variable insect.

Parnara marchalli, Boisd.
23. *Pamphila Marchalli*, Boisd.

Known in Mauritius, but erroneously, as *Hesperia poutieri*, a Madagascan species. It is usually very common, and is the most "confidential" skipper of my acquaintance; I have not infrequently captured it in my fingers when basking in the sun. The larva feeds on sugar-cane. Flies I–V, common; VI–VIII, scarce; IX–XII, common. It has not been recorded from Bourbon.

A long series shows considerable variation on the fore wing, the spots, though never more than two in number, are frequently reduced to mere points and in some specimens are completely absent, the entire wing being an uniform yellowish brown. In the female the spots are larger and altogether more pronounced.

NOTE.—*Precis rhadama.* My remark as to the date of its introduction into Bourbon being later than into Mauritius must be modified or withdrawn. Guenée, in Maillard, "Notes sur l'ile de la Réunion 1863," states that it was introduced "about twelve years previously," *i. e.* about 1851.

Catopsilia florella.—When I wrote that the different markings on this larva were not indicative of the sex of the future butterfly, I was unaware of Vinson's different conclusion quoted by Guenée in the above work. Vinson says that all the caterpillars which produce the yellow variety have the "first segment of the neck" entirely black, while the larvæ without the black collars produce the white butterflies. Guenée adds, "this curious observation ought to be repeated." I do not know whether in this long interval of nearly fifty years any one has carried out Guenée's suggestion, but I append my results which show that Vinson's opinion was founded in error—not an error due to carelessness but to a curious chance.

Two pupæ from larvæ with "black collars" (pupated 22 I, emerged 3 II) were both males, of course white.

Two pupæ from larvæ without "black collars" (pupated 28 I, emerged 4 II) were one male, one yellow female.

One pupa from larva without black collar (emerged 12 II), white female.

Two pupæ from larvæ with incomplete collar (emerged 6 II), two yellow females.

Explanation of Plate XXIX.

See Explanation facing the Plate.]

XXVI. *Studies of the* Blattidæ. By R. SHELFORD, M.A., F.L.S.

[Read December 4, 1907.]

VIII. THE BLATTIDÆ DESCRIBED BY LINNÆUS, DE GEER AND THUNBERG.

STÅL published in 1873, 1874, and 1875 the three parts of his "Recensio Orthopterorum. Revue critique des Orthoptères décrits par Linné, De Geer et Thunberg." The families treated in this memoir, which is not only a critical review but a revision of genera also, are the Acridiidæ, Locustidæ, Gryllidæ and Phasmidæ. Stål relinquished the idea of treating the Mantidæ and Blattidæ in the same way, though in 1877 he published his "Systema Mantodeorum," and this contains all the information necessary for the correct determination of the scanty number of species described by the older Swedish entomologists. The Blattidæ have long been neglected, and since the exact determination of the species described by the older authors is, in any systematic work on any group of insects, a matter of first-rate importance, if not an actual necessity, I made it the first object of a visit to Sweden last summer to examine in detail the Blattidæ in the collections of De Geer at Stockholm and of Thunberg at Uppsala. The collection of Queen Louisa Ulrica now at Uppsala contains only three species of Blattidæ described by Linnæus, and I assumed that the remainder of his types were in the possession of the Linnæan Society of London. However, on looking over this collection recently I found that such was by no means the case, and for reasons given below I believe that with one exception those types of Blattidæ described by Linnæus, which are not at Uppsala nor in London, are in De Geer's collection at Stockholm. In my investigations I have received the kindest assistance from Dr. Daydon Jackson, Prof. Chr. Aurivillius, Dr. Y. Sjöstedt and Dr. Ivar Trägårdh, to all of whom I beg to offer my cordial thanks.

i. Species described by Linnæus.

The Linnæan species are twelve in number, viz. :—

1.	*Blatta gigantea*,	Syst. Nat. (ed. x) i, p. 424,	No. 1 (1758).
2.	„ *ægyptiaca*,	op. cit.	No. 2.
3.	„ *surinamensis*,	„ „	No. 3.
4.	„ *americana*,	„ „	No. 4.
5.	„ *nivea*	„ „	No. 5.
6.	„ *africana*	„ „	No. 6.
7.	„ *orientalis*,	„ „	No. 7.
8.	„ *lapponica*,	„ „	No. 8.
9.	„ *oblongata*,	„ „	No. 9.
10.	*Cassida petiveriana*,	„ „ p. 364,	No. 18.
11.	„ 7-*guttata*,	Syst. Nat. (ed. xii) i (2), p. 577,	No. 19 (1767).
12.	*Blatta germanica*,	op. cit. p. 668,	No. 7.

With the exception of *nivea* and *oblongata* all the species have been determined with accuracy by subsequent authors.* *Petiveriana* and 7-*guttata*, originally described as Coleoptera, are synonymous. As regards the types, *gigantea*, *ægyptiaca* and *africana* represented by unique male specimens are in the Queen Ulrica collection at Uppsala. The Linnæan Society's collection of insects contains a number of Blattidæ, but only five of these can be identified by the labels in Linnæus' handwriting as his types, viz., *lapponica* (1 ♂, 1 ♀), *germanica* (1 ♂), *orientalis* (1 ♂), *petiveriana* (1 ♂) and 7-*guttata* (♀). The other species were added subsequent to the purchase of the Linnæan cabinet and bear labels in various handwritings; moreover the collection includes no species that can possibly be identified with *oblongata* and *nivea*. The types of four species have still to be accounted for, viz. *surinamensis*, *americana*, *nivea* and *oblongata*. I have some reason for believing that these are in De Geer's collection. De Geer in his "Mémoires pour servir à l'histoire des insectes," vol. iii (1773), enumerates twelve species of Blattidæ, six of which he describes as new and

* Brunner however in his "Nouveau Système des Blattaires," p. 357 (1865), identifies *Polyphaga ursina*, Burm., with *africana* L., which is incorrect, for the species are very different.

six of which are Linnæan species, Linnæus' descriptions in full being prefixed to his own descriptions. Of these six Linnæan species he records two as occurring in Russia, Finland and Sweden, viz. *orientalis* and *lapponica;* the other four correspond with the missing Linnæan types, viz. *surinamensis, americana, nivea* and *oblongata.* The coincidence is arresting, and I have looked into the matter more closely to see if it is something more than mere coincidence. In the first place we may assume with some degree of confidence that the two local species of Blattidæ, *lapponica* and *orientalis,* were the first to attract the attention of Swedish naturalists and formed the nucleus of collections of these insects; consequently to find specimens of them in the cabinets both of Linnæus and De Geer is not surprising. De Geer received, as he states in his book, insects from Surinam, sent to him by his correspondent Rolander: is it not probable that at first he lent these for description to his friend Linnæus who he knew to be preparing new editions of his "Systema Naturæ," but that when later he wrote his own work on entomology he kept the specimens that arrived from Rolander and described them himself? Thus we find in De Geer's collection two common local species, ten exotic species, four of which were described by Linnæus in 1758, six by himself in 1773. The supposition that Linnæus described specimens from De Geer's collection becomes almost a certainty when we read in De Geer's description of *Blatta oblongata* (l. c., p. 541), "Cette petite Blatte que M. Rolander m'a encore envoyée de Surinam . . . ," and on turning to the Linnæan description of the species see that it ends with "*Habitat* in America. *Rolander.*" It is possible but not very probable that Rolander sent specimens of this species both to Linnæus and to De Geer, and as a matter of fact Dr. Daydon Jackson tells me that Linnæus somewhere laments that Rolander never gave him anything. That Linnæus and De Geer were on the most friendly terms is shown by the series of fifteen letters to Linnæus from De Geer, now in the possession of the Linnæan Society. Dr. Daydon Jackson has also drawn my attention to a passage in a translation of Linnæus' diary printed in Morton's edition of Pulteney's Linnæus: "Rolander collected in the islands near America a great many plants, which he gave to M. de Geer, Chamberlain of the Household, who made me a present of every one of them." Whether my supposition that De Geer lent some of the specimens in his collection to Linnæus for description is correct—and it must be admitted that there is a degree of probability in its favour—or not, I would venture to suggest that the specimens of *surinamensis, americana* and *nivea* now in the De Geer cabinet be selected as the types of the Linnæan species; otherwise these species must remain without typical specimens, for if these specimens are not the actual types then the actual types are irrevocably lost. The specimen of *oblongata* in De Geer's cabinet cannot be chosen as the type of the species, for, though it is in a fragmentary condition, enough remains to show that it does not in the least correspond with the Latin diagnosis of Linnæus or with De Geer's description in French or with his figures. In other words, this is not the actual specimen on which both Linnæus and De Geer based their descriptions; that specimen must have been lost or destroyed accidentally, and the existing specimen subsequently placed under the same name, either by De Geer or perhaps still later by some one else. The discrepancy between the descriptions of *oblongata* and the existing specimen does not invalidate my view as to the identity of the Linnæan types, for the diagnosis of Linnæus tallies perfectly not only with De Geer's description but with his figure. It is noteworthy too that in the case of the other three species the Linnæan diagnoses agree perfectly with De Geer's specimens, figures and descriptions; the Latin diagnoses are of course much shorter than the French descriptions, which are therefore not mere translations, but additional and amplified diagnoses.

As to *oblongata* there seems nothing for it but to regard the species for the present as uncertain; it has not been recognised with accuracy since it was described, for the *Blatta oblongata* of Serville and the *Thyrsocera oblongata* of Brunner and de Saussure is quite a different insect, to be identified probably with the *Blatta intercepta* of Burmeister. The species described by Walker as *Pseudomops inclusa* (= *amœna* Sauss.) is evidently closely allied to *oblongata* L., and a long series of specimens might show that Walker's species was merely a varietal form of *oblongata.*

The other Linnæan species which had not been recognised with certainty by later authors, *Blatta nivea,* will be discussed in the next section of this paper.

ii. De Geer's Collection.

As already stated, De Geer in his "Mémoires pour servir à l'histoire des insectes," vol. iii (1773) enumerates twelve species of Blattidæ, six of which are described as new, viz.:—

Blatta pensylvanica.
Blatta abdomen-nigrum.
Blatta livida.
Blatta rufa.
Blatta grisea.
Blatta minutissima.

The remaining six species are Linnæan species, but new names are given to two, even though De Geer fully recognised the specific identity of his species with those of Linnæus.

The collection is now at Stockholm in the Riks Naturhistoriska Museum, and with the exception of one specimen is in a good state of preservation. I am indebted to Dr. Y. Sjöstedt for permission to make a careful examination of this very interesting collection. The following is a catalogue of the specimens with annotations:—

1. *Blatta culinaris*, De Geer, op. cit. p. 530, pl. 25, ff. 1–7.

This is the *Blatta orientalis* of Linnæus; 2 ♂♂, 1 ♀, and also 1 larva of *Pycnoscelus surinamensis*, L.

2. *Blatta lapponica*, De Geer, op. cit. p. 533, pl. 25, ff. 8–12.
= *Ectobius lapponicus*, L.
3 ♂♂.

3. *Blatta kakkerlac*, De Geer, op. cit. p. 535, pl. 44, ff. 1–3.
= *Periplaneta americana*, L.
1 ♂, 1 ♀.

From S. America (Rolander.)

4. *Blatta pensylvanica*, De Geer, op. cit. p. 537, pl. 44, f. 4.
= *Ischnoptera pensylvanica*, De Geer.
1 ♂.

The species has been recognised and correctly determined by all subsequent authors.

From "Pensylvania" (Acrelius).

5. *Blatta abdomen-nigrum*, De Geer, op. cit. p. 537, pl. 44, f. 5.

= *Epilampra abdomen-nigrum*, De Geer (*syn. Epilampra brevis*, Brunner, P.Z.S. Lond., 1892, p. 203, pl. 15, f. 3).

1 ♀.

The species is omitted in Kirby's "Synonymic Catalogue of Orthoptera."

Description of the type:—

♀. Rufo-testaceous shading to rufo-castaneous. Head with vertex between the eyes castaneous, rest of head rufo-testaceous with a few scattered brown points; width between the eyes slightly greater than length of first antennal joint. [Antennæ mutilated.] Pronotum trapezoidal, anteriorly truncate, posteriorly produced, sides deflexed; smooth, rufo-testaceous but densely covered with fine castaneous dots, lyrate markings faintly indicated. Tegmina just failing to reach base of supra-anal lamina, rufo-castaneous with a few scattered castaneous points; anal field with slight indications of seriate punctures; the part of the right tegmen overlapped by the left, dark castaneous; mediastinal vein forked at apex, radial vein bifurcate, dark castaneous at base, 12 costals from upper branch of radial, the lower branch multiramose. Abdomen above heavily mottled with castaneous, supra-anal lamina produced, triangular, apex notched, (slightly mutilated during life and regenerated on the right side), projecting beyond the sub-genital lamina. Spiracular tubes prominent. Abdomen beneath castaneous, sub-genital lamina produced, ample, posterior margin sinuate. [Cerci mutilated.] Coxæ rufo-testaceous, spotted with castaneous; femora rufo-testaceous with a castaneous line along the outside and lower aspect; tibiæ with apex and a line down the outer aspect castaneous. Front femora with a series of 5 spines on the anterior margin beneath, succeeded distally by a row of piliform setæ, 2 spines on the posterior margin, mid-femora with 4 spines on anterior margin and also on posterior margin beneath, hind-femora with 3 on anterior margin and 4 on posterior margin beneath. Formula of apical spines $\frac{2}{1}$, $\frac{1}{1}$, $\frac{1}{0}$, no genicular spines on front femora. Posterior metatarsus [one absent] has been regenerated and is composed of 4 joints only.

Total length 25·5 mm.; tegmina 18·1 mm.; pronotum 7 mm. × 8·4 mm.

The species is recorded from Surinam by De Geer;

there are examples in the Oxford Museum from Demerara, Guadeloupe and I. of St. Vincent.

6. *Blatta livida*, De Geer, op. cit. p. 538, pl. 44, f. 6.
   = *Epilampra abdomen-nigrum*, De Geer.
   1 ♂.

One example with the abdomen missing. From a comparison with specimens in the Oxford Museum, I am convinced that this species of De Geer's is merely the male of *E. abdomen-nigrum*. The differences between the two specimens are, irrespective of size, very trifling, e.g. in *Blatta livida*, the mediastinal vein is triramose, there are only 10 costals, the legs are testaceous, and there are only 4 spines on the anterior margin beneath of the front femora and 3 on both margins beneath of the other pairs.

Total length 19 mm.; tegmina 15 mm.; pronotum 5 mm. × 6·9 mm.

Also recorded from Surinam. The unique specimen bears a label in Stål's handwriting "Epilampra brasiliensis, Burm. var."

7. *Blatta rufa*, De Geer, op. cit. p. 539, pl. 44, f. 7.
   (*syn. Ischnoptera rufa*, Brunner.)
   1 ♂.

This species also is omitted in Kirby's Catalogue.

Description of the type:—

♀. Uniform rufo-castaneous. [Head missing.] Pronotum trapezoidal, anteriorly truncate, sides deflexed, posteriorly very obtusely angulated, smooth, with two oblique obsolescent impressions. Scutellum exposed. Tegmina and wings extending considerably beyond the apex of the abdomen; mediastinal vein simple, radial vein not bifurcate, 16–18 costals, 11 longitudinal discoidal sectors, both the ulnar veins being ramose, the sectors connected by numerous transverse venulæ. Supra-anal lamina triangularly produced, its apex hyaline, exceeding the sub-genital lamina in length, sparsely fimbriate. Abdomen beneath castaneous, sub-genital lamina semiorbicular, ample. [Cerci mutilated.] Legs testaceous, tibiæ rather darker than femora. Front femora with 4 spines on anterior margin, succeeded distally by piliform setæ, one spine on posterior margin beneath; mid and hind femora with 4 spines on both margins beneath. Formula of apical spines $\frac{3}{1}$, $\frac{1}{1}$, $\frac{1}{1}$, no genicular spines on front femora.

Total length 21 mm.; body-length 13·5 mm.; tegmina 17 mm.; pronotum 4·1 mm. × 5·5 mm.

From Surinam.

8. *Blatta surinamensis*, L., De Geer, op. cit. p. 539, pl. 44, f. 8.
 = *Pycnoseclus surinamensis*, L. Type.

One example with the abdomen missing.

From Surinam.

9. *Blatta grisea*, De Geer, op. cit. p. 540, pl. 44, f. 9.
 = *Epilampra grisea*, De Geer.
 (*syn. Blatta maculicollis*, Serv.
 ? *Phyllodromia burmeisteri*, Guér.
 Epilampra brasiliensis, Brunner (*nec* Fab.) .)
 1 ♂ with label in Stål's handwriting, "*Epilampra burmeisteri*, Sauss.

Description of the type:—

♂. Testaceous. Head with sparse castaneous mottlings on the vertex and frons. Eyes converging slightly on frons which is slightly depressed and faintly wrinkled between lower part of eyes; least distance between eyes greater than breadth of 1st antennal joint but less than its length. Pronotum sprinkled with minute castaneous points, but almost devoid of the lyrate markings characteristic of the genus, these being represented by two triangular castaneous points near base of the disc. Tegmina testaceous, a few scattered castaneous dots along the radial vein and at apex, mediastinal vein with 2 short branches, 11 costals, radial bifurcate, 10 longitudinal discoidal sectors. Abdomen beneath sprinkled with castaneous; supra-anal lamina produced, bilobed, exceeding in length the subgenital lamina which is rather narrow, slightly asymmetrical and furnished with 2 slender styles. Cerci rather long. Legs testaceous, front femora with 5 spines on anterior margin, 3 on posterior margin beneath, mid-femora with 4 on both margins, hind-femora 3 on anterior margin, 4 on posterior margin; formula of apical spines $\frac{2}{1}$, $\frac{1}{1}$, $\frac{1}{0}$, no genicular spines on front femora. Posterior metatarsus longer than remaining joints; all the tarsal joints biseriately spined beneath.

Total length 24·1 mm.; body-length 20·4 mm.; tegmina 20·5 mm.; pronotum 5 mm. × 6 mm.

Recorded from Surinam.

10. *Blatta nivea*, L., De Geer, op. cit. p. 540, pl. 44, f. 10.
= *Panchlora nivea,* L. Type.
(*syn. Panchlora virescens*, Thunb.)
1 ♂.

The genus *Panchlora* includes several species described by the older authors, e. g. *viridis* Fab., *hyalina* Stoll, *virescens* Thunb., *exoleta* Burm., *viridis* Burm., *chlorotica,* Pall.; to determine these with accuracy or to fix their synonymy is a matter of impossibility unless all the types are critically examined. De Saussure and Zehntner in the "Biologia Centrali-Americana. Orthoptera," vol. i, p. 90–92, have drawn up a synoptical key to the species of *Panchlora* without consulting any of the older types; such a key certainly enables the student to give a name to his specimens, but by no means does it follow that these names are correct, in fact it must be a matter of pure chance if the use of such a key enables the systematist to identify any one of his specimens with accuracy. A good example of this is shown in the species under notice, *P. nivea*, L.; the key of de Saussure and Zehntner accidentally is correct in diagnosing *P. virescens* Thunb., but *P. nivea*, L. is situated in another part of the key; yet these two species are the same, as I have discovered from an examination of De Geer's specimen which I accept as the Linnean type and of Thunberg's type. The identification of the species of *Panchlora* is most difficult, as they resemble each other very closely and present scarcely any characters that do not vary to such an extent that they are practically useless for purposes of discrimination. One character however appears to be of some importance, viz. the form of the cerci, and the size of their apical joints when viewed from below. In a species which I identify provisionally as *P. antillarum* Sauss., the cerci are broad, somewhat spatulate and with the last two joints much enlarged; in *P. viridis* Fab., the cerci are lanceolate with the last two joints enlarged; in *P. nivea,* L., the cerci are lanceolate with the last joint only enlarged. This character occurs in both sexes, and taken in conjunction with the general size of the insect and the distance apart of the eyes is of considerable help in discriminating the species. In *P. nivea*, L., the eyes almost touch on the vertex of the head, and the male type has the following dimensions:—Total length 16 mm.; length of body 12 mm.; length of tegmina 13·5 mm.; pronotum 3·9 mm. × 4·1 mm. The antennæ are unicolorous, and the tegmina are immaculate. This is the commonest species of the genus, and will eventually be proved, I am sure, to have been described over and over again; it frequently finds its way to England, lurking in imported fruit, and has been recorded in the lists of Natural History societies as *P. exoleta* Burm, and as *P. virescens* Thunb. The type is recorded from Surinam.

11. *Blatta oblongata*, L., De Geer, op. cit. p. 541, pl. 44, f. 11.

= *Pseudomops oblongata*, L.

The specimen in De Geer's cabinet is much mutilated, consisting of the head and the two thoracic segments only; the tegmina also are missing. The head is piceous, with first and basal half of second joint of maxillary palpi flavo-testaceous, the rest of the palpi fuscous. Pronotum flavo-testaceous with a complex fusco-castaneous design on the disc. As already pointed out, this does not correspond with Linnæus' description "thorace punctis duobus lunulaque nigris" nor with De Geer's figure and description. The species is most nearly allied to *Pseudomops angusta*, Wlk.

12. *Blatta minutissima*, De Geer, op. cit. p. 542, pl. 44, ff. 13, 14.

= *Holocompsa minutissima*, De Geer.

(? *syn. Holocompsa cyanea*, Burm.)

One specimen in bad condition, the abdomen missing.

Description of the type:—

Head fuscous with a sparse rufous pubescence, clypeus and labrum testaceous; antennæ (mutilated) fuscous. Pronotum fuscous with a recumbent rufous pubescence. Tegmina with basal half coriaceous, castaneous, apical half membranous, hyaline, marginal area with rufous pubescence 6 to 7 costal veins anal vein impressed and bent at a right angle. Wings not longer than tegmina; marginal area with a castaneous "stigma" formed by the incrassated branches of the mediastinal vein and by the five incrassated costal veins, the internervular spaces also being castaneous. Coxæ castaneous.

Total length 5 mm.; length of tegmina 4 mm.

From Surinam.

Brunner was the first to suggest that this species should be placed in the genus *Anaplecta*, and every other author has followed this lead without question. De Geer's figures are certainly too small and ill-defined to enable one to guess correctly at the systematic position of the species.

iii. Species described by Thunberg.

The papers in which Thunberg described new species of cockroaches are:—

1. Dissertatio Entomologica novas Insectorum species sistens. Part iv, pp. 76–78, Uppsala, 1784.
2. Några nya species af Blattae—slägtet beskrifna. Vetensk. Acad. nya Handl. vol. 31, pp. 185–189, pl. 5, 1810.
3. Blattarum novæ species descriptæ. Mém. Acad. St. Pétersb., vol. 10, pp. 275–293, pl. 14, 1826.

The second of these two papers containing the descriptions of seven new species has entirely escaped the notice of every subsequent authority on the *Blattidæ;* this neglect is rather remarkable, seeing that the paper was published in a well-known scientific journal, was furnished with a plate, and was referred to by Thunberg in a later memoir which is well-known to every orthopterist, viz., *Hemipterorum maxillosorum genera illustrata. Mém. Acad. St. Pétersb., vol. 5, pp. 211–301, pl. 3, 1815. It affords me considerable satisfaction to bring about the resurrection of this forgotten memoir, especially as this involves no startling changes in nomenclature. In his Dissertatio Entomologica de Hemipteris maxillosis Capensibus, Uppsala pp. 1–8, 1822, Thunberg enumerates four species of Blatta, but all of these have been described previously, either by himself or by Fabricius, and as the

* A manuscript copy of this memoir from the library of Audouin is in the Hope Library, Oxford Museum.

descriptions add nothing to those already published this paper will not be quoted below.

The Thunbergian collection of insects, which in its day must have been one of the largest in Europe, is still at Uppsala and is very much as Thunberg left it. Stål overhauled the Orthoptera, and though he published nothing concerning Thunberg's Blattidæ, nevertheless attached to most of the specimens the names of more recent authors. It is quite evident from a study of the collection that Thunberg was by no means a "splitter," even if judged by the standard of scientific accuracy of his day, and as a result it is frequently the case that more than one species in his collection stands under the same specific name. To take one example:—under the name *Blatta grossa* stand three species of the genus *Monachoda,* and the question arises, which of these is to be selected as the type? Thunberg's description affords no help. The simplest course is to regard that specimen as the type which most closely approximates to the description of the species drawn up by later authors from specimens which they imagined to be identical with Thunberg's specimen. A certain definite species of *Monachoda* stands in all collections under the name *M. grossa* Thunb., it is recognised presumably not by Thunberg's description but by Serville's, Brunner's or that of some other authority; since in Thunberg's own collection there is an example of this species, that example, in the absence of all evidence to prove the contrary, may be selected as the type of his species *M. grossa.* The following is a list of the species described by Thunberg, taken in the order of their publication.

In the first column the Thunbergian name is given, in the second the correct name of the species, and in the third column some synonyms:—

	THUNBERG'S NAME.	CORRECT NAME.	SYNONYMS.
(1784)	1. *Blatta capensis* (op. cit. p. 77)	*Deropeltis erythrocephala*, Fab.	Cf. Kirby's Syn. Cat. Orth. i, p. 145.
	2. *Blatta fusca* (op. cit. p. 77)	*Aptera fusca*, Thunb.	*Aptera cingulata*, Burm.
	3. *Blatta deusta* (op. cit. p. 77 *)	*Oxyhaloa deusta*, Thunb.	Cf. Kirby, t. c. pp. 175, 176.
(1810)	4. *Blatta ferruginea* (op. cit. p. 187)	*Blatta orientalis* L., rufous var.	
	5. *Blatta bicolor* (op. cit. p. 187, pl. 5, f. A	*Pseudoderopeltis bicolor*, Thunb.	*Periplaneta orba*, Stål, *Ischnoptera juncea*, Sauss., *Nauphœta foveolata*, Wlk.
	6. *Blatta tuberculata* (op. cit. p. 187)	*Rhyparobia maderæ*, Fab. Larva.	
	7. *Blatta guttata* (op. cit. p. 188)	,, ,, ,, ,,	
	8. *Blatta scabra* (op. cit. p. 188)	*Hyposphæria scabra*, Thunb.	*Perisphæria unicolor*, Brunner (nec Burmeister). *Zetobora rugosa*, Wlk.
	9. *Blatta hirta* (op. cit. p. 189)	*Blepharodera hirta*, Thunb.	*Panchlora pilipes*, Wlk. †
	10. *Blatta ciliata* (op. cit. p. 189, pl. 5, f. B)	*Euthyrrhapha pacifica*, Coq.	
(1826)	11. *Blatta papillosa* (op. cit. p. 276, pl. 14)	*Monastria papillosa*, Thunb.	*Monastria semialata*, Sauss. *Monachoda granosa*, Brunn. *Blatta cassidea*, Dalm., may be the same species, if it is, that name antedates Thunberg's, but the type is missing.
	12. *Blatta pellucens* (op. cit. p. 276, pl. 14)	*Cyrtilia pellucens*, Thunb.	*Phoraspis luctuosa*, Sauss.
	13. *Blatta sexnotata* (op. cit. p. 276, pl. 14)	*Brachycola tuberculata*, Dalm.	Cf. Kirby, t. c. p. 196.
	14. *Blatta asellus* (op. cit. p. 277, pl. 14)	*Blabera asellus*, Thunb. Young larva.	
	15. *Blatta cinerea* ‡ (op. cit. p. 277)	*Epilampra grisea*, De Geer.	
	16. *Blatta limbata* (op. cit. p. 278)	*Nyctibora limbata*, Thunb.	*Nyctibora sericea*, Burm.
	17. *Blatta brunnea* (op. cit. p. 278)	*Nyctibora brunnea*, Thunb.	*Nyctibora holosericea*, Burm.
	18. *Blatta reflexa* (op. cit. p. 278)	*Petasodes reflexa*, Thunb.	Cf. Kirby, t. c. p. 161.
	19. *Blatta virescens* (op. cit. p. 278)	*Panchlora nivea*, L. ♀	
	20. *Blatta bipustulata* (op. cit. p. 279)	*Parahormetica bipustulata*, Thunb.	
	21. *Blatta convexa* (op. cit. p. 279)	*Cyrtilia convexa*, Thunb.	*Phoraspis heydeniana*, Sauss.
	22. *Blatta cylindrica* (op. cit. p. 279)	*Periplaneta cylindrica*, Thunb. var. Larva.	
	23. *Blatta gibba* (op. cit. p. 279)	*Notolampra gibba*, Thunb.	*Phoraspis cassidea*, Burm.
	24. *Blatta grossa* (op. cit. p. 280)	*Monachoda grossa*, Thunb.	

* *Blatta irrorata*, Fab., described in the same memoir is certainly not the same as the Fabrician species; it is represented in Thunberg's collection by two or three different species of *Epilampra*.

† *B. pilifera*, Stål, is a different species.

‡ It is not clear why Thunberg gave a new name to this species, which he recognised as identical with De Geer's species.

I append a description of *Parahormetica bipustulata*, as it is the only Thunbergian species which has not been redescribed by subsequent authors, and which in consequence cannot be recognised without a more detailed description than the original one.

♀ Dark castaneous. Pronotum almost smooth, no impressions, only a very few punctuations, a pair of small orange spots in the posterior half of the disc, widely separated. Tegmina lobiform, of the same shape as in *P. bilobata*, Sauss., extending to apex of second abdominal tergite. Supra-anal lamina rounded, surpassed by subgenital lamina into which it fits. Cerci blunt, short. Abdomen below with disc rufous. Legs rufous. Total length 29 mm.; length of tegmina 9 mm.; pronotum 9·5 mm. × 13 mm.

IX. Synonymical Notes.

The following Fabrician species have been omitted by Kirby from his Syn. Cat. Orthopt. vol. 1 :—

Blatta occidentalis, Fabricius, Ent. Syst. ii, p. 7 (1793) to genus *Nauphœta*. *Rhyparobia rufipes*, Kirby is synonymous. Type in Copenhagen Museum. Fabricius gives the locality as "in Americæ insulis," and on the label borne by the type is written "St. Thomas Is." The species is characteristic of W. Africa, and it is possible that Fabricius confused the Island of San Thomé with the West Indian island.

Blatta palliata, Fabricius, Ent. Syst. Suppl. p. 186 (1798) to genus *Hemithyrsocera*. *H. nigra*, Brunner is synonymous. Type in Copenhagen Museum.

Blatta reticulata, Fabricius, op. cit. p. 186 to genus *Phyllodromia*. Type in Copenhagen Museum.

Blatta ruficollis, Fabricius, Mant. Ins. i, p. 226 (1787) to genus *Ischnoptera*. Type in Copenhagen Museum.

I was unable to find the type of *Blatta longipalpa*, Fab.

The following notes result from an examination of Stål's types:—

Blatta pumila, Stål, is a species of *Anaplecta* probably conspecific with *A. lateralis*, Burm.

Blatta misella to genus *Hololampra*.

Blatta tenella is a synonym of *Euthyrrhapha pacifica*, Coq.
Thyrsocera (= *Pseudothyrsocera*) *circumclusa*, Stål, is ♀ of *P. circumcincta* Stål, and *P. semicincta* is ♀ of *P. rufiventris*, Stal.
Epilampra tagalica, *E. trivialis* and *E. caliginosa* are conspecific.
Cutilia tartarea is a synomym of *Platyzosteria nitida*, Brunner.
Periplaneta wahlbergi to genus *Deropeltis; D. atra*, Brunner, is a synonym.
Periplaneta albilatera to genus *Pseudoderopeltis*.
Pollusca and *Homalodemas* are synonyms of *Derocalymma*, Burm.
Blabera monstrosa is a synonym of *Monastria biguttata*, Thunb.
Blabera luctuosa is not synonymous with *B. atropos*, Stoll.

The following corrections should be made in the list of Blattidæ from the Transvaal given in Mr. Distant's "Insecta Transvaaliensia."

Phyllodromia delta, Kirby, is synonymous with *P. supellectilium*, Serv.
Apotrogia, Kirby, is founded on a larva of the genus *Gyna*, and *A. angolensis*, Kirby, is probably the same as *Gyna caffrorum* Stål.
Deropeltis distanti, Kirby, is synonymous with *Blatta meridionalis*, Sauss.
Nauphœta aspersata, Kirby, is a species of *Oxyhaloa* possibly conspecific with *O. ferreti*, Reiche.
Elliptoblatta uniformis, Kirby, is a species of *Hyposphæria*.*
Pilema saussurei, Kirby, described as a female, is in reality an immature male and probably the same as *P. clypeata*, Sauss.
Derocalymma intermedia, Kirby, is a synonym of *D. versicolor*, Burm.
Derocalymma clavigera, Kirby, is a species of *Hostilia*.

Dr. G. W. Müller of the Greifswald Museum having kindly lent me some of Gerstäcker's types, I am able to make the following corrections in nomenclature:—

* I do not think that *Melanosilpha*, Stål, is distinct from *Hyposphæria*, Lucas.

Phyllodromia	*patricia*	to be transferred to	*Theganopteryx.*
,,	*pulchella*	,, ,,	*Theganopteryx.*
,,	*cinnamomea*	,, ,,	*Ischnoptera.*
,,	*basalis*	,, ,,	*Ischnoptera.*
,,	*punctifrons*	,, ,,	*Ischnoptera.*
,,	*ægrota*	,, ,,	*Ischnoptera.*
,,	*relucens*	,, ,,	*Ischnoptera.*

hemerobina, centralis, pustulosa, and *obsoleta* are true species of *Phyllodromia;* the type of *P. amplicollis* is lost.

Panchlora adusta and *P. vitellina* are true species of *Panchlora.*

XXVII. *Notes and Descriptions of* Pterophoridæ *and* Orneodidæ. By E. Meyrick, B.A., F.R.S., F.Z.S.

[Read December 4th, 1907.]

The following notes may be regarded as materials towards the study of the geographical distribution of these curious families, which is likely to prove eventually of much interest.

PTEROPHORIDÆ.

Diacrotricha, Z.

Having become acquainted with *D. fasciola*, the species to which Zeller attached this generic name, I find it agrees with my genus *Cosmoclostis* in essential characters, and therefore propose to adopt Zeller's name for that genus. Including Zeller's, four species have been described, ranging from Ceylon to Queensland, and I now add a fifth.

Diacrotricha fasciola, Z.

Described from Java; I have it also from Ceylon, India, and the Kei Islands. Bred by Mr. H. Maxwell-Lefroy from pupæ found on leaf of *Averrhoa bilimbi* (?), a tree of cultivation, so that it may be artificially spread.

Diacrotricha auxileuca, n. sp.

♂ ♀. 14–18 mm. Head and thorax white partially suffused with whitish-yellow. Palpi and antennæ ochreous-whitish. Abdomen whitish-yellow, irregularly marked with ferruginous, with three silvery-white transverse bands, beneath wholly white. Legs white, indistinctly banded with ferruginous-ochreous, anterior and middle tibiæ lined with dark fuscous. Fore-wings cleft from $\frac{1}{3}$, segments linear; snow-white; costa slenderly ferruginous-brown from base to cleft, and anterior half of first segment more or less entirely suffused with ferruginous-brown; dorsum also partially ferruginous; first segment with a dark fuscous dot at base of its lower margin, two dark fuscous marks on costa before and at middle, suffusedly connected beneath, a bar at $\frac{3}{4}$, and a dot at apex; second segment with a ferruginous bar mixed with dark fuscous almost at base, a narrow dark fuscous bar beyond middle, and a dot at apex: cilia ochreous, at apex of segments suffused with fuscous. Hind-wings cleft firstly from $\frac{1}{12}$, secondly almost from base ; grey more or less mixed with whitish, sometimes with distinct white subapical bands on segments ; cilia ochreous, tinged with grey.

ASSAM (Khasi Hills), in March; three specimens. Allied to *D. aglaodesma*, but easily distinguished by the different markings of second segment of fore-wings.

TRICHOPTILUS, Wals.

I am indebted to Mr. T. Bainbrigge Fletcher for calling my attention to the fact that in my published description of this genus I have misinterpreted the neuration of the fore-wings; owing to the slenderness of the segments the veins are difficult to follow out to their termination, but I am now satisfied that 7 is always present (not absent as stated), 9 absent, 10 out of 8 or absent, 11 short, separate or out of 8 near base. Unfortunately I am not acquainted with the type of this genus, *T. pygmæus*, though I possess all the other described species.

Trichoptilus pelias, n. sp.

♂ ♀. 12 mm. Head and thorax pale greyish-ochreous. Palpi pale greyish-ochreous, sprinkled with whitish and dark grey. Antennæ white lined with black. Abdomen pale greyish-ochreous dorsally suffused with fuscous, base white, third segment with a pale ochreous arrow-head on back, mixed with blackish on sides, fourth segment much mixed with blackish. Legs white lined with black, posterior pair white banded with greyish-ochreous. Fore-wings cleft from before middle, segments linear; pale whitish-ochreous irrorated with ochreous-grey ; a small black dot beneath costa near base, one in disc at $\frac{1}{3}$, and one above base of cleft; narrow distinct white bands on first segment at about $\frac{1}{3}$ and $\frac{2}{3}$ of length: cilia grey somewhat mixed with white scales, on first segment with several small groups of black scales on posterior half of lower margin, on second with some black scales towards middle of upper margin, and two or three black scales near and beyond middle of dorsum. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from near base, segments linear; dark grey ; cilia grey, on dorsum with a well-marked black scale-projection in middle, and a very small one almost at apex.

COORG (3,500 feet), in January (*Newcome*); ASSAM (Khasi Hills), in November; two specimens.

Trichoptilus congrualis, Walk.

(*Pterophorus congrualis*, Walk. 943; *P. oxydactylus*, ib. 944; *Trichoptilus centetes*, Meyr., Trans. Ent. Soc. Lond., 1886, 16 ; ? *T. compsochares*, ib. 16; *T. ralumensis*, Pag., "Zoologica," xxix, 239; *T. ochrodactylus*, Fish, Can. Ent. xiii, 142.)

This very wide-ranging species occurs freely in South and East Africa, from India and Ceylon to New Guinea and N.E. Australia, and in the West Indies and Southern States of North America (I have several specimens from Florida).

Deuterocopus, Z.

Deuterocopus rubrodactylus, Pag.

I have this from South Africa, Ceylon, India, New Guinea and the surrounding islands.

Deuterocopus planeta, n. sp.

♂. 10-11 mm. Head and thorax deep ferruginous, sprinkled with yellow-whitish. Palpi ferruginous, with several whitish rings. Antennæ whitish, with a biserrate fuscous line. Abdomen whitish-yellow, above with three suffused stripes and several transverse bands ferruginous, third segment with a semicircular silvery-white spot on posterior margin, anal valves and tuft very long and slender. Legs ferruginous ringed with whitish, posterior pair with whorls of expanded scales at origin of spurs and apex of tarsal joints. Fore-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{2}{3}$, first segment narrow, second and third linear; deep ferruginous, sprinkled with whitish-yellowish; undefined slender irregular white bars on first segment before $\frac{1}{3}$ and beyond $\frac{2}{3}$, before base of second cleft, and on middle of second segment: cilia pale ferruginous, on costa mostly dark fuscous, with dark fuscous bars at apex of segments, and dark grey patches or bars on lower margin of first segment towards apex, upper margins of second and third segments towards apex, and lower margins of second and third segments about middle. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from near base, segments linear; ferruginous, first two segments suffused with dark fuscous posteriorly; cilia light ferruginous, third segment with a dot of one or two black scales on dorsum before its middle, and a moderate apical scale-tooth of black and ferruginous scales extending above and beneath.

Coorg (Kuti) (*Newcome*), Assam (Khasi Hills); in

October and November; two specimens. Very similar to *rubrodactylus*, but the silvery-white spot on abdomen is an easy distinction. In *D. ritsemæ*, Wals., the abdomen is also marked with white, but differently, according to the description.

Deuterocopus Tengstrœmi, Z.

Described from Java; I have it also from Assam and the Kei Islands; specimens from the latter group are much more suffused with ferruginous than those from Assam, in which the white colouring is more extensive, but they do not seem otherwise distinct.

Deuterocopus famulus, n. sp.

♀. 15 mm. Head, palpi, and antennæ dark coppery-fuscous with a few white scales. Antennæ dark fuscous. Abdomen blackish-fuscous, first segment white except a dorsal stripe, second segment wholly ochreous-white, third ochreous-white on sides, ventral surface wholly ochreous-white. Legs dark coppery-fuscous, anterior and middle pairs lined and sprinkled with white, posterior tibiæ banded with white, with expansible whorls of scales on origin of spurs (tarsi broken). Fore-wings cleft firstly from before $\frac{2}{5}$, second segment cleft from its middle; dark prismatic coppery-fuscous; a few irregularly scattered white scales: cilia fuscous, towards apex of segments suffused with dark fuscous, beneath apex of first and second segments with a slender white bar, on dorsum with a white space extending from middle to $\frac{3}{4}$, including a central fuscous bar. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{6}$, segments slender; dark fuscous; a pellucid streak in disc; two or three white scales in middle of third segment; cilia pale prismatic purplish-fuscous, darker towards tips of segments, apex of third segment with a small projection of black scales above and beneath.

Kei Islands, in May; one specimen.

Tetraschalis, Meyr.

Tetraschalis ischnites, n. sp.

♂ ♀. 14–15 mm. Head, palpi, and thorax white, sprinkled with brownish and dark fuscous. Antennæ whitish. Abdomen white, streaked with brown and sprinkled with blackish. Legs white, lined and barred with dark fuscous. Fore-wings cleft from $\frac{3}{5}$, segments very slender, tornus almost obsolete ; brown irrorated with white, strewn throughout with small white spots or bars, basal $\frac{2}{5}$ more or less wholly suffused with white ; costa more or less irrorated with black, more broadly posteriorly ; a blackish dot in disc at $\frac{1}{4}$; a small black spot on base of lower margin of first segment, and a black dot below base of cleft ; white patches on costa at middle and $\frac{4}{5}$ of first segment, separated by a blackish patch, and a corresponding blackish patch on second segment : cilia white, irregularly barred with pale ochreous, with scattered black scales, at tornus with a grey bar mixed with stronger black scales. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from near base, segments linear ; grey-whitish irrorated with dark fuscous ; cilia grey with irregular whitish patches, apex of each segment with a small black scale-projection, third segment with a large triangular black dorsal scale-projection at $\frac{2}{3}$.

ASSAM (Khasi Hills), in October and November ; two specimens.

Tetraschalis ochrias, n. sp.

♂. 21–22 mm. Head and thorax pale ochreous sprinkled with whitish, crown sprinkled with grey, face irrorated with blackish. Palpi whitish, second joint with a streak of blackish irroration, terminal joint banded with blackish irroration. Antennæ ochreous-whitish with a dark fuscous line. Abdomen whitish streaked with dark fuscous irroration. Legs whitish lined with blackish, posterior pair banded with fuscous. Fore-wings cleft from before middle, segments very slender, apex of second long-produced, subfalcate, very acute ; ochreous-whitish, irregularly tinged and sprinkled or suffused with brownish ; some dark fuscous irroration towards dorsum anteriorly ; a dark fuscous dot beneath costa near base, and another at $\frac{1}{4}$; an oblique blackish mark at base of cleft ; blackish marks on costal edge before and beyond middle of first segment ; a dark fuscous dash on first segment at about $\frac{2}{3}$, followed by a white bar ; posterior half of second segment mostly suffused with blackish : cilia ochreous-whitish, on lower margin of first segment with some scattered black scales, a grey posterior patch, and a black subapical scale-tooth, on upper margin of second segment mostly suffused with grey, with scattered black scales, on dorsum with grey patches towards middle of wing and before tornus, between these mixed with black scales, with a black scale-projection at tornus and a small one at apex. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from near base, segments linear ; dark grey, first and second segments sometimes partially suffused with whitish ; cilia grey, on costa with a whitish patch towards middle, on upper margin of third segment with a few black scales, on dorsum irregularly mixed with black scales from base to apex, with broad irregular black scale-projections at $\frac{1}{3}$ and beyond $\frac{2}{3}$.

ASSAM (Khasi Hills), in November; KEI ISLANDS, in March; two specimens.

Tetraschalis lemurodes, n. sp.

♂ ♀. 23–24 mm. Head, palpi, and thorax dark reddish-fuscous sprinkled with blackish and whitish. Antennæ grey, above dotted with black and white scales. Abdomen very long and slender, dark reddish-fuscous sprinkled with whitish. Legs dark reddish-fuscous lined with white. Fore-wings very narrow, cleft from $\frac{1}{3}$, segments almost linear, second segment with tornus slight but distinct, its apex extremely slender and elongate; dark reddish-fuscous sprinkled with whitish; first segment with a broad band of whitish suffusion beyond its middle, and a narrow fascia towards apex, sometimes also much suffused with whitish anteriorly: cilia dark fuscous, on costa whitish with several dark fuscous patches, on lower margin of first segment with some scattered white and black scales, on both margins of second segment irregularly mixed with black scales. Hind-wings cleft firstly from $\frac{1}{5}$, secondly from near base, segments linear; dark fuscous; cilia dark fuscous, on upper margin of third segment with scattered black scales, on dorsum much mixed with black and white scales from base to apex, forming a rather longer and more conspicuous accumulation beyond middle.

KEI ISLANDS, in April and May; two specimens.

OXYPTILUS, Z.

Oxyptilus epidectes, n. sp.

♂ ♀. 11–13 mm. Head and thorax dark fuscous sprinkled with whitish, metathorax suffused with white. Palpi whitish, banded with dark fuscous irroration. Antennæ white, lined with dark fuscous. Abdomen reddish-fuscous, sprinkled with whitish and mixed on sides with dark fuscous, third segment with a cloudy white arrow-head on back. Legs white, tibiæ and sometimes posterior tarsi banded with dark fuscous. Fore-wings cleft from about middle, segments very narrow, apex of second long-produced, very slender; dark reddish-fuscous, sprinkled with whitish; an oblique white mark in disc about $\frac{1}{3}$, sometimes indistinct; a white mark on base of cleft, edged internally with dark fuscous, extended as a white spot on lower margin of first segment; a white band or costal spot on first segment about middle, preceded and followed on costa by some blackish scales; sometimes a whitish bar at $\frac{3}{4}$ of first segment: cilia within cleft grey mixed with black and a few white scales, at base of cleft ochreous-whitish, beneath apex barred with white, on termen of second segment whitish except towards angles, on dorsum ochreous-whitish with a grey posterior patch, with a strong blackish scale-projection opposite base of cleft, and three rather smaller ones posteriorly, last tornal. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from near base, segments linear; dark fuscous; cilia fuscous, third segment with a small black dorsal scale-tooth beyond middle.

BURMA (Mone) (*Manders*); COORG, 3,000 feet (*Newcome*); NILGIRIS, 3,500 feet (*Andrewes*); CEYLON (Maskeliya) (*Alston*); in August, October, January and May; four specimens. I have also a specimen taken by myself at Port Louis, Mauritius, in May. The strong black median scale-tooth of fore-wings is characteristic.

Oxyptilus pelecyntes, n. sp.

♂ ♀. 11-15mm. Head dark fuscous. Palpi white banded with blackish. Antennæ white lined with black. Thorax dark fuscous, with an ochreous-white posterior spot. Abdomen ochreous-brown streaked with blackish, margins of segments mixed with white, with an ochreous-white basal patch. Legs white, anterior and middle pairs lined with black, posterior pair banded with black. Fore-wings cleft from middle, segments narrow, apex of second long-produced, slender, termen concave; dark reddish-fuscous, sprinkled with whitish-ochreous; first segment with a small white spot on base of lower margin, and two slender undefined somewhat inwardly oblique white bars at $\frac{1}{3}$ and $\frac{2}{3}$; second segment sometimes with a few white scales at $\frac{1}{3}$ and $\frac{2}{3}$: cilia on costa ochreous-whitish with black scales at base and blackish patches before and between bars, in cleft grey with scattered black scales, on dorsum ochreous-white with a black scale-tooth before cleft, others at $\frac{1}{4}$ of second segment and apex, and a grey patch mixed with black midway between these. Hind-wings cleft firstly from about $\frac{1}{3}$, secondly from near base, segments linear; dark fuscous; cilia dark grey, on dorsum with two or three scattered black scales, and a moderate black scale-projection at $\frac{4}{5}$ of third segment, marked with some black scales on upper side also.

ASSAM (Khasi Hills) in April and September; three specimens.

Oxyptilus raptor, n. sp.

♀. 19 mm. Palpi whitish, spotted with dark fuscous. Abdomen brown mixed with dark fuscous, segmental margins mixed with white. Legs white, lined and banded with dark fuscous. Fore-wings cleft from beyond middle, segments narrow, first pointed, second somewhat dilated, its apex long, acute, termen concave; ferruginous-fuscous, irrorated with dark fuscous; a small dark fuscous spot on base of cleft; first segment crossed by two inwardly oblique whitish bars at $\frac{1}{3}$ and $\frac{2}{3}$, former rather broad, latter slender; a similar bar crossing second segment at $\frac{2}{3}$: cilia dark fuscous, on costa more blackish, and barred with whitish on costal markings, beneath apex with two whitish bars, on termen of second segment whitish except towards angles, on dorsum mostly whitish with dark fuscous bars before and beyond cleft, and a dark fuscous patch towards tornus. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{4}$, segments very slender; dark fuscous, third segment brownish-ochreous from base to near $\frac{2}{3}$ and at apex; cilia fuscous, on both margins of third segment with a patch of blackish scales extending from before $\frac{2}{3}$ of segment to $\frac{5}{6}$.

COLORADO, U.S.; one specimen.

Oxyptilus caminites, n. sp.

♂. 21 mm. Head and thorax dark fuscous, lower margin of face with a white bar. Palpi dark fuscous, lower edge white. Antennæ dark grey, with two series of white dots. Abdomen blackish, three basal segments orange-fulvous above except on lateral and posterior margins, apical scales pale ochreous, beneath with an elongate pale fulvous ventral patch extending over first two segments, and two spots on third. Legs dark fuscous, anterior and middle pair lined with white, posterior pair with indications of whitish bands. Fore-wings cleft from $\frac{2}{3}$, segments moderately broad, termen nearly straight, oblique; dark bronzy-fuscous, costal third sprinkled with whitish from base to beyond cleft; a very fine white line crossing first segment and upper half of second not far from termen: cilia whitish, on termen grey with white base and black spots at angles of segments, within cleft and on dorsum with dark grey patches on posterior half of segments, on dorsum with three black scale-projections. Hind-wings cleft firstly from $\frac{1}{2}$, secondly from $\frac{1}{5}$, segments linear; blackish; cilia grey, on first segment and upper margin of second whitish-ochreous except towards tips, third segment with a rather small triangular black dorsal scale-tooth at about $\frac{4}{5}$ of wing.

ASSAM (Khasi Hills) in September; one specimen. The unusual coloration of the abdomen, combined with the general superficial appearance, is so suggestive of some of the fossorial *Hymenoptera*, that I think it may be protective.

Oxyptilus peltastes, n. sp.

♂. 12–13 mm. Head and thorax ferruginous-brown mixed with dark fuscous, sometimes pale-sprinkled, metathorax pale yellow. Palpi sickle-shaped, acute, ferruginous, terminal joint and apex of second somewhat whitish-sprinkled, anterior edge blackish. Antennæ blackish, whitish-sprinkled. Abdomen deep chestnut-bronze-brown, basal segment and apical margin of second and third whitish, fourth segment with two pale or whitish dorsal patches. Legs golden-bronze, spurs and tarsi suffused with dark fuscous, posterior tibiæ with whorls of dark fuscous spines near base and on origin of spurs. Fore-wings cleft from $\frac{3}{5}$, first segment rather narrow, second posteriorly dilated, its apex produced, termen concave, oblique; deep chestnut-brown, thinly sprinkled throughout with white; costal edge dark fuscous; whitish-ochreous dots or small spots on first segment at base and on costa before its middle and towards apex: cilia ochreous-whitish, with blackish patches at angles of both segments, black bars on dorsum at middle and $\frac{3}{4}$, and some grey suffusion towards base of cleft. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from near base, segments linear; dark fuscous, towards base and on third segment suffused with ferruginous; cilia light yellowish, suffused with grey towards apex of first two segments, third segment with a small black apical scale-tuft.

QUEENSLAND (Cairns), in October (*Dodd*); four specimens.

XYROPTILA, n. g.

Head with appressed scales, on back of crown with erect scales. Palpi moderately long, slender, curved, sickle-shaped, smooth, terminal joint somewhat longer than second, acute. Antennæ in ♂ simple. Posterior legs with small whorls of scales at origin of spurs and apex of tarsal joints. Fore-wings cleft from about $\frac{3}{5}$, segments moderate, rather dilated posteriorly; 2 from middle of cell, 3 and 4 from angle, 5 and 6 very short, 7 from near 8, long, 9 apparently absent, 8 and 10 stalked, 11 from near 8. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from near base, segments linear, without black scales in cilia; 2 and 3 absent, 5 and 6 very short, 7 to apex.

Allied to *Oxyptilus*, especially to *O. peltastes*, but distinguished by the entire absence of the black scales in cilia of hind-wings. Type *X. œnophanes.*

Xyroptila marmarias, n. sp.

♂ ♀. 11–12 mm. Head golden-bronze, mixed with dark fuscous. Palpi golden-ochreous, anterior edge blackish. Antennæ dark grey. Thorax coppery-bronze, mixed with white posteriorly, anterior half bright golden. Abdomen bright golden-bronze, base of first segment yellowish-white, margins of second and third segments more or less whitish, towards middle and apex more or less suffused with dark coppery-fuscous. Legs golden-bronze, spurs and tarsi suffused with dark fuscous, posterior tibiæ with whorls of spines near base and at origin of spurs. Fore-wings cleft from $\frac{3}{5}$, first segment rather narrow, second posteriorly dilated, its apex produced, termen concave, oblique; very deep ferruginous, costal edge dark fuscous; markings deep yellow, more developed and larger in ♀; some irregular small spots or strigulæ anteriorly, and a larger spot before middle; first segment with a transverse mark at base, a costal spot in middle, and a transverse mark near apex; second segment with a spot towards base and a transverse mark near termen: cilia yellowish tinged with rosy, with blackish patches at angles of both segments, and two blackish bars on dorsum. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from near base, segments linear; dark fuscous; anterior part of disc and most of third segment in ♂ deep ferruginous, in ♀ bright golden; cilia pale shining rosy, tinged with purplish-grey on costa and towards apex of first two segments.

Queensland (Cairns), in October (*Dodd*); two specimens.

Xyroptila œnophanes, n. sp.

♂ ♀. 10–11 mm. Head and thorax fuscous irrorated with dark fuscous. Palpi whitish lined with black. Antennæ white with blackish dorsal line. Abdomen rather dark fuscous, base ochreous-white, beneath whitish. Legs dark fuscous, anterior and middle pairs streaked with whitish, posterior pair with indications of whitish bands. Fore-wings with apex of second segment produced, acute, termen concave; dark ferruginous-fuscous, somewhat sprinkled with whitish; a whitish bar parallel to termen crossing both segments before their middle: cilia pale ochreous tinged with crimson, with a black bar at apex, and blackish-grey posterior patches on lower margin of first segment and both margins of second. Hind-wings dark fuscous; cilia pale ochreous tinged with crimson.

BOMBAY (Bandora), in September; four specimens.

KOREMAGUIA, Hamps.

This is a good genus, with distinct neuration.

Koremaguia alticola, Feld.

(*Cnemidophorus alticola*, Feld., Reis. Nov. pl. CXL, 59; *Koremaguia aurantidactyla*, Hamps., Ill. Het. Brit. Mus. VIII, 142, pl. 156, 20.)

I think Felder's figure undoubtedly represents this species, which varies in extent of dark suffusion; I have it from the Andaman Islands, and it is recorded from the Nilgiris and Himalaya.

PLATYPTILIA, Hb.

Platyptilia ignifera, n. sp.

♂. 20 mm. Head, thorax, and abdomen dark fuscous, partly tinged with blackish and ferruginous. Palpi and antennæ ferruginous, sprinkled with whitish and dark fuscous. Legs dark fuscous partly mixed with ferruginous, posterior coxæ with a small silvery-white spot, apex of all tibiæ, centre of middle and posterior tibiæ, and apex of three joints of posterior tarsi with large dense expanded whorls of scales, spurs thickened with rough scales. Fore-wings cleft from about $\frac{3}{4}$, segments broad, termen sinuate, little oblique; purplish-fuscous irrorated with dark fuscous, and somewhat mixed with brownish or ferruginous-brown; indications of an undefined bent blackish-fuscous bar near termen: cilia light grey, basal $\frac{2}{3}$ ferruginous-fuscous edged with a black line, sinuate-concave in middle of termen of each segment. Hind-wings cleft firstly from middle, secondly from $\frac{1}{5}$, third segment very short; deep orange; first segment posteriorly suffused with dark fuscous; third segment somewhat mixed with dark fuscous; cilia fuscous tinged with crimson, on dorsum of third segment with several scattered short dilated black scales, and a large projection of dark purplish-fuscous scales tipped with black occupying apical fourth. Fore-wings beneath with disc deep orange.

ASSAM (Khasi Hills), in August; one specimen. Allied to the African species described by Lord Walsingham as *Crocydoscelus ferrugineum*, but I do not consider the genus *Crocydoscelus* sufficiently distinct from *Platyptilia*.

Platyptilia donatella, Walk.

This South American species is the type of the genus *Sochchora*, Walk., but it appears to differ in no important particular from *Platyptilia*, of which I therefore regard *Sochchora* as a synonym.

Platyptilia taprobanes, Feld.

(*Amblyptilia taprobanes*, Feld., Reis. Nov. pl. CXL, 54; *Platyptilia Sythoffi*, Snell. Tijd. v. Ent. XLVI, 54, pl. V, 15, 16.)

Felder's figure is very poor, but notwithstanding can only be this species. CEYLON (Madulsima, Pattipola, Maskeliya, Peradeniya) (*Green, Pole, Alston*); S. INDIA (Palni Hills) (*Campbell*); ASSAM (Khasi Hills); from April to January, a hill species, received in plenty. Described by Snellen from Java.

Platyptilia citropleura, n. sp.

♂ ♀. 15–18 mm. Head blackish, sides, a frontal row of dots, and lower part of face pale yellow. Palpi black, beneath spotted with pale yellowish. Antennæ blackish. Thorax dark ferruginous-fuscous, central third blue-black on anterior half, beneath and on sides of metathorax pale clear yellow. Abdomen dark ferruginous-fuscous, on dorsum blue-blackish, beneath with a series of pale yellow spots. Legs blackish dotted with white, posterior tarsi with three apical joints mostly white. Fore-wings cleft from $\frac{3}{4}$, segments broad, termen oblique, on second segment bowed; dark ferruginous-fuscous becoming blackish posteriorly; a series of minute white costal and subcostal dots, last four larger and costal; sometimes a few scattered white scales in disc; a very fine white line near termen on first segment and upper half of second: cilia on termen blackish spotted with white, whitish on inner half of cleft and blackish-grey on outer half, on dorsum whitish with black scale-teeth before and beyond $\frac{2}{3}$, and a small grey posterior patch. Hind-wings cleft firstly from $\frac{1}{2}$, secondly from $\frac{1}{5}$, apex of second segment slenderly produced, third segment short; blackish; cilia grey, third segment with a very small triangular black dorsal scale-tooth almost at apex.

ASSAM (Khasi Hills); CEYLON (Maskeliya) (*Alston*); in March, and from June to October; twelve specimens. Very similar to *taprobanes*, but smaller and blacker, fore-wings cleft from $\frac{3}{4}$ only (instead of from $\frac{2}{3}$), without dark costal blotches, cilia at base of cleft clear white, narrower white bars in terminal cilia, and scale-tooth of hind-wings all but apical, whereas in *taprobanes* it is a little before apex.

Platyptilia brachymorpha, Meyr.

Amblyptilia Seeboldi, Hofm. (Iris, xi, 33), from Syria, is a synonym of this species; the description is very accurate and unmistakable. The species ranges from S. Africa through India to the Hawaiian Islands.

Platyptilia pusillidactyla, Walk.

Platyptilia hemimetra, Meyr., Trans. Ent. Soc. Lond. 1886, 18, is a synonym of this species. I could not determine this identification from Walker's type, but have lately received specimens from his locality (Jamaica), which are conclusive. This is another wide-ranging insect, known from Réunion, Ceylon, India, and the West Indies.

Platyptilia charitopa, n. sp.

♂. 12–14 mm. Head and thorax orange-ochreous sprinkled with fuscous, frontal tuft very short. Palpi orange-ochreous sprinkled with blackish, above and beneath mixed with whitish. Antennæ grey, above blackish with two series of white dots. Abdomen orange-ochreous variably mixed or sprinkled with blackish, on back sometimes mixed with white or pale yellow. Legs orange-ochreous sprinkled with dark fuscous, anterior and middle pairs lined with black beneath, posterior pair banded with whitish and blackish. Fore-wings cleft from $\frac{2}{3}$, segments moderate, posteriorly dilated, termen of first indented-concave, of second rounded-prominent in middle, sinuate-concave above and below this, rather strongly oblique; orange-ochreous, posterior $\frac{2}{3}$ and dorsum anteriorly more or less sprinkled irregularly with dark fuscous; costa narrowly black dotted with white; a cloudy spot of blackish suffusion towards dorsum at $\frac{1}{4}$, and one in disc at $\frac{1}{3}$; a large triangular blackish blotch on costa before cleft, its apex reaching beyond cleft; a broad fascia of blackish suffusion covering nearly anterior $\frac{2}{3}$ of both segments, edged posteriorly by a fine white line and anteriorly by a less distinct one ; a black terminal line : cilia whitish-ochreous, on costa suffused with dark fuscous, on termen with basal half dark fuscous on angles and prominence, beneath lower angle of first segment with a blackish patch, on dorsum with some scattered black scales anteriorly, a blackish scale-tooth beyond middle, and two blackish bars posteriorly. Hind-wings cleft firstly from before middle, secondly from $\frac{1}{6}$, third segment short ; dark fuscous, more or less orange-tinged towards base, third segment orange-ochreous mixed with dark fuscous ; cilia ochreous, at apex of first two segments dark grey, third segment with some scattered black scales on both margins, and a large black triangular scale-projection beneath occupying apical fourth.

Bolivia (Songo); three specimens. Belongs to the group of *brevipennis*, in which it is characterised by its bright colouring.

Platyptilia paraglyptis, n. sp.

♂ 14 mm. Head brownish, frontal tuft very short. Palpi fuscous, apex of joints whitish-ochreous. Antennæ fuscous dotted with whitish. Thorax pale ochreous mixed with brownish. Abdomen whitish-ochreous, mixed with brownish on sides. Legs whitish-ochreous, anterior and middle femora and tibiæ lined with dark brown. Fore-wings cleft from $\frac{2}{3}$, segments moderately broad, termen of first sinuate beneath apex, of second very obliquely bowed ; brownish-ochreous, indistinctly transversely striated with brown irroration ; costal edge suffused with dark fuscous from near base to blotch ; a spot of dark fuscous suffusion on dorsum at $\frac{1}{4}$, and one beneath costa at $\frac{2}{5}$; a triangular dark fuscous blotch on costa before cleft, its apex reaching to below cleft ; costal edge beyond this dark fuscous, interrupted by four dots of whitish suffusion, third giving rise to a whitish line crossing first segment and obscurely indicated on second ; segments sprinkled with dark fuscous and whitish, darkest posteriorly : cilia whitish, on termen with a dark fuscous subbasal line becoming blackish towards tornus, indented once on first and twice on second segment, within cleft fuscous-tinged, with some scattered dark fuscous scales, on dorsum with about five small teeth of dark fuscous scales. Hind-wings cleft firstly from before middle, secondly from $\frac{1}{6}$, segments moderate, first dilated, termen of second very obliquely sinuate ; dark fuscous ; cilia grey, round termen of first segment with dark grey subbasal shade, on dorsum with moderate triangular black scale-projection beginning at $\frac{3}{4}$, and scattered blackish scales between this and base.

ARGENTINA (Parana); one specimen.

Platyptilia direptalis, Walk.

(*Oxyptilus direptalis*, Walk., B. M. Cat. 934.)

♂ ♀. 19–21 mm. Head, palpi, and thorax brown sprinkled with whitish, face with short cone of scales. Antennæ white spotted with dark fuscous. Abdomen brownish, streaked with whitish and sprinkled with dark fuscous. Legs whitish banded with brownish, apex of joints dark fuscous. Fore-wings cleft from before $\frac{3}{4}$, segments moderately broad, apex of first produced, subfalcate, termen of second bisinuate, oblique; light yellow-ochreous, irregularly mixed with ferruginous-brown and in disc with white; some dark fuscous scales towards dorsum about $\frac{1}{4}$; costal edge more or less dark fuscous; a triangular dark fuscous blotch, posteriorly edged with white, resting on costa just before cleft and reaching $\frac{2}{3}$ across wing; a slender white bar crossing both segments near termen but not reaching dorsum, preceded on second segment and lower edge of first by a patch of blackish irroration or suffusion: cilia whitish, on termen with basal half brownish edged with blackish-grey and barred with whitish, in cleft grey except on a posterior patch enclosing a dark grey bar, on dorsum with an elongate-triangular projection of black scales about $\frac{2}{3}$, two or three scattered black scales before this and a bar beyond it. Hind-wings cleft firstly from before middle, secondly from $\frac{1}{6}$; dark grey; cilia grey, third segment on dorsum with some scattered black scales anteriorly, an elongate-triangular projection of black scales extending from middle to $\frac{3}{4}$, and some black scales beneath apex.

CEYLON, Pattipola, 6,000 feet, (*Alston*); S. INDIA, Palni Hills, 6,000 feet, (*Campbell*); Nilgiri Hills, 6,000 feet (*Andrewes*); Simla, 8,000 feet (Indian Museum); also known from Cape Colony and the Congo. This is identified by Lord Walsingham with the European *cosmodactyla*, but is in my judgment quite distinct, though nearly allied; it differs markedly in the colouring, and also especially by the narrower segments of hind-wings, of which the second has the apex obviously more produced, and the different form of the principal dorsal scale-projection on each wing; in *cosmodactyla* the one on the fore-wings is narrower, with its posterior edge much more abrupt and obviously concave, and the one on the hind-wings is rather longer and rather narrower, so as to appear distinctly more abrupt. I do not observe any difference between Walker's type and my Indian specimens, but it is noticeable that all the latter are from high altitudes.

Platyptilia epidelta, n. sp.

♂ ♀. 17–21 mm. Head ferruginous-ochreous, partially infuscated, with moderate frontal cone of scales. Palpi moderate, whitish-ochreous, basal and second joints irrorated with dark fuscous except apex of second. Antennæ light brownish, towards base mixed with black above. Thorax rather dark brown or fuscous, with transverse pale brownish-ochreous band behind middle, metathorax with lateral ochreous-white stripes edged above with black. Abdomen brown irregularly mixed with ochreous-whitish, third segment with a suffused oblique dark fuscous lateral mark. Legs whitish, suffusedly banded with ferruginous-ochreous, apex of joints suffused with dark fuscous. Fore-wings cleft from $\frac{3}{4}$, segments broad, termen of first sinuate, of second prominent on vein 3, very obliquely sinuate below it; ferruginous-ochreous mixed with dark fuscous, transversely striated with whitish; indistinct spots of dark fuscous suffusion in disc at $\frac{1}{3}$, and on dorsum obliquely before this, latter followed by a whitish spot; a triangular dark fuscous blotch on costa before cleft, its apex reaching to below cleft; a blackish triangular costal blotch about middle of first segment, more or less edged with white suffusion, its apex connected with posterior extremity of a blackish dash beneath it; a very small dark fuscous costal spot before apex; some dark fuscous suffusion before middle of second segment, sometimes followed by an oblique white transverse line; termen marked with dark fuscous: cilia ochreous-whitish partially tinged with fuscous, on termen with an ochreous-fuscous antemedian shade more or less marked with blackish, extending round tornus, on dorsum with scattered dark fuscous scales, and two strong dark ochreous-fuscous teeth. Hind-wings cleft firstly from $\frac{1}{2}$, secondly from $\frac{1}{5}$, first two segments dilated, termen of second sinuate; dark fuscous; cilia whitish-fuscous, on termen with a darker fuscous antemedian shade, on dorsum with scattered blackish scales, and a strong elongate-triangular blackish scale-projection commencing at $\frac{2}{3}$, and a smaller one at apex.

Argentina (Parana); nine specimens. Varies to some extent, but recognisable by the conspicuous sharply-defined second costal triangle, which is darker than first.

Platyptilia cretalis, n. sp.

♂. 21–22 mm. Head, palpi, antennæ, thorax, and legs whitish (abdomen broken); face without tuft; antennæ with blackish line above towards base; palpi with dark fuscous lateral streak; anterior and middle femora and tibiæ and basal joint of tarsi lined with dark fuscous, posterior tibiæ infuscated beneath towards middle and apex. Fore-wings cleft from $\frac{2}{3}$, segments moderately broad, termen concave so that apex of each segment appears falcate; ochreous-whitish, on segments slightly tinged or sprinkled with pale brownish; some fuscous scales forming a cloudy dot in disc at $\frac{1}{3}$, and two transversely placed close before cleft; minute dark fuscous dots on costa at $\frac{1}{3}$ and $\frac{2}{3}$ of first segment; termen and posterior half of lower margin of both segments narrowly suffused with fuscous, and edged with a dark fuscous line: cilia ochreous-whitish, with dark fuscous spots at both angles of both segments, some fuscous suffusion a little before lower angle of both segments, and small blackish scale-teeth on dorsum beyond middle and at $\frac{3}{4}$. Hind-wings cleft firstly from middle, secondly from $\frac{1}{4}$, segments moderate, apex of second long-falcate; grey; cilia whitish-fuscous, with traces of darker scales beyond middle.

Japan; two specimens. These are not in good order, and possibly the dark dorsal scales may be naturally better expressed, but the species is a very distinct one.

Platyptilia empedota, n. sp.

♂ ♀. 20–21 mm. Head brownish, face with moderate roughly projecting scales. Palpi dark fuscous, white above and beneath. Antennæ whitish with a blackish line above. Thorax ochreous-whitish, suffused anteriorly and posteriorly with light red-brownish. Abdomen whitish-ochreous longitudinally lined with dark brown, base whitish, anal valves in ♂ elongate, white, with a brownish line on sides. Legs white, banded with brownish, and longitudinally lined with blackish. Fore-wings cleft from beyond $\frac{2}{3}$, segments moderately broad, termen of first slightly sinuate, rather oblique; red-brown sprinkled with silvery-whitish, suffused with whitish-ochreous on costal half anteriorly, and on a streak extending from this along middle of second segment to near termen; a dark reddish-fuscous dot in disc beyond $\frac{1}{3}$, and two transversely placed before cleft: costal cilia dark fuscous throughout; remaining cilia grey, on termen white with strong black basal line, on dorsum with some small scattered black scales. Hind-wings cleft firstly from middle, secondly from $\frac{1}{5}$, segments moderate; reddish-fuscous; cilia grey, on dorsum with a few scattered brownish and blackish scales from base to $\frac{3}{4}$.

TRANSVAAL (N.E. Pretoria district), in January (*Janse*); five specimens.

Platyptilia xylopsamma, n. sp.

♀. 28 mm. Head light yellow-ochreous sprinkled with whitish, frontal tuft moderate. Palpi $2\frac{1}{3}$, pale yellow-ochreous sprinkled with fuscous, white beneath and at apex. Antennæ whitish-ochreous, above with a dark fuscous line. Thorax brownish-ochreous sprinkled with whitish, especially on patagia, which are somewhat expanded towards apex. Abdomen whitish-ochreous, faintly streaked with brownish. Legs whitish, lined with dark fuscous (posterior pair broken). Fore-wings cleft from $\frac{3}{4}$, segments broad, termen of first somewhat sinuate, of second very slightly bent, oblique; brownish-ochreous, slightly sprinkled with whitish, dorsal half suffused with pale whitish-ochreous from base to cleft; costal edge very shortly strigulated with dark fuscous on basal third; a small round dark fuscous spot in disc at $\frac{1}{3}$, and another tending to form a transverse mark close before and beneath cleft; a mark of dark fuscous suffusion along costa above cleft, followed by a white mark mostly in costal cilia: cilia pale greyish-ochreous, on termen with basal half rather dark fuscous, on dorsum with a greyish bar beneath cleft. Hind-wings cleft firstly from before middle, secondly from $\frac{1}{6}$, first segment considerably dilated, second moderate; ferruginous-fuscous; cilia pale greyish, within cleft mostly suffused with very pale ochreous, on termen of first segment darker grey on basal half, on dorsum with a series of short dark fuscous scales from base to $\frac{2}{3}$.

COLORADO, U.S., 7,000 feet; one specimen.

ALUCITA, L.

In the fore-wings the principal vein remaining in the first segment should be regarded as vein 7, not 8.

Alucita lacteipennis, Walk.

(*Aciptilus lacteipennis*, Walk., Brit. Mus. Cat. 949.)

♂♀. 24–28 mm. Head, antennæ, and thorax white, collar sometimes sprinkled with grey. Palpi white, sometimes slightly sprinkled with dark grey towards apex. Abdomen white, with a few black lateral scales posteriorly. Legs white, anterior femora and tibiæ streaked with blackish, middle tibiæ with fine oblique median bar and apical dot blackish, posterior tibiæ with internal fringe of projecting scales on basal half, with a few black specks, and black dots on origin of spurs, posterior tarsi somewhat roughened with scales, third and fourth joints tufted above and with apical black dots (in Australian form nearly obsolete). Fore-wings cleft from before $\frac{1}{3}$, segments linear; white, with some scattered black specks; black dots on costa before and beyond middle and about $\frac{3}{4}$ and on lower margin of first segment towards apex; a minute black dot before middle of second segment, and a round black dot at $\frac{3}{4}$: cilia white, with three grey bars (faint in Australian form) on lower margin of each segment, and on upper margin of second segment at $\frac{1}{3}$ of length. Hind-wings cleft firstly from $\frac{1}{6}$, secondly almost from base, segments linear; white, with some black specks, especially at base of first cleft, and along costa from $\frac{1}{4}$ to middle; second segment with small black dots at $\frac{1}{3}$, $\frac{2}{3}$, and before apex; cilia white, on costa with a grey space before middle and bar at $\frac{3}{4}$, on lower margin of second segment with grey bars on first two dots.

BURMA; BORNEO; NEW GUINEA, Woodlark Island; SOLOMON ISLANDS; QUEENSLAND, Cairns (*Dodd*); Walker's type, recorded as from Hindostan, is really from Burma. The closely allied *melanopoda*, Fletcher, which ranges from Ceylon to Assam, has the tufts of posterior tarsi mainly black; in Walker's type the tips of the tarsi are broken, but enough remains, in conjunction with other characters, to show the identity of the species, which I have thought it best to redescribe here.

Alucita rhyparias, n. sp.

♂. 19–20 mm. Head and thorax ochreous-whitish, face fuscous. Palpi short, whitish, terminal joint very short. Antennæ whitish, above with a grey line near base. Abdomen ochreous-whitish, with fuscous dorsal line, and some black lateral dots. Legs whitish, anterior and middle femora and tibiæ dark grey anteriorly. Fore-wings cleft from $\frac{2}{5}$, segments very slender; ochreous-grey-whitish, base of cleft and lower margin of both segments grey; cilia ochreous-grey-whitish, with a faint grey median shade, with two minute black dots on costa at about $\frac{1}{2}$ and $\frac{3}{4}$ of first segment, and three on dorsum of second segment near its base and about $\frac{1}{3}$ and $\frac{2}{3}$. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from $\frac{1}{6}$, segments linear; pale grey; cilia pale grey, becoming grey-whitish towards base.

Transvaal, Pretoria, from February to April (*Janse*); three specimens.

Alucita elaeopa, n. sp.

♂ ♀. 21–26 mm. Head ochreous-whitish, sprinkled with dark fuscous. Palpi and antennæ whitish. Thorax and abdomen whitish-ochreous. Legs whitish, anterior and middle tibiæ blackish beneath, posterior legs whitish-ochreous. Fore-wings cleft from $\frac{2}{5}$, segments linear; pale ochreous; minute black dots on costa at about $\frac{2}{5}$ and $\frac{3}{5}$ of first segment: cilia whitish-ochreous, within cleft with scattered black-tipped scales, on dorsum with four small equidistant projections of black-tipped scales, first before cleft, fourth at $\frac{3}{4}$ of second segment. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from near base, segments linear; ochreous-whitish tinged with grey, base of cleft grey; cilia ochreous-grey-whitish, at base with minute scattered grey scales especially on first segment.

Assam (Khasi Hills), in November; three specimens.

Alucita candidalis, Walk.

(*Aciptilus candidalis*, Walk., Brit. Mus. Cat. 948; *A. leucadactylus*, ib. 948.)

After examining a considerable number of specimens, I am satisfied that these represent only one species, ranging from South Africa through India to the Philippines, New Guinea, and North-East Queensland, varying in the development of the minute black dots which are more or less apparent at the base of the cilia, but always recognisable by its pale yellowish colour (though described as white by Walker in each instance) from the following species, to which it is otherwise closely allied. *A. aptalis*, Walk., is much broader-winged.

Alucita niveodactyla, Pag.

(*Alucita niveodactyla*, Pag. "Zoologica" xxix, 240; *A. nivea*, Snell. Tijd. v. Ent. xlvi, 56, pl. V, 17.)

Differs from the preceding in being pure white; it ranges from Ceylon to the Philippines and Solomon Islands.

PSELNOPHORUS, Wallgr.

Gypsochares, Meyr., cannot be regarded as sufficiently distinct from this. The neural characters of fore-wings are in part incorrectly given by me; there are however differences between some of the species as stated below, but I think they should be treated as specific only. The neuration of *Pselnophorus* should then be defined thus: 7 present, 8 absent, 9 sometimes absent (in *catharotes*, *hemiargus*, and *baptodactylus*) or out of 7, 10 out of 7, 11 out of 7 or separate (in *vilis*).

Pselnophorus hemiargus, n. sp.

♂. 14 mm. Head whitish-ochreous, between antennæ white, face fuscous. Palpi short, white. Antennæ whitish-ochreous. Thorax whitish-ochreous, anteriorly suffused with white. Abdomen whitish, longitudinally streaked with pale ochreous. Legs white, lined with dark fuscous. Fore-wings cleft from before middle, segments narrow, very acute; 9 absent, 10 and 11 out of 7; whitish-ochreous; a moderate streak of white suffusion along costa from base to middle; costal edge finely mixed with dark fuscous for a short space above cleft; first segment sprinkled with white posteriorly; second segment wholly suffused with white except at base: cilia whitish-ochreous, on costa white, on second segment white towards apex above. Hind-wings cleft firstly from before $\frac{1}{3}$, secondly from $\frac{1}{6}$, segments slender; grey; cilia light greyish-ochreous, at apex of segments whitish.

SYRIA (Beirut); one specimen. Allied to *Hedemanni*, Reb., which has similar neuration.

Pselnophorus catharotes, n. sp.

♂ ♀. 12–15 mm. Head fuscous, with a white frontal line, face somewhat sprinkled with white. Palpi short, grey sprinkled with white. Antennæ white, above with a dark grey line. Thorax fuscous, anterior margin more or less suffused with white irroration. Abdomen brown, with several white lines. Legs white lined with blackish, last four joints of posterior tarsi wholly white. Fore-wings cleft from $\frac{1}{2}$, first segment moderate, second narrow, both acutely pointed; 9 absent, 10 and 11 out of 7; light brown, irrorated with dark fuscous; costa from base to $\frac{2}{3}$ irrorated with white; a small blackish spot above middle at $\frac{1}{3}$, and another beneath base of cleft; a blackish mark on costa beyond cleft, followed by a white patch mainly in costal cilia; second segment more or less irrorated or obscurely suffused with white: cilia dark fuscous-grey, on costa white towards apex, on second segment with a white spot above apex. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from $\frac{1}{6}$, segments very narrow; dark fuscous; cilia fuscous-grey.

ASSAM (Khasi Hills), from August to November and in April; about eighty specimens. It is nearly allied to *baptodactylus*, which however differs from *catharotes* by absence of dark fuscous irroration, the presence of distinct black dots at apex of wing and extremity of vein 7, and clear white streak along upper half of second segment, dark-edged beneath; the extensive material obtained shows *catharotes* to be constant in these particulars. *Alucita albitarsella*, Wals., must be referable to this genus and closely allied to these two species; I have not seen it, but from the description it must agree very nearly with *baptodactylus*, having the characteristic white streak of the second segment, but being apparently without the black dots. Probably Zeller's quotation of India as a locality for *baptodactylus* is founded upon *albitarsella*, the distinction of which must be at present regarded as doubtful, as Lord Walsingham makes no comparison with *baptodactylus*.

Pselnophorus vilis, Butl.

This name supersedes *amurensis*, Christ., having one year's priority. The species occurs in Eastern Siberia and Japan.

MARASMARCHA, Meyr.

Marasmarcha bonaespei, Wals.

(*Lioptilus bonaespei*, Wals., Trans. Ent. Soc. Lond. 1881, 281, pl. XIII, 46.)

This species, which I have from Weenen, Natal, is a true *Marasmarcha*.

Marasmarcha hodias, n. sp.

♂. 13 mm. Head ochreous, anterior half of crown white. Palpi rather short, white. Antennæ white, rather shortly ciliated. Thorax ochreous-whitish. Abdomen whitish, with rather broad dark brown dorsal stripe. Legs white, anterior and middle femora and tibiæ and basal joint of tarsi lined with dark fuscous. Fore-wings cleft from middle, segments narrow, acute; ochreous-whitish, somewhat sprinkled with light brown; some dark fuscous scales on base of cleft, continued as a dark fuscous line along basal fourth of lower margin of first segment; a dark fuscous dot on lower margin of first segment at $\frac{3}{4}$, and less definite dots at extremities of veins 2–4: cilia whitish, on dorsum and towards base of cleft tinged with brownish, on posterior dot of first segment with a brownish bar. Hind-wings cleft firstly from $\frac{1}{3}$, secondly from $\frac{1}{5}$, segments slender; grey; cilia pale grey.

BRAZIL, Sao Paulo; one specimen. Belongs to the *microdactyla* group.

Marasmarcha invida, n. sp.

♂ ♀. 12–13 mm. Head light brownish, between antennæ white. Palpi moderately long, white. Antennæ whitish, in ♂ rather shortly ciliated. Thorax ochreous-whitish, dorsally tinged with brownish. Abdomen whitish, with brown dorsal line. Legs whitish, anterior and middle femora and tibiæ and basal joint of tarsi lined with dark fuscous. Fore-wings cleft from before $\frac{3}{5}$, segments rather narrow, acute; ochreous-whitish, somewhat sprinkled with brown; a curved oblique dark brown mark crossing base of cleft; a dark brown dash along costa a little beyond this; a dark brown dot on costa at $\frac{2}{3}$ of first segment, and others on extremities of veins 2, 3, and 7: cilia whitish-ochreous, on costa whitish, beneath apex with a patch of brown suffusion. Hind-wings cleft firstly from $\frac{1}{4}$, secondly from $\frac{1}{6}$, segments slender; grey; cilia pale greyish-ochreous.

BRAZIL, Sao Paulo; two specimens. The longer palpi and dark brown costal mark distinguish this species from the preceding.

PTEROPHORUS, Geoffr.

Pterophorus pavidus, n. sp.

♀. 18 mm. Head whitish-ochreous, crown anteriorly suffused with whitish. Palpi long ($2\frac{1}{4}$), white, terminal joint long, with whitish-ochreous median suffusion. Antennæ whitish, above with a dark fuscous line. Thorax whitish-ochreous. Abdomen whitish-ochreous, obscurely lined with dark fuscous. Legs whitish, anterior and middle femora and tibiæ lined with dark fuscous. Fore-wings cleft from before $\frac{2}{3}$, segments moderate, acute-pointed, termen of second sinuate, not falcate; whitish-ochreous, partially tinged with whitish; costa towards middle of first segment and termen of second segment somewhat infuscated: cilia ochreous-whitish, on apex of each segment with blackish dots, at extremities of veins 2 and 3 with small dark fuscous dots. Hind-wings cleft firstly from middle, secondly from $\frac{1}{4}$, first segment moderate, second narrow, its apex long-produced, termen sinuate; grey, somewhat whitish-suffused towards base and on third segment; apex of first segment with a dark grey dot; cilia whitish-grey, on dorsum with scattered whitish scales.

TRANSVAAL, Pietersburg, in December (*Janse*); one specimen.

Pterophorus timidus, n. sp.

♀. 19 mm. Head pale ochreous, between antennæ whitish. Palpi short (1), slender, whitish, terminal joint short, ochreous. Antennæ, thorax, abdomen, and legs whitish, anterior and middle femora and tibiæ lined with dark fuscous. Fore-wings cleft from $\frac{3}{5}$, segments moderate, acutely pointed, second rather falcate; whitish, partly faintly tinged with pale ochreous, sprinkled with grey towards anterior half of dorsum and before cleft; two dark grey dots above and below base of cleft; indistinct grey dots at extremities of veins 2, 3, and 7: cilia whitish. Hind-wings cleft firstly from middle, secondly from $\frac{1}{4}$, first segment moderate, second narrower, acutely pointed, rather falcate; ochreous-whitish partially suffused with light grey; cilia whitish, with grey dots at extremities of veins, more apparent on under-surface.

NATAL, Northdene (*Spiller*); one specimen. Easily separated from the preceding species by the very different palpi. Compared with *triadias*, the fore-wings are less deeply cleft, the segments shorter-pointed.

Pterophorus triadias, n. sp.

♂ ♀. 20 mm. Head deep ochreous, with a white frontal band. Palpi whitish, upper edge blackish. Antennæ whitish. Thorax white. Abdomen ochreous-whitish. Legs whitish, anterior tibiæ and tarsi lined with black (others imperfect). Fore-wings cleft from beyond middle, segments moderate, gradually pointed; ochreous-white, with more or less faint traces of pale ochreous longitudinal streaks: black dots on first segment at $\frac{2}{3}$ of its upper and $\frac{3}{4}$ of its lower margin, and on second segment at $\frac{2}{3}$ of its lower margin; sometimes a blackish dot at apex of second segment: cilia whitish-ochreous, with a grey bar at apex of second segment. Hind-wings cleft firstly from beyond $\frac{1}{3}$, secondly from $\frac{1}{5}$, segments narrow; pale grey, apex of segments with more or less distinct blackish dots; third segment ochreous-whitish towards base, in ♂ with an ochreous-whitish hairpencil from base resting on it; cilia whitish-ochreous.

ASSAM (Khasi Hills), in September; three specimens.

Pterophorus harpactes, n. sp.

♂. 21 mm. Head ochreous-brown, lower edge of face and anterior half of crown white. Palpi fuscous, beneath white. Antennæ and thorax white. Abdomen whitish longitudinally streaked with brown. Legs white, anterior and middle femora and tibiæ lined with blackish. Fore-wings cleft from middle, segments moderate, gradually pointed, apex of second narrowly produced, subfalcate; ochreous-whitish, largely suffused with pale brownish-ochreous; a black dot in disc at $\frac{1}{4}$, another at base of cleft, and some scattered black scales between them; first segment with a blackish mark along costa at $\frac{1}{3}$, a black dot at $\frac{2}{3}$, and an irregular black line round apex and apical fourth of lower margin; second segment with a short blackish-fuscous dash ending in middle of termen, and an irregular blackish-fuscous marginal line round apical half: cilia ochreous-whitish, outer $\frac{2}{3}$ brownish on lower margin of both segments except beneath apex of second, with a patch above apex of second segment dark grey except at base. Hind-wings cleft firstly from about $\frac{1}{3}$, secondly from $\frac{1}{6}$: grey, apex of segments blackish; cilia brownish, becoming ochreous-whitish towards base.

ASSAM (Khasi Hills), in September; one specimen.

Pterophorus palmatus, n. sp.

♂ ♀. 19–20 mm. Head ochreous, between antennæ whitish. Palpi whitish, with an ochreous lateral line. Antennæ whitish, with a dark fuscous line above towards base, in ♂ minutely ciliated. Thorax and abdomen yellow-whitish, faintly ochreous-tinged. Legs whitish, femora dark fuscous beneath, anterior and middle tibiæ and first joint of tarsi lined with dark fuscous, posterior tibiæ with a dark grey apical dot. Fore-wings cleft from $\frac{3}{5}$, segments moderate, acutely pointed, subfalcate; yellow-whitish, partially tinged or sprinkled with pale fuscous, before cleft and towards anterior half of dorsum suffused with fuscous; a minute dark fuscous dot in disc at $\frac{1}{3}$; a short oblique transverse dark fuscous mark or dot at base of cleft; costal edge narrowly dark fuscous for a short distance above this; conspicuous blackish dots at extremities of veins 3 and 7: cilia ochreous-whitish. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{6}$, segments rather narrow, second very long-pointed; light fuscous; cilia ochreous-whitish slightly tinged with fuscous.

BRAZIL, Sao Paulo; three specimens.

Pterophorus procontias, n. sp.

♂ ♀. 18–20 mm. Head deep ochreous, lower edge of face and anterior half of crown white. Palpi deep ochreous. Antennæ whitish. Thorax whitish, tinged or sprinkled with pale ochreous. Abdomen whitish, longitudinally striped with ochreous. Legs white, anterior and middle femora and tibiæ lined with blackish. Fore-wings cleft from beyond middle, segments moderately broad, acute, apex of second produced, subfalcate; white, irregularly suffused with pale ochreous; a narrow dark fuscous streak along costa from base to $\frac{2}{3}$; an indistinct blackish dot in disc before $\frac{1}{3}$; a larger blackish dot beneath base of cleft; a black dot on costa at $\frac{5}{6}$, one on lower margin of first segment at $\frac{3}{4}$ of its length, and two on dorsum at $\frac{1}{2}$ and $\frac{3}{4}$ of second segment: cilia whitish-ochreous, becoming fuscous on outer half except on costa and beneath a blackish bar at apex of second segment. Hind-wings cleft firstly from $\frac{2}{5}$ secondly from $\frac{1}{6}$; grey, third segment whitish-ochreous; cilia whitish-ochreous, becoming light fuscous on outer half.

ASSAM (Khasi Hills), from April to September; twenty specimens.

Pterophorus sematias, n. sp.

♀. 21 mm. Head ochreous-brown, lower edge of face and anterior half of crown white. Palpi fuscous, beneath whitish. Antennæ grey. Thorax ochreous-whitish. Abdomen whitish, with traces of pale ochreous streaks, a dorsal series of minute black dots, and a rather dark fuscous ventral streak. Legs whitish, middle tibiæ and first joint of tarsi lined with blackish (others broken). Fore-wings cleft from beyond middle, segments moderately broad, pointed, apex of second acutely produced; ochreous-white, partially suffused with pale ochreous, with a few scattered black scales, especially along costa anteriorly and on second segment; a slender dark fuscous streak along costa from base to cleft; a black dot in disc before $\frac{1}{3}$; a strong curved oblique black mark running round base of cleft and extending shortly into first segment; a strong black mark along costa immediately beyond this, followed by two black costal dots; a black dot on lower margin of first segment at $\frac{3}{4}$ of length; some grey and black irroration round apex of second segment: cilia ochreous-whitish, on costa with two dark grey spots, on lower margin of first segment with broad grey patch beyond middle and blackish subapical patch, towards apex of second segment dark grey on both margins, otherwise on dorsum pale fuscous. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{6}$; rather dark grey; cilia grey.

CEYLON (Maskeliya), in October (*Alston*); one specimen.

Pterophorus lienigianus, Z.

P. serindibanus, Moore ("Lep. Ceyl." iii, 527, pl. CCIX, 14) is a synonym of this species; it is common in India and Ceylon, and though the specimens show a little individual variation in intensity of marking, I am unable to find any specific difference between European and Indian examples.

Pterophorus chlorias, n. sp.

♂ ♀. 22–25 mm. Head pale yellow-ochreous, a band below forehead, and crown between antennæ and collar fuscous. Palpi pale yellow-ochreous, apex infuscated. Antennæ pale ochreous, shortly ciliated. Thorax and abdomen pale yellowish-ochreous. Legs yellow-whitish, anterior and middle femora and tibiæ dark fuscous beneath. Fore-wings cleft from $\frac{3}{5}$, segments moderately broad, first pointed, termen of second straight, very oblique; light brownish-ochreous, often more or less suffused with whitish-ochreous, especially along costa, sometimes sprinkled with fuscous in disc anteriorly and towards base of first segment; a small dark fuscous spot on base of cleft; cloudy dark fuscous dots on first segment at apex and extremity of 7, and on second at extremities of veins 2–4: cilia whitish-ochreous. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{4}$, segments narrow, long-pointed; grey: cilia whitish-grey-ochreous.

COLORADO, U.S., 5,000 feet; three specimens.

Pterophorus glaphyrotes, n. sp.

♂ ♀. 19–23 mm. Head light ochreous-brown, between antennæ ochreous-white. Palpi whitish, with an ochreous lateral streak.

Antennæ and thorax ochreous-whitish. Abdomen whitish, with more or less indicated fine ochreous dorsal and other lines. Legs white, anterior and middle femora and tibiæ lined with dark fuscous. Fore-wings cleft from $\frac{3}{5}$, segments rather broad, first acutely pointed, second with termen very oblique; ochreous-whitish, more or less partially tinged with pale yellowish-ochreous, sometimes sprinkled with deeper ochreous; a more or less defined streak of pale brownish-ochreous suffusion beneath costa from near base, slender anteriorly, wider on first segment and becoming obsolete towards apex: cilia pale whitish-ochreous. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{5}$, segments moderate, first pointed, second acutely pointed; rather light grey; cilia whitish-ochreous, sometimes partially tinged with grey.

BRAZIL, Sao Paulo; ARGENTINA, Parana; four specimens.

Pterophorus stadias, n. sp.

♂ ♀. 20–23 mm. Head ochreous-brown, between antennæ white. Palpi white, with a brown lateral stripe. Antennæ ochreous-whitish, with a dark fuscous line, in ♂ rather strongly ciliated. Thorax and abdomen ochreous-whitish. Legs whitish, anterior and middle femora and tibiæ lined with blackish, posterior tibiæ with grey dots at origin of spurs. Fore-wings cleft from $\frac{2}{3}$, segments broad, first pointed, termen of second rather strongly oblique; pale whitish-ochreous, in ♀ more whitish, more or less sprinkled with dark fuscous; some brownish suffusion towards costa posteriorly, in ♀ more ochreous and forming a distinct sub-costal streak; a conspicuous blackish-fuscous dot at base of cleft beneath; a small fuscous mark on costa somewhat beyond this, in ♀ obsolete; two blackish-fuscous dots on costa between this and apex, and a third almost at apex; blackish dots at extremities of veins 1*b*, 2, 3, and 7: cilia whitish-ochreous, with patches of fuscous suffusion on vein 7 and beneath apex of first segment, and at apex of second. Hind-wings cleft firstly from beyond $\frac{2}{5}$, secondly from $\frac{1}{5}$, segments moderate, first pointed, second long-pointed; pale ochreous-grey; cilia whitish-ochreous.

BRAZIL, Petropolis; four specimens.

Petrophorus oxyntes, n. sp.

♂ ♀. 16–21 mm. Head ochreous-brown, between antennæ white. Palpi slender, white, with an ochreous-brown lateral stripe. Antennæ whitish, with indistinct dark line above, in ♂ shortly ciliated.

Thorax whitish, sometimes more or less tinged with ochreous. Abdomen whitish-ochreous, base sometimes whitish, with dorsal and lateral series of blackish dots on edges of segments. Legs whitish, anterior and middle femora and tibiæ and basal joint of tarsi lined with dark fuscous. Fore-wings cleft from $\frac{2}{3}$, segments rather broad, first pointed, termen of second very oblique; whitish-ochreous, partially tinged or sprinkled with brownish, and strewn with scattered blackish-fuscous scales, usually more or less mixed with whitish suffusion; a blackish-fuscous dot on costa beyond middle of first segment, one just before apex, and one on lower margin of segment between these; minute blackish-fuscous dots at extremities of veins 1*b* and 2–4: cilia whitish-ochreous, beneath apex somewhat infuscated. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{5}$, segments moderate, first pointed, second very acute, subfalcate; pale ochreous-grey; cilia whitish-ochreous.

BRAZIL, Sao Paulo; seven specimens.

Pterophorus spermatias, n. sp.

♂. 16–17 mm. Head ochreous-brown, between antennæ whitish. Palpi whitish, with dark fuscous lateral line. Antennæ whitish, towards base with dark line above, moderately ciliated. Thorax ochreous-whitish, tinged or sprinkled with brownish. Abdomen ochreous-whitish, with dorsal series of blackish dots on segmental margins. Legs whitish, anterior and middle femora and tibiæ and basal joint of tarsi lined with dark fuscous, posterior tibiæ with dark grey apical dot. Fore-wings cleft from $\frac{3}{5}$, segments broad, first pointed, termen of second very oblique; whitish-ochreous mixed with whitish and brownish, and irregularly sprinkled with dark fuscous; traces of a small cloudy dark fuscous spot in disc at $\frac{1}{3}$, and a more distinct one above base of cleft; two small dark fuscous costal spots about middle and $\frac{3}{4}$ of first segment, a dark fuscous dot on its lower margin near apex, and one at apex; dark fuscous dots at extremities of veins 3 and 4: cilia whitish-fuscous. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{5}$, segments moderate, first pointed, second long-pointed, acute; grey; cilia light grey.

BRAZIL, Sao Paulo; three specimens.

Pterophorus nivalis, n. sp.

♂ ♀. 22–24 mm. Head ochreous sprinkled with whitish, upper half of face brown edged beneath with whitish. Palpi ochreous-fuscous, becoming whitish towards base. Antennæ ochreous. Thorax brownish-ochreous, anteriorly more or less suffused with whitish. Abdomen brownish-ochreous, base and an interrupted lateral streak white. Legs white banded with ochreous. Fore-wings cleft from $\frac{3}{5}$, segments moderate, first pointed, termen of second very oblique; brownish-ochreous, irregularly and variably sprinkled and mixed with white, and sprinkled with dark fuscous; an irregular undefined streak of dark fuscous suffusion beneath middle from base almost to cleft, where it is sharply limited by an oblique white mark on base of cleft, upper edge of this streak with a projection at $\frac{1}{3}$ of wing; a small white spot on costa above base of cleft, and a larger spot at $\frac{1}{3}$ of first segment, obliquely directed towards and tending to be connected with the white mark on cleft; costa between these spots suffused with dark fuscous, and a similar patch beyond second spot; a white streak along lower margin of first segment from about $\frac{1}{3}$ to near apex, edged above anteriorly by a dark fuscous dash; a narrow white streak along lower margin of second segment from beneath cleft to near apex, and one or two short white streaks towards termen running into this: cilia whitish-ochreous, on costa whitish towards apex, on lower margin of first segment mixed with grey, beneath apex with a blackish-grey patch edged beneath with white, on second segment grey on upper margin and at tornus, and with blackish-grey patches at apex and middle of termen separated with white. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{5}$, segments moderate, long-pointed; grey; cilia pale greyish-ochreous, more whitish towards tips.

JAMAICA, Newcastle; four specimens.

Pterophorus acrias, n. sp.

♂ ♀. 24–27 mm. Head white, irrorated with dark fuscous except between antennæ. Palpi white irrorated with dark fuscous. Antennæ white ringed with dark fuscous. Thorax white, thinly sprinkled with fuscous. Abdomen brownish mixed with dark fuscous. Legs white, femora and tibiæ irrorated with dark fuscous, tips of tarsal joints dark fuscous. Fore-wings cleft from before $\frac{2}{3}$, first segment rather narrow, acute, second much broader, acute-pointed; brownish, sprinkled with dark fuscous, costal half more or less suffused with white irroration, dorsal half somewhat sprinkled irregularly with white; a suffused white spot above dorsum at $\frac{1}{3}$; a suffused white spot on base of cleft, edged anteriorly by a curved oblique mark of dark fuscous suffusion; an elongate blackish mark along costa above base of cleft, and two shorter blackish costal marks posteriorly: cilia white, on costa dark fuscous on markings, and on an apical patch except at tips, on lower margin of first segment wholly dark fuscous except a white bar on vein 7, on upper margin of second segment fuscous, round its apex dark fuscous except at tips, on dorsum and termen with three undefined patches of pale fuscous suffusion. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{5}$, segments moderate, long-pointed; rather dark fuscous; cilia fuscous, with an ochreous gloss.

COLORADO, U.S., 5,000–7,000 feet; three specimens. Very similar superficially to *inquinatus*, but larger, with the first segment of fore-wings much narrower in proportion to second, the white irroration chiefly on costal half (in *inquinatus* distributed evenly throughout), no apparent dark spot in disc anteriorly, and two distinct similar dark marks on costa posteriorly, whereas in *inquinatus* there is only one conspicuous posterior mark and sometimes a minute additional dot.

Pterophorus chionastes, n. sp.

♂ ♀. 24–27 mm. Head, palpi, antennæ, thorax, abdomen, and legs white; thorax sometimes with a broad whitish-ochreous central stripe; abdomen sometimes mostly suffused with whitish-ochreous. Fore-wings cleft from $\frac{3}{5}$, first segment moderate, long-pointed, second obviously broader, shorter-pointed; pale fuscous, mostly suffused with white, less strongly towards costa, with some scattered dark fuscous scales; a small cloudy dark fuscous spot in disc at $\frac{1}{3}$; an oblique dark fuscous mark before cleft, preceded by some fuscous suffusion, a dark fuscous mark along costa above base of cleft, and sometimes a small dark fuscous mark between these; a short undefined dark fuscous mark beneath cleft; a suffused dark fuscous mark along costa at $\frac{5}{6}$; sometimes traces of dark fuscous dots at extremities of veins 2–4, 7, and 8: cilia white, within cleft and on dorsum more or less suffused with brownish. Hind-wings cleft firstly from $\frac{3}{5}$, secondly from $\frac{1}{5}$, segments rather narrow, second long-pointed; grey, third segment paler; cilia grey or pale grey, with a brassy tinge.

COLORADO, U.S., 5,000–7,000 feet; four specimens.

Pterophorus glochinias, n. sp.

♂ ♀. 26–28 mm. Head ochreous-whitish, more or less irrorated with fuscous or dark fuscous except on anterior half of crown.

Palpi ochreous-whitish, sprinkled with dark fuscous except towards apex. Antennæ ochreous-whitish, with a cloudy fuscous line above. Thorax pale whitish-ochreous finely sprinkled with fuscous. Abdomen ochreous-whitish, more or less sprinkled with fuscous on sides, sometimes with dark lateral stripes towards base. Legs ochreous-whitish, anterior and middle pairs obliquely banded and lined with dark fuscous, posterior pair narrowly banded with dark fuscous suffusion. Fore-wings cleft from $\frac{3}{5}$, segments moderate, first pointed, second with apex slightly produced, termen very obliquely sinuate; pale whitish-ochreous slightly tinged with brownish, more or less thinly and finely sprinkled with dark fuscous; an indistinct dark fuscous dot in disc beyond $\frac{1}{4}$; a triangular dark fuscous spot resting on base of cleft, its angles shortly produced on each side of cleft; a cloudy dark fuscous dot beyond upper angle of this, and a dark fuscous mark on costa beyond this dot, preceded and followed by some whitish suffusion; a blackish dot on costa beyond middle of first segment, one at apex, and one on lower margin midway between these: termen of first segment suffused with whitish, with a suffused dark fuscous mark beneath costal dot; more or less irregular dark fuscous suffusion towards apex; second segment with more or less dark fuscous suffusion on upper margin towards apex, and suffused dark fuscous dots on extremities of veins 2–4: cilia pale whitish-ochreous, partially tinged with brownish, beneath apex of each segment suffused with dark fuscous. Hind-wings cleft firstly from $\frac{2}{5}$, secondly from $\frac{1}{5}$, segments narrow, long-pointed; grey; cilia ochreous-grey.

Brazil, Petropolis; four specimens. Much like *lithodactylus*, but segments of hind-wings much narrower; distinguished from both *lithodactylus* and *Constanti* by the dark fuscous mark on lower margin of first segment opposite costal dot.

Pterophorus citrites, n. sp.

♂ ♀. 24–27 mm. Head ochreous-whitish, face and back of crown more ochreous-tinged. Palpi and antennæ whitish-ochreous. Thorax whitish-ochreous, patagia sometimes more whitish. Abdomen whitish-ochreous, sides more ochreous. Legs ochreous-whitish, anterior and middle femora and tibiæ ochreous. Fore-wings cleft from $\frac{2}{3}$, first segment moderate, long-pointed, second much broader, shorter-pointed; ochreous, partially tinged with whitish; an undefined patch of light brownish suffusion with a few dark fuscous scales towards dorsum about $\frac{1}{4}$; a small spot of similar suffusion in disc at $\frac{1}{3}$; an oblique dark fuscous mark a little before base of cleft, preceded by some yellow-brownish suffusion which is extended upwards as an indistinct oblique streak to costa above base of cleft, posteriorly edged with white suffusion ; a short longitudinal streak of yellowish-brown suffusion sprinkled with dark fuscous in apex of second segment, and another less distinct and sometimes obsolete beneath apex of wing: cilia whitish, beneath apex with a pale ochreous patch, within cleft tinged with ochreous and on upper margin of second segment with fuscous, on dorsum tinged with whitish-ochreous. Hind-wings cleft firstly from before middle, secondly from $\frac{1}{4}$, segments rather narrow, second long-pointed; grey, sometimes much suffused with whitish-ochreous; cilia whitish-ochreous-grey or whitish-ochreous.

Colorado, U.S., 5,000–7,000 feet; three specimens.

Pterophorus balanotes, n. sp.

♂. 31 mm. Head light ochreous-brown, space between antennæ ochreous-whitish. Palpi ochreous-whitish. Antennæ whitish. Thorax ochreous-whitish. Abdomen pale whitish-ochreous with some dorsal and lateral blackish dots. Legs ochreous-whitish, (anterior pair broken,) middle femora infuscated and tibiæ streaked with dark fuscous, posterior coxæ with a blackish dot near base. Fore-wings cleft from $\frac{2}{3}$, segments moderately broad, first pointed, termen of second nearly straight, very oblique; whitish-ochreous, brownish-tinged in disc; some blackish irroration somewhat suffused with brown forming a fine subcostal streak from near base to middle, a very undefined broad median streak from $\frac{2}{5}$ to near cleft, a broad cloudy submedian streak from base to $\frac{2}{5}$, a small spot on base of cleft, and indications of a short dash in middle of first segment; cloudy dark fuscous dots at extremities of veins 2-4 and 7: cilia ochreous-whitish. Hind-wings cleft firstly from before middle, secondly from $\frac{1}{4}$, segments moderate, pointed; pale ochreous-grey; cilia whitish-grey-ochreous.

S. Florida, U.S., Titusville, in August; one specimen.

Pterophorus aquila, n. sp.

♂. 42 mm. Head ochreous-brown, space between antennæ ochreous-whitish. Palpi whitish, becoming ochreous towards apex. Antennæ whitish-ochreous. Thorax brownish-ochreous, patagia ochreous-whitish. Abdomen whitish-ochreous. Legs whitish, anterior and middle femora and tibiæ fuscous beneath. Fore-wings cleft from $\frac{2}{3}$, first segment moderate, pointed, second broad, termen straight, oblique; pale brownish-ochreous; a fine dark fuscous line on vein $1b$ from near base to near middle; a small suffused dark fuscous spot on base of cleft, and a dot obliquely before and beneath it; extremities of all veins with dark fuscous dots: cilia whitish-ochreous, broadly barred on veins with a faint brownish tinge. Hind-wings cleft firstly from before middle, secondly from about $\frac{1}{4}$, segments moderately broad, pointed; fuscous, third segment whitish-fuscous; cilia whitish-fuscous, base tinged with pale ochreous.

TEXAS, U.S.; one specimen. Much the largest species of the genus, exceeding *grandis* by 8 mm.

STENOPTILIA, Hb.

Stenoptilia petræa, n. sp.

♂. 20–21 mm. Head and thorax greyish-ochreous, with a white line above eyes, thorax sometimes white-sprinkled. Palpi whitish-ochreous sprinkled with fuscous and whitish, base white beneath. Antennæ grey. Abdomen greyish-ochreous with suffused streaks of white irroration, becoming more defined towards base. Legs grey, anterior and middle pair white internally. Fore-wings cleft from $\frac{3}{5}$, segments moderately broad, first evenly pointed, without lower angle, second with termen straight, very oblique; brownish-ochreous, becoming browner posteriorly, more or less sprinkled irregularly with whitish and blackish; a cloudy dark fuscous dot in disc at $\frac{1}{3}$, and a more distinct one on base of cleft: cilia light brownish-ochreous, base mixed with whitish in cleft and on termen, with traces of dark fuscous dots at angles of segments and in middle of termen of second segment. Hind-wings cleft firstly from $\frac{3}{5}$, secondly from near base, first and second segments acutely pointed, apex of second produced; rather dark grey; cilia light greyish-ochreous.

S. INDIA, Palni Hills, 6,000 feet (*Campbell*); Nilgiri Hills, 6,000 feet (*Andrewes*); two specimens. Much like *bipunctidactyla*, but certainly distinct by shape of first segment of fore-wings, which is narrower and with lower margin straight to apex, so that there is no lower angle, which in *bipunctidactyla* is distinct.

Stenoptilia zophodactyla, Dup.

I have recently recorded this species as occurring not uncommonly in India, Ceylon and Eastern Australia, and have since obtained several specimens from Parana, Argentina, which I regard as certainly identical. Mr. T. Bainbrigge Fletcher has bred the Ceylon form from *Sopubia trifida* (*Scrophulariaceæ*), and has sent me bred examples which appear quite normal. Doubtless it has more food plants than are at present known.

ORNEODIDÆ.

Orneodes, Latr.

Orneodes nephelotoxa, n. sp.

♂. 15–16 mm. Head, antennæ, and thorax white, face slightly sprinkled with grey. Palpi moderate, ascending, somewhat loosely scaled, terminal joint somewhat over half second; white, second joint somewhat sprinkled with grey. Abdomen whitish, sprinkled with dark fuscous on sides. Legs white, anterior tibiæ suffused with dark fuscous. Fore-wings white, faintly tinged with fuscous; anterior half of costa dark fuscous interrupted several times with white, posterior half with several indistinct fuscous marks; segments 2–6 crossed by a moderate fascia before middle and narrow one before $\frac{3}{4}$, whose margins only are indicated by blackish irroration: cilia white, on fasciæ light fuscous. Hind-wings white, faintly tinged with fuscous; a moderate grey fascia at $\frac{1}{3}$, irrorated with blackish; a narrower fascia at $\frac{2}{3}$, indicated by margins of blackish irroration, on first segment dilated and suffused with blackish; dots of blackish irroration near tips of segments; cilia white, on fasciæ more or less tinged or mixed with fuscous.

Assam (Khasi Hills); two specimens.

Orneodes pluvialis, n. sp.

♀. 13 mm. Head white, with grey bar on face, and bar of blackish-grey irroration on crown. Palpi moderate, ascending, with appressed scales, terminal joint about $\frac{3}{4}$ of second; white, second joint externally grey. Antennæ whitish-ochreous. Thorax white. Abdomen white, with a blackish lateral mark on second segment, and some dots of dark fuscous irroration on sides. Legs white, anterior femora and tibiæ dark fuscous externally. Fore-wings white; first segment with about ten moderately broad fuscous bars edged with black irroration; segments 2-5 with six more or less broad fasciæ of fuscous irroration edged with black irroration, leaving narrow interspaces and a basal area ; sixth segment with a black dot at ¼, a black fascia beyond middle, and two fasciæ of fuscous irroration edged with black on posterior fourth : cilia white, on fasciæ whitish-fuscous. Hind-wings as fore-wings, but first segment similar to 2–5, sixth with central black mark smaller.

ASSAM (Khasi Hills), in September ; one specimen.

Orneodes tricausta, n. sp.

♂ ♀. 14–16 mm. Head, palpi, antennæ, thorax, abdomen, and legs white ; face with a dark grey spot on each side beneath antennæ ; palpi moderate, curved, somewhat rough anteriorly, second and terminal joints each with basal and median dark grey spots, terminal joint rather shorter than second ; abdomen sprinkled with blackish near base and towards apex ; anterior tibiæ and tarsi mostly suffused with grey. Fore-wings white, thinly and irregularly sprinkled with dark grey ; first segment with five small fuscous dark-edged spots on costa, a blackish bar before apex, and small dark fuscous apical spot ; other segments crossed by slender median and subterminal pale ochreous fasciæ edged with dark fuscous irroration, subterminal broadened and suffused with blackish on second and third segments, angulated inwards on third : cilia white, with grey bars on fasciæ. Hind-wings white, with scattered dots of dark fuscous irroration ; narrow or very narrow pale ochreous median and subterminal fasciæ edged with dark fuscous irroration, median broader and more suffused with dark fuscous on sixth segment ; cilia white, more or less barred with grey on fasciæ.

ASSAM (Khasi Hills), in October, November, and June ; six specimens.

Orneodes pinalea, n. sp.

♂ ♀. 13–18 mm. Head white, crown more or less mixed with dark fuscous. Palpi moderately long, ascending, loosely scaled anteriorly, terminal joint half second ; white, second joint externally more or less sprinkled with grey, terminal joint with a dark grey median band. Antennæ pale whitish-ochreous. Thorax white. Abdomen white, second segment with small blackish subdorsal spots, anal tuft of ♂ whitish-ochreous. Legs white, anterior tibiæ suffused with dark grey. Fore-wings white ; first segment with about ten pale yellowish spots partially edged with dark fuscous irroration, alternate ones more strongly suffused with dark fuscous ; other segments crossed by six moderately broad pale yellowish fasciæ edged with blackish irroration, fourth broadest, represented on sixth segment by a blackish spot: cilia white, on fasciæ pale yellowish. Hind-wings white; fasciæ mostly reduced to single dots of blackish irroration, but postmedian fascia faintly yellowish; sixth segment with three posterior dots only.

CEYLON (Madulsima, Wellawaya), in November (*Pole, Green, Vaughan*); four specimens.

Orneodes niphostrota, n. sp.

♂♀. 21–22 mm. Head and thorax white tinged or sprinkled with pale ochreous. Palpi moderate, ascending, loosely scaled, terminal joint $\frac{3}{4}$ of second; grey, terminal joint white towards apex. Antennæ pale whitish-ochreous. Abdomen whitish, with subbasal and subapical bands and lateral stripes of fuscous irroration. Legs whitish, anterior femora and tibiæ suffused with dark fuscous externally. Fore-wings white; basal half tinged with ochreous and partially sprinkled with dark fuscous, especially on base of costa and towards base of lowest cleft; segments crossed by four fuscous fasciæ sprinkled with blackish, and an additional blotch on first two segments between third and fourth fasciæ, the blotch and upper half of second fascia darker than the rest, first three fasciæ moderate, angulated on fourth segment, first obsolete towards costa, third narrow on fourth and fifth segments, fourth narrow throughout, subapical, all widely separated on sixth segment: cilia ochreous-whitish, slightly tinged with fuscous on fasciæ. Hind-wings white; basal third irrorated with dark fuscous except at base; segments crossed by four rather narrow curved or angulated fuscous fasciæ sprinkled with blackish; cilia as in fore-wings.

CEYLON (Maskeliya), in October and January (*de Mowbray, Alston*); two specimens.

Orneodes chloracta, n. sp.

♀. 16 mm. Head ochreous-whitish. Palpi long, whitish, second joint somewhat rough-scaled above and towards apex beneath, sprinkled with grey, terminal joint porrected, hardly over half second, with grey median ring. Thorax and abdomen ochreous-whitish sprinkled with dark fuscous. Fore-wings ochreous-whitish, sprinkled with fuscous except on first segment; basal area sprinkled with dark fuscous; three small semi-oval fuscous spots on anterior half of costa; segments 2–6 crossed by two broad slightly curved fasciæ of fuscous irroration before middle of wing and about $\frac{2}{3}$, and a slender fascia before apex of segments, these fasciæ edged with indistinct whitish dots ; fourth segment with an apical dark fuscous dot : cilia ochreous-whitish, more or less mixed irregularly with fuscous, on margins of fasciæ dark fuscous mixed with whitish, on first segment ochreous-whitish with dark fuscous patches on lower margin opposite fasciæ. Hind-wings ochreous-whitish sprinkled with blackish ; moderate curved fasciæ of fuscous irroration at $\frac{1}{3}$ and $\frac{2}{3}$, edged with white dots, and slender indistinct subapical fascia ; dark fuscous dots at apex of segments except first ; cilia ochreous-whitish, mixed with fuscous, and on fasciæ with dark fuscous.

BENIN (Wari), in September ; one specimen.

Orneodes mesolychna, n. sp.

♂ ♀. 9–11 mm. Head ochreous-whitish, crown suffusedly mixed with blackish-grey. Palpi moderate, curved, ascending, transverse-flattened, terminal joint somewhat shorter than second ; whitish, with apical band of second joint and median band of terminal joint blackish-grey. Antennæ ochreous-white. Thorax ochreous-whitish mixed with blackish-grey. Abdomen rather dark fuscous, third segment ochreous-white, segments 4–6 edged posteriorly towards middle with white, towards sides with black, ventral surface ochreous-white. Legs whitish, anterior femora and tibiæ suffused with dark grey externally, apex of middle femora with a dark grey dot. Forewings ochreous-yellow ; basal area irrorated with blackish ; a moderate fascia of blackish irroration edged with white before $\frac{1}{4}$; first segment with three, other segments crossed by two rather broad fasciæ of blackish irroration edged by white lines margined with two rows of black scales ; a slender blackish subapical fascia, and tips of segments also blackish : cilia dark grey, barred with whitish on white markings. Hind-wings whitish, with about ten irregular transverse bars of blackish irroration, alternate interspaces ochreous-yellowish ; cilia as in fore-wings, but whitish bars wider.

ASSAM (Khasi Hills) ; CEYLON (Maskeliya), (*Pole*) : from November to March, seven specimens. Much like *spilodesma*, but smaller, and immediately distinguished by the conspicuous white third segment of abdomen.

Orneodes spilodesma, n. sp.

♂ ♀. 14–16 mm. Head pale yellowish, with three transverse bars of blackish irroration on crown and two on face. Palpi moderately long, curved, second joint rough-scaled towards middle above and towards apex beneath, terminal joint rather thick, $\frac{3}{4}$ of second; whitish-ochreous, second joint with two sometimes confluent bands of blackish irroration, terminal joint with extreme base and a median band blackish. Antennæ ochreous-whitish, towards base with some black scales above. Thorax pale yellowish, with two transverse bands or sometimes wholly suffused with dark fuscous irroration. Abdomen pale yellowish suffusedly irrorated with dark fuscous, segmental margins ochreous-whitish towards middle, spotted with blackish on each side of this. Legs white, anterior pair more or less grey externally, apex of middle femora grey. Fore-wings ochreous-yellow, sometimes sprinkled or wholly irrorated with dark fuscous; basal third more or less irrorated and spotted with dark fuscous; costa with six moderately broad dark fuscous spots edged by oblique white marks, and a seventh at apex; segments 2–5 crossed by two irregular fasciæ of dark fuscous irroration, edged by white lines margined with black irroration, first median, rather curved inwards in middle, broadest on fifth segment, second subterminal, curved inwards in middle, broadest on segments 2–4; blackish dots at tips of segments: cilia whitish, barred with dark fuscous, with broader dark fuscous bands on fasciæ. Hind-wings pale yellowish; basal area irrorated with dark fuscous; segments with about eight bars of blackish irroration, alternate interspaces more whitish; fifth segment with two remote and sixth with two approximated bands of dark fuscous irroration; cilia whitish, barred with dark fuscous, with broader dark fuscous spots on bands of fifth and six segments.

S. INDIA, Gooty (*Campbell*); ASSAM, Khasi Hills; from June to November, sixteen specimens. The variation in development of the dark fuscous irroration causes some diversity of appearance.

Orneodes huebneri, Wallgr.

TRANSVAAL, Pretoria (*Janse*); KASHMIR, 6,000 feet. The length of terminal joint of palpi varies somewhat, and in both of these forms is usually somewhat shorter than in European specimens, and perhaps rather more thickly scaled, but there appears to be no constant or definable difference, either in structure or markings. In one Transvaal specimen (out of six) the subterminal fascia is simple on costa and not furcate as usual, certainly an abnormality only, but noticeable.

Orneodes magadis, n. sp.

♂ ♀. 14–16 mm. Head, palpi, and thorax fuscous-whitish mixed with fuscous and dark fuscous; palpi long, porrected, second joint long, with projecting scales above and towards apex beneath, terminal joint about half second, porrected, mostly concealed in tuft of second joint, white with dark fuscous median ring. Antennæ fuscous. Abdomen whitish mixed with dark fuscous, segmental margins white. Legs ochreous-whitish suffusedly banded with fuscous. Fore-wings fuscous-whitish, suffusedly irrorated with fuscous, sometimes tinged with ochreous; basal area irrorated with dark fuscous; six dark fuscous slenderly white-edged subquadrate spots on costa, last five crossing first segment, last two united beneath as continuation of subterminal fascia; segments 2–6 crossed by median and subterminal moderately broad dark fuscous fasciæ slenderly edged with white, both sinuate inwards on third and fourth segments, median broadest on fifth segment, subterminal on third and fourth; all segments with an apical black dot: cilia fuscous, with whitish bars on margins of fasciæ. Hind-wings whitish irrorated throughout with dark fuscous, with several more or less defined white bars, sometimes edged with blackish irroration; apex of all segments with black dots; cilia whitish, with about ten grey bars on each segment, pairs before middle and about $\frac{3}{4}$ enclosing lighter grey fasciæ.

Assam (Shillong), in March; six specimens.

Orneodes cancellata, n. sp.

♂ ♀. 15–16 mm. Head ochreous-white. Palpi long, curved, second joint with projecting scales above and strong projecting tuft beneath, terminal joint as long as second, slender, acute; white, second joint pale ochreous sprinkled with fuscous except on margins. Antennæ white ringed with dark fuscous. Thorax ochreous-white, with two small dark fuscous spots behind collar. Abdomen ochreous-whitish, with two series of small dark fuscous spots on margins of segments, those on second segment larger and blacker. Legs whitish. Fore-wings white; four subquadrate fuscous spots edged with black on anterior half of costa, with smaller indistinct fuscous spots between these, basal third of wing otherwise irregularly spotted with fuscous, with some dots of blackish scales; irregular post-median and subterminal fasciæ of suffused fuscous irroration edged with blackish, both sinuate inwards on third segment, subterminal bifurcate on first segment; between these a small semioval fuscous black-edged spot on costa, and a faint fuscous-tinged dark-edged narrower fascia on other segments, attenuated or obsolete on fourth segment; a blackish dot at apex of each segment, and on segments 3–6 a fuscous dot a little before it: cilia white, barred with fuscous on dark markings. Hind-wings white; basal area ochreous-tinged and spotted with dark fuscous; three fasciæ as in fore-wings, but intermediate one darker and entire; all segments with blackish apical and preceding fuscous dots; cilia as in fore-wings.

SYRIA (Alma Dagh); two specimens.

ADDENDUM.

Pterophorus orchatias, n. sp.

♂. 21 mm. Head brownish, between antennæ ochreous-white. Palpi whitish, with a blackish lateral line. Antennæ pale greyish-ochreous, above white, towards base with a blackish line. Thorax whitish-yellow. (Abdomen broken.) Legs yellow-whitish, femora and tibiæ lined with dark fuscous. Fore-wings cleft from $\frac{3}{5}$, segments moderate, pointed; light ochreous, in disc with a few scattered dark fuscous specks; a small irregular blackish spot on base of cleft, emitting a short oblique strigula upwards; groups of black scales at extremities of veins 8, 10, and 11, and strong black marks at extremities of veins 7 and 2–4: cilia light ochreous, more whitish at tips. Hind-wings cleft firstly from $\frac{2}{3}$, secondly from $\frac{1}{3}$; grey; cilia light grey, tinged with ochreous.

NATAL, Durban, in October (*Leigh*); one specimen.

FEBRUARY 14, 1908.

Explanation of Plate I.

Fig. 1. *Papilio ægialus*, Dist. ♀

,, 2. ,, *acheron*, Gr. Sm. ♀.

,, 3. ,, *stratoclides*, sub-sp. nov.

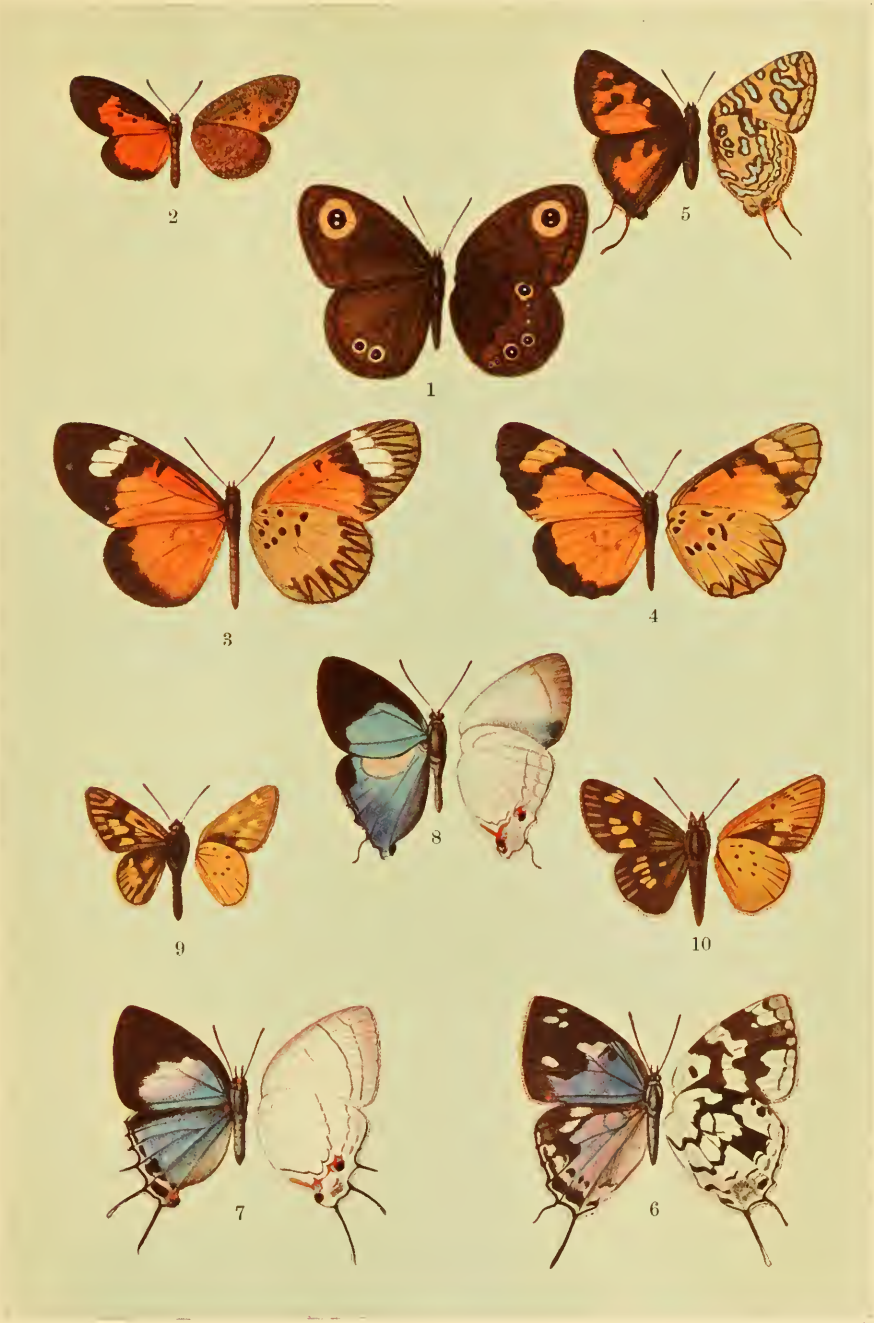
Trans. Ent. Soc. Lond. 1907. Pl. I.

E. C. Knight del. West, Newman chromo.

INDO-AUSTRALIAN PAPILIOS.

Explanation of Plate II.

Fig. 1. *Neocænyra cooksoni*, sp. nov.
,, 2. *Telipna rogersi*, sp. nov.
,, 3. *Mimacræa skoptoles*, sp. nov.
,, 4. ,, *neokoton* ,,
,, 5. *Spindasis menelas* ,,
,, 6. *Stugeta maria*, Suffert.
,, 7. *Epamera mermis*, H. H. Druce, ♀.
,, 8. ,, *mirabilis*, H. H. Druce.
,, 9. *Kedestes rogersi*, sp. nov. ♂.
,, 10. ,, ,, ,, ♀.



H. Knight, del.

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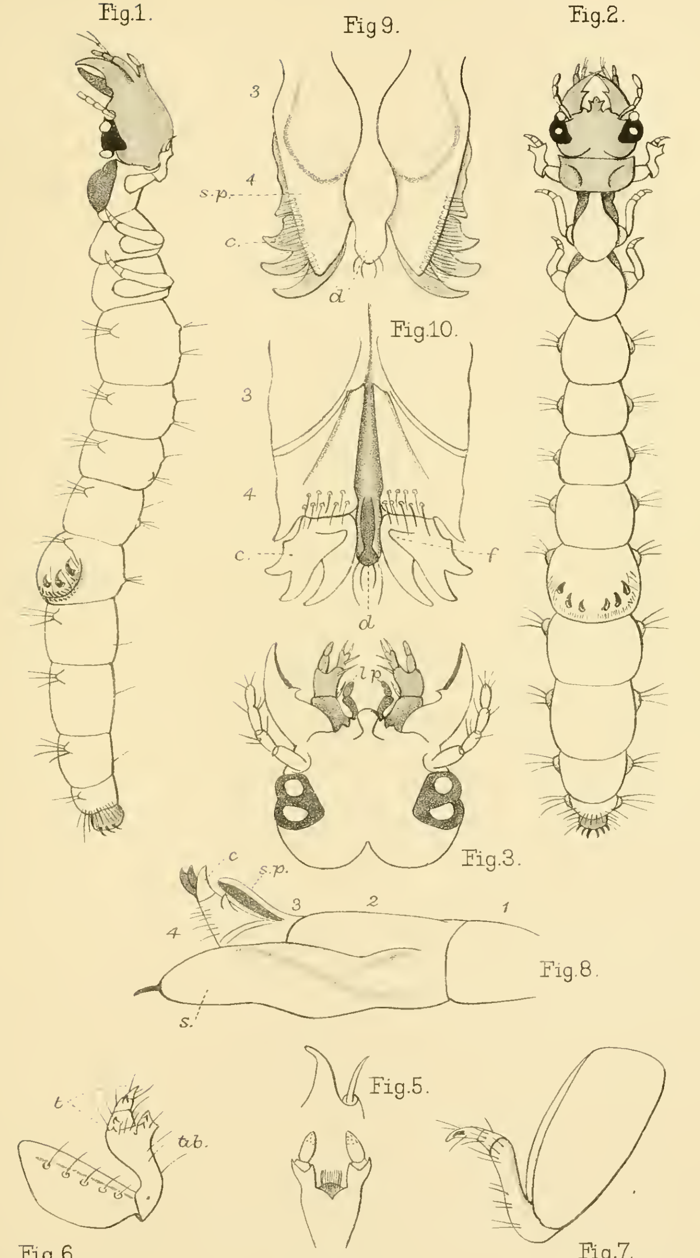
TROPICAL AFRICAN BUTTERFLIES.

Explanation of Plate III.

Fig. 1. Larva, side view × 8.
2. Larva, dorsal view × 8.
3. Head of larva, dorsal view ; *l.p.*, labial palps × 33.
4. Labium, ventral view × 33.
5. One of the hooks from the 8th segment × 33.
6. Front leg ; *t.* tarsus, *tib.* tibia × 33.
7. Second leg ,, ,, × 33.
8. Genital apparatus of adult female, side view ; 1—4, numbers of segments, *s*, spoon-shaped sclerite borne by 2nd segment and bearing at apex one pair of decurved spines, *c*, crotchets, *s.p.* setigerous plate borne by 3rd segment × 16.
9. Apex of above, the spoon-shaped sclerite removed, dorsal view ; lettering as before. *d*, median dorsal sclerite of 3rd segment × 52.
10. Ditto. ventral view, *f.* flange × 52.



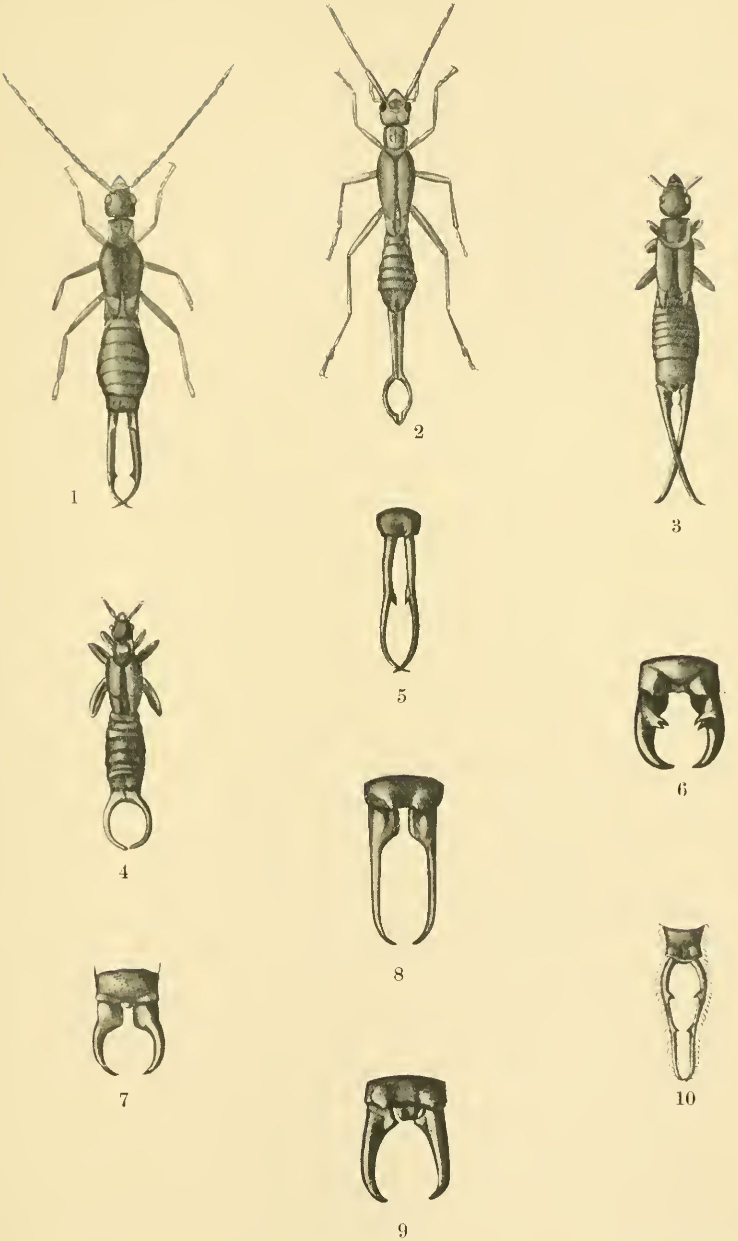
R. S. del.
H. F. Knight lith.

West, Newman imp.

LARVA OF COLLYRIS EMARGINATUS.

Explanation of Plate IV.

Fig. 1. *Timomenus oannes*, Burr, ♂. (India.)
,, 2. *Opisthocosmia erroris*, Burr, ♂. (Sarawak.)
,, 3. *Forficula mogul*, Burr, ♂. (India.)
,, 4. *Forficula planicollis*, Kirby, ♂. (India.)
,, 5. *Kosmetor brahma*, Burr, ♂ forceps. (India.)
,, 6. *Anechura harmandi*, Burr, ♂ forceps. (Japan.)
,, 7. *Forficula interrogans*, Burr, ♂ forceps. (India.)
,, 8. *Forficula davidi*, Burr, ♂ forceps. (China.)
,, 9. *Forficula mikado*, Burr, ♂ forceps. (China.)
,, 10. *Kosmetor temora*, Burr, ♂ forceps. (India.)



G. Arnold, del. *Andre & Sleigh, Ltd.*

NEW SPECIES OF DERMAPTERA.

Explanation of Plate V.

All figures natural size.

Figs. 1–12. *Cœnonympha dorus mathewi.*

These show sundry variations, but as hardly any two specimens are quite alike, 100 figures would hardly exhaust the several forms in my moderate series.

Figs. 1–4. Various forms of darker males, fig. 1 perhaps the least common, with no ocellus on upper wing.

Figs. 5 and 6. Two males of lighter forms. There are one or two specimens (not figured) that are a little nearer to *dorus* (type) than these.

7. ♂ under-side. The under-sides differ much in the leaden line, sometimes nearly as clear as in *dorus*, frequently quite wanting, oftener more or less intermediate.

Figs. 8–11. Several forms of ♀s. Fig. 10 is perhaps the form to which most specimens are nearest.

Fig. 12. ♀ Under-side.

Figs. 13, 14, 15. *Lycæna idas.*

13. Form with discal spots most developed. This form is mentioned but not figured by Rambur.

14. Form with least discoidal marking.

15. Under-side.

Figs. 16–19. *Lycæna argus*, var. *casaiacus.*

16–17. Two ♂ upper-sides.

18. ♀ upper-side.

19. ♂ under-side.

E. C. Knight, del. *Andre & Sleigh, Ltd.*

BUTTERFLIES FROM NORTH-WEST SPAIN.

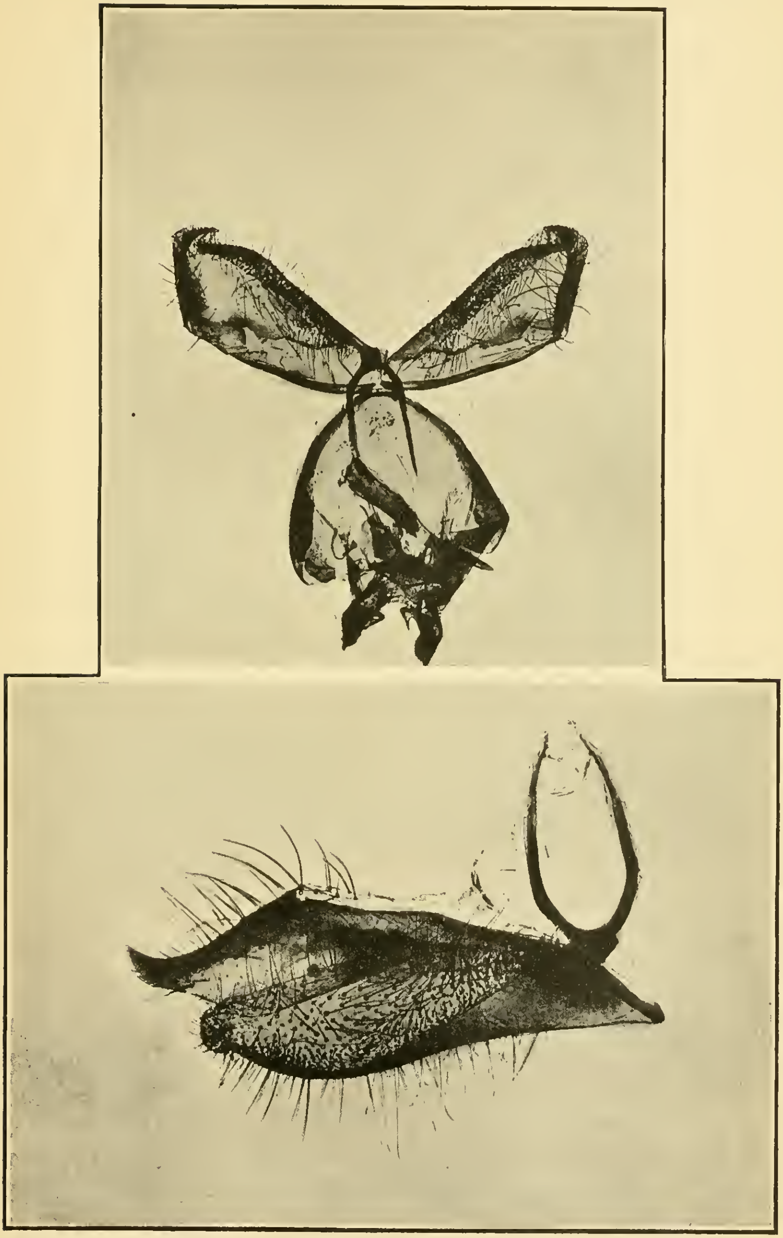
Explanation of Plate VI.

1. Ancillary appendages of *Lycæna idas* × 25.
2. One clasp with Œdeagus supports × 45.

Photo, by F. N. Clark.

In 1, the distal margins of clasps are incurved.

In 2, it is straightened out, the latter shows the structure better, the natural attitude is intermediate. During life these parts are movable, the interior of clasps containing muscles. In comparing fig. 1 with Pl. VII, fig. 1, note the different amplifications.



Ancillary appendages *Lycæna idas*, Rmb.

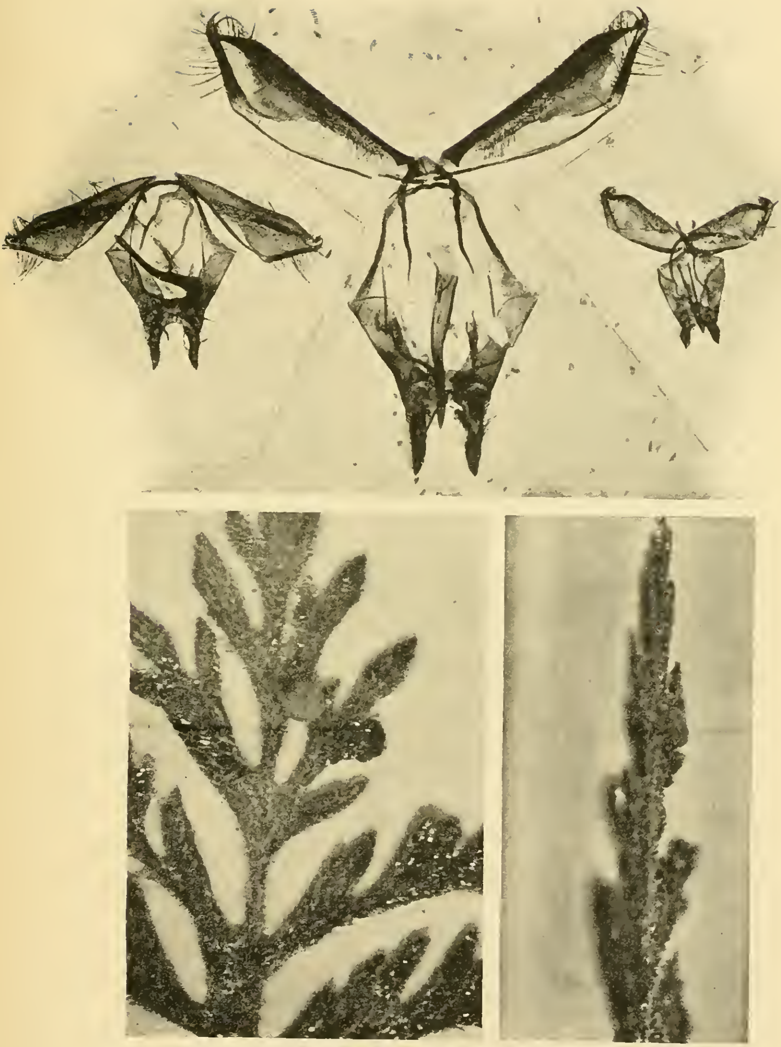
Explanation of Plate VII.

1. Ancillary appendages, *L. astrarche* × 18, by F. N. Clark.
2. " " " × 10
3. " " *L. idas* × 10

These give the relative form and sizes, being to same scale.

4-5. Two views of egg of *L. idas* on leaf of *Erodium* × 10.

Figs. 2–5, photo by A. E. Tonge.



Ancillary appendages *Lycæna astrarche* and *L. idas*,
and eggs of *L. idas*.

Explanation of Plates VIII—XI.

VIII. View looking up Casoya Valley.

IX. Another view looking up Casoya Valley. The hill left centre of picture is opposite Casayo, and is same as point to left in VIII, and whose shoulder we look over to in XI.

X. View in Casayo, showing school-house where we lodged.

XI. View from school-house over roofs below us, to opposite shoulder, across which our path went to locality for *L. argus*, var. *casaiacus*, *Erebia palarica* and *Heterogynis paradoxa*.

In Valley of Casoya, half way to Casayo.
Casayo across ridge and to the left from about 2,500 feet.

The Casoya Valley, a few miles below Casayo, looking up. The highest point to the left is the one opposite Casayo (from about 3,000 feet).

Casayo. The School House.
(*circa* 4,000 feet.)

Outlook from School House, Casayo,
over roofs of Village.

(The slabs of stone in the light portion of the foreground are the roofs of the houses.)

Explanation of Plate XII.

Jaws of larval structure on a pupa of *Hastula hyerana*, Mill. Figures × 22.

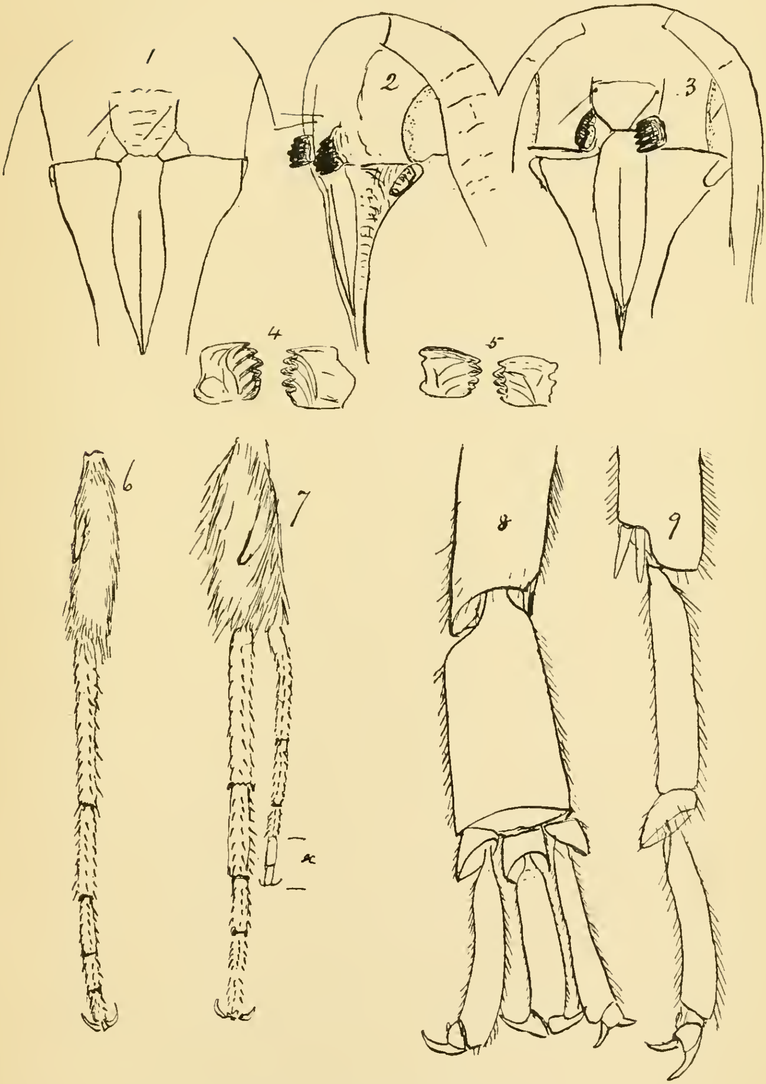
Fig. 1. Face of a normal pupa, front view.
2. Face of a pupa with larval jaws, view nearly from left side.
3. Face of a pupa, view nearly from front.
4. Jaws of larva in last-feeding instar.
5. Jaws of larva in post-feeding æstivating instar.

Additional tarsus in *Catocala nupta*, × 7.

Fig. 6. Tibia and tarsus, normal, first leg right.
7. Tibia and tarsus, normal, first leg left, with extra tarsus, *x* last two joints lost by some accident to specimen.

Abnormal (triplicated) tarsus of hind (right) leg of *Capnia atra* ♀ × 65.

Fig. 8. Portion of tibia, with abnormal tarsus.
9. Portion of tibia, with normal tarsus, for comparison.



TERATOLOGICAL SPECIMENS.

Explanation of Plate XIII.

Binsitta barrowi, Bingham.

Figs. 1, 2. Pupæ.
Fig. 3. Imago.

1

2

Hugh Main, Phot.

3

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BINSITTA BARROWI.

Explanation of Plate XIV.

Fig. 1.	*Molippa*	*simillima*,	Jones,	$\frac{1}{1}$.
1*a*.	,,	,,	,,	uncus × 10.
1*b*.	,,	,,	,,	larva $\frac{1}{1}$.
2*a*.	,,	*sabina*,	Walk.,	uncus × 10.
2*b*.	,,	,,	,,	larva $\frac{1}{1}$.

1

1b

2b

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1a

2a

MOLIPPA SIMILLIMA AND M. SABINA.

Explanation of Plate XV.

Section of wood cylinder from which the bark has been removed all but a thin layer of young bast, showing the course of the larva through the latter from the point when, having penetrated the entire bark from the outside where the egg was laid, it reaches the surface of the wood cylinder (A.A.A.). Continuing to feed upon the soft bast and cambium layer, and grazing superficially the sapwood, finally, if it does not pupate in the bark, it enters the wood for pupation by an elliptical hole (B.B.).

Nat. size.

G.A.C. Photo.

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LIFE HISTORY OF TETROPIUM GABRIELI.

Explanation of Plate XVI.

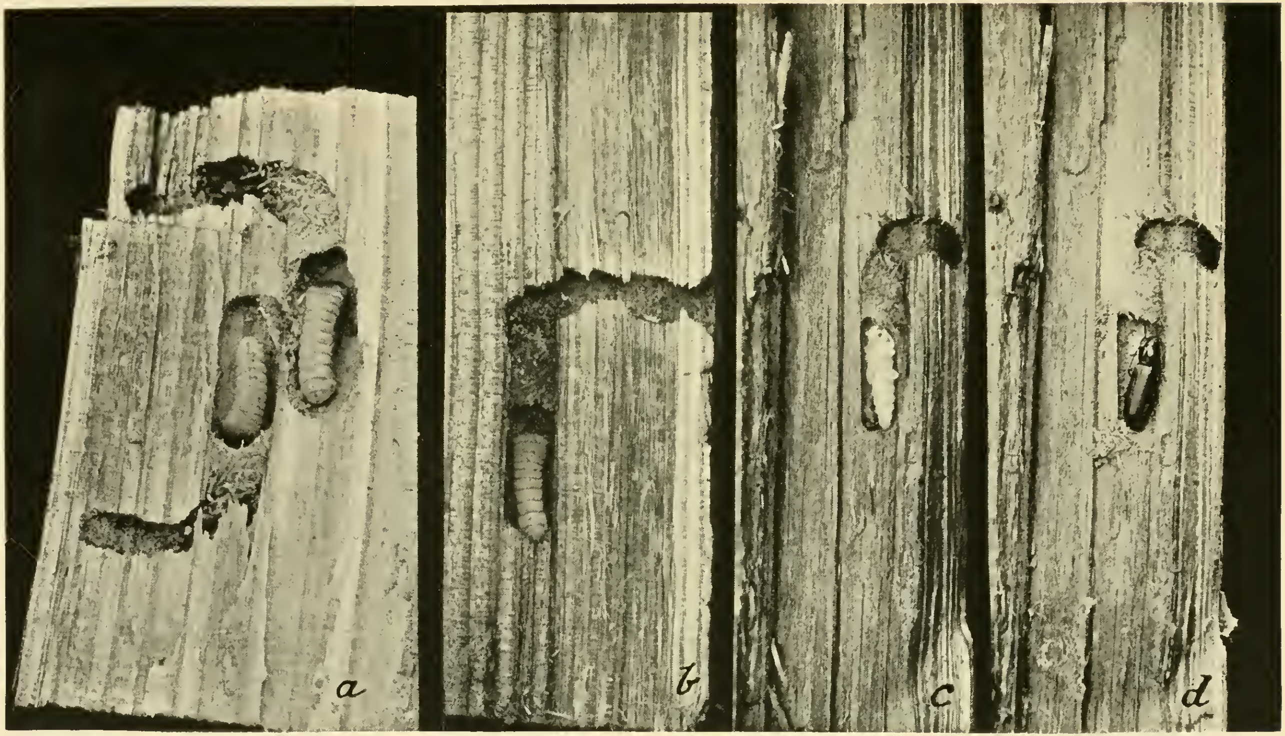
(*a*) Abnormal. Larvæ established in pupa-cells excavated in felled tree lying in a horizontal position.

(*b*) Normal. Larva resting in pupa-cell excavated in standing tree.

(*c*) Normal. Pupa ditto

(*d*) Normal. The same individual transformed to imago. These pieces of wood were split and the insects photographed without having been disturbed from their natural positions.

Nat. size.



G.A.C. Photo.

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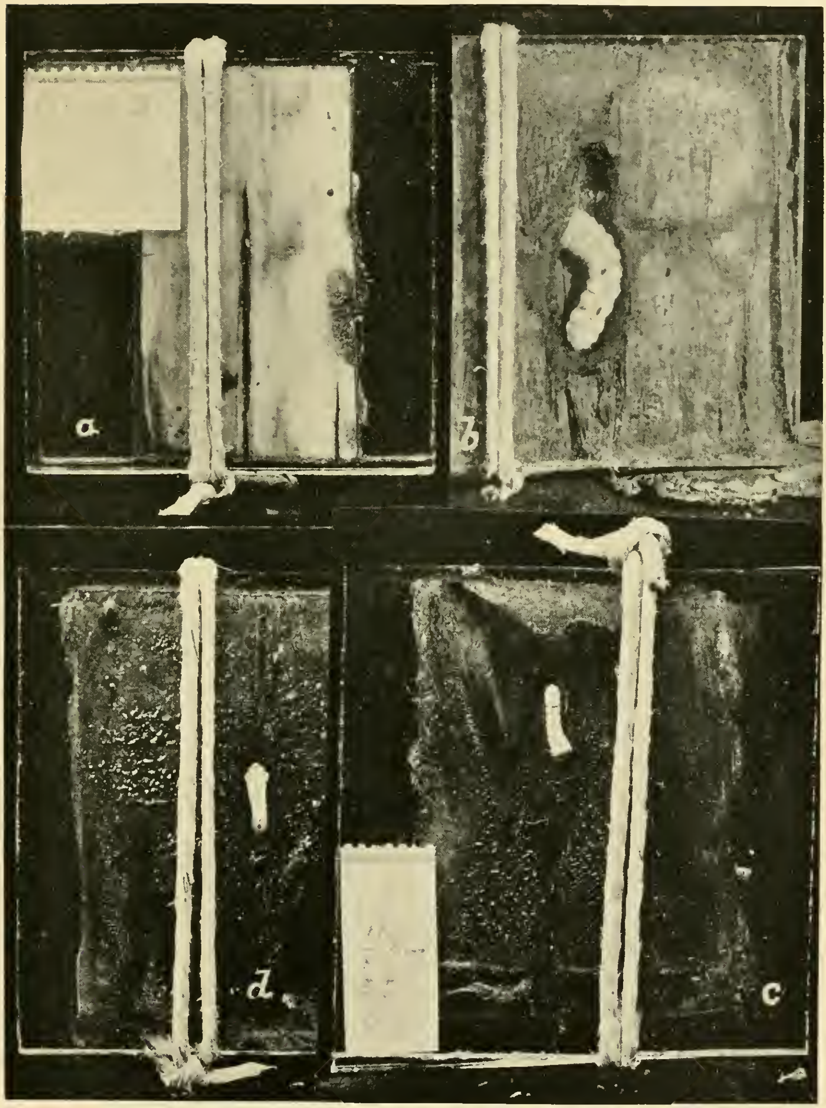
LIFE HISTORY OF TETROPIUM GABRIELI.

Explanation of Plate XVII.

Process of feeding larva in bast under glass.

(*a*) Larva one day old in bast of *Picea excelsa.*
(*b*) Full-fed larva in bast of *Larix europæa.*
(*c*) Immediately prior to 4th moult.
(*d*) Immediately after 4th moult.

Nat. size.



G A.C. Photo. *Andre & Sleigh, Ltd.*

LIFE HISTORY OF TETROPIUM GABRIELI.

Explanation of Plate XVIII.

Process of rearing the full-fed larva and pupa in blocks of wood under glass.

(*a*) Larvæ immediately after insertion in artificial grooves in wood blocks.

(*b*) The same in process of establishing themselves in pupa-cells.

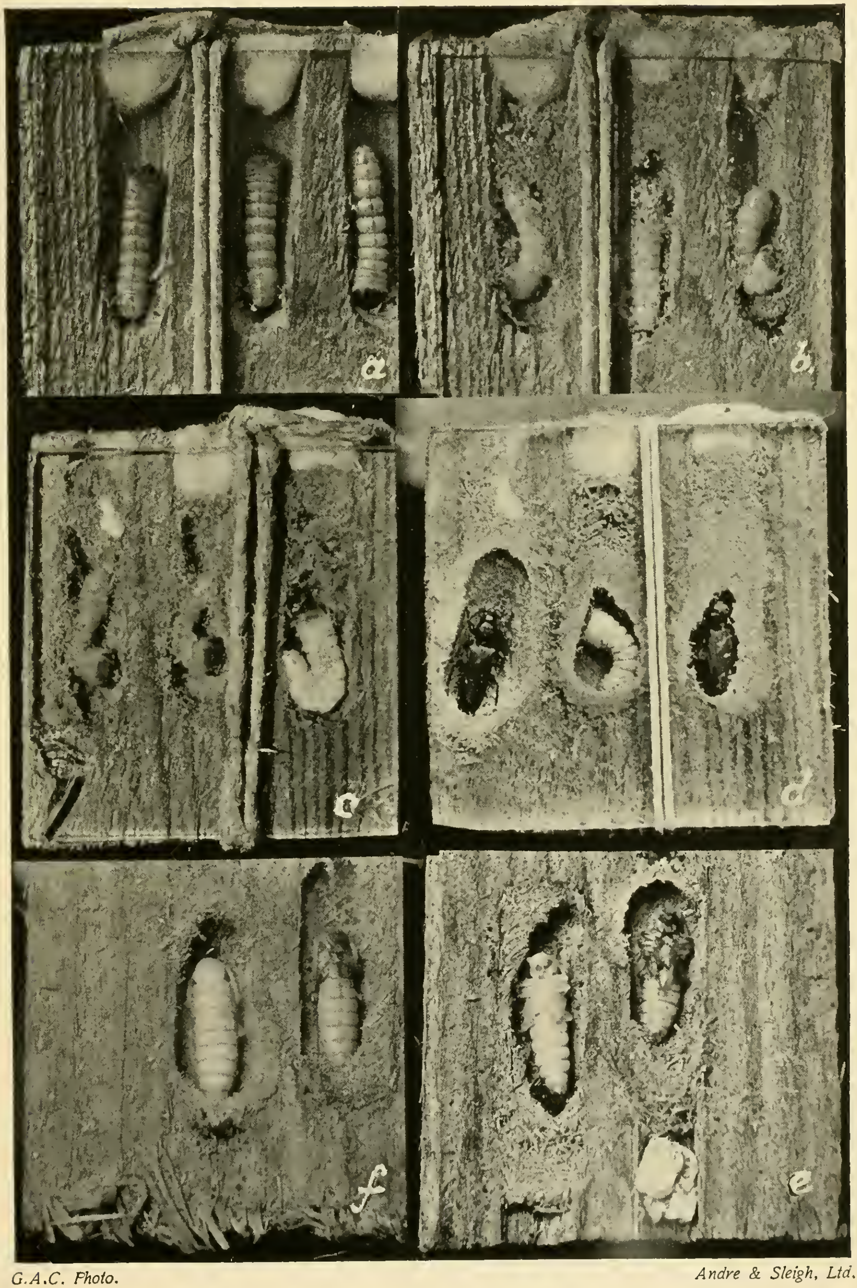
(b^1) Showing larva's method of drawing wood refuse out of the burrow.

(*c*) Larvæ forming pupa-cells.

(*d*) Showing pupa-cells completed containing larva and imagines.

(*e*) Pupæ, with glass removed. Ventral view.

(*f*) Ditto ditto Dorsal view.



G.A.C. Photo. Andre & Sleigh, Ltd.

LIFE HISTORY OF TETROPIUM GABRIELI.

Explanation of Plate XIX.

Process of rearing full-fed larva and pupa in glass tubes.

(*a*) Larva on point of transforming to pupa in wood cylinder in glass tube.

(*b*) Larvæ established in pupa-cells in wood cylinder in glass tube.

(*c*) Pupa in act of transforming in wood cylinder in glass tube.

(*d*) Pupa lately transformed in wood cylinder in glass tube.

(*e*) Pupa in pupa-cell in tube of bark.

(*f*) The same individual transformed to imago.

Nat. size.

G A.C. Photo.

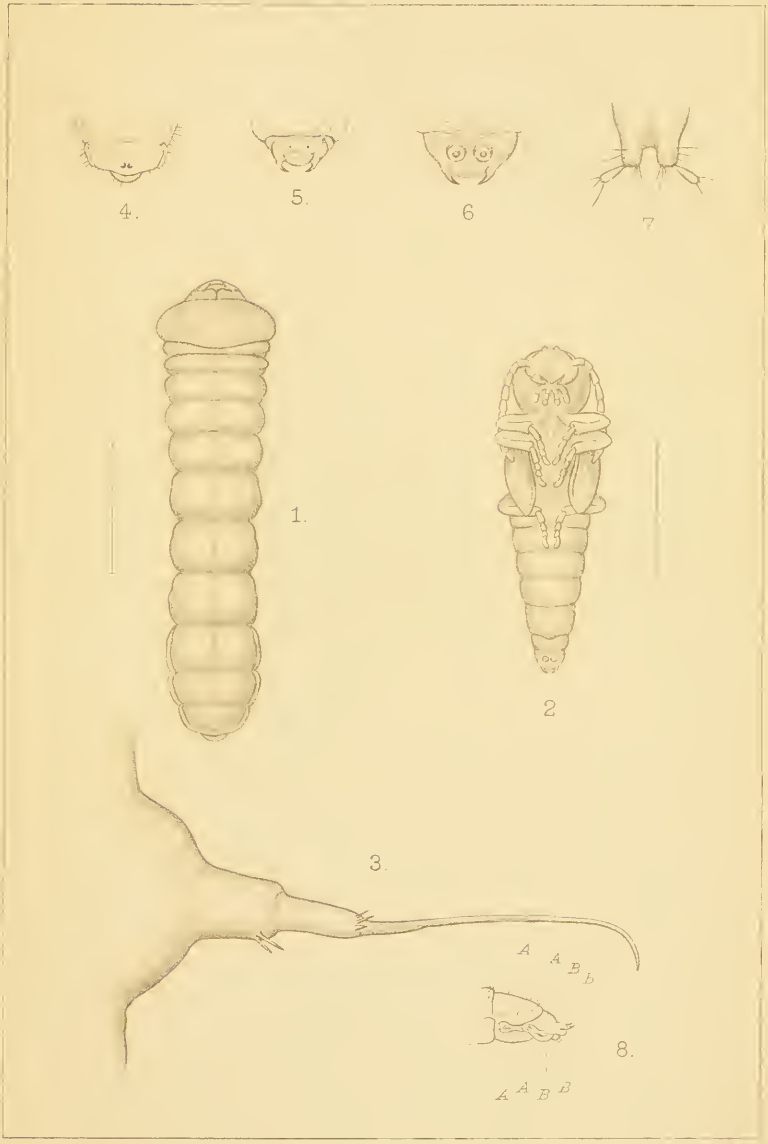
Andre & Sleigh, Ltd.

LIFE HISTORY OF TETROPIUM GABRIELI.

Explanation of Plate XX.

Fig. 1. Full-grown larva of *T. gabrieli.*

2. Pupa of *T. gabrieli.*
3. Leg of newly-hatched larva, highly magnified.
4. Terminal segment of abdomen of larva, dorsal view, showing corneous tubercles on median line, distinguishing the sp from *Criocephalus* and *Asemum.*
5. Terminal segment of abdomen of ♂ pupa, ventral view, × 8.
6. Terminal segment of abdomen of ♀ pupa, ventral view, showing fleshy tubercles, rudiments of appendices at apex of ovipositor in the imago, × 8.
7. Apex of ovipositor showing appendices, × 30.
8. Terminal segment of abdomen of ♀ pupa, viewed transversely, showing what, in the imago, will become the tergite and sternite of the last segment of the abdomen gaping (A. A. A. A.) and rudiments of genitalia protruding in process of formation (B. B. B. B.).



R. Crawshay del. West, Newman lit.

TRANSFORMATIONS OF TETROPIUM GABRIELI.

Explanation of Plate XXI.

		PAGE
Fig. 1.	*Epitettix punctatus*, gen. et sp. n.	216
2.	*Cladoramus crenulatus*, gen. et sp. n.	217
3.	*Chthonotettix palpatus*, Stål.	219
4.	*Ocytettix latihumerus*, gen. et sp. n.	227
5.	*Bolotettix validispinus*, gen. et sp. n.	224
6.	*Camelotettix curvinotus*, gen. et sp. n.	233
7.	*Rhynchotettix rostratus*, gen. et sp. n.	228
8.	*Mitritettix processus*, sp. n.	229

H. Knight del. et lith.

West, Newman imp.

NEW SPECIES OF TETRIGINÆ.

Explanation of Plate XXII.

Fig. 1. *Spindasis lohita*, egg, much enlarged.

2. Larva, much enlarged, in dry season colouring, on *Loranthus chinensis.*
3. Pupa, much enlarged.
4. Ants' nest containing pupa, in *Henslowia frutescens;* part of covering torn away; a small ants' nest on lower part of stem.
5. Imago of *Spindasis lohita*, Horsf., on *Viscum orientale.*

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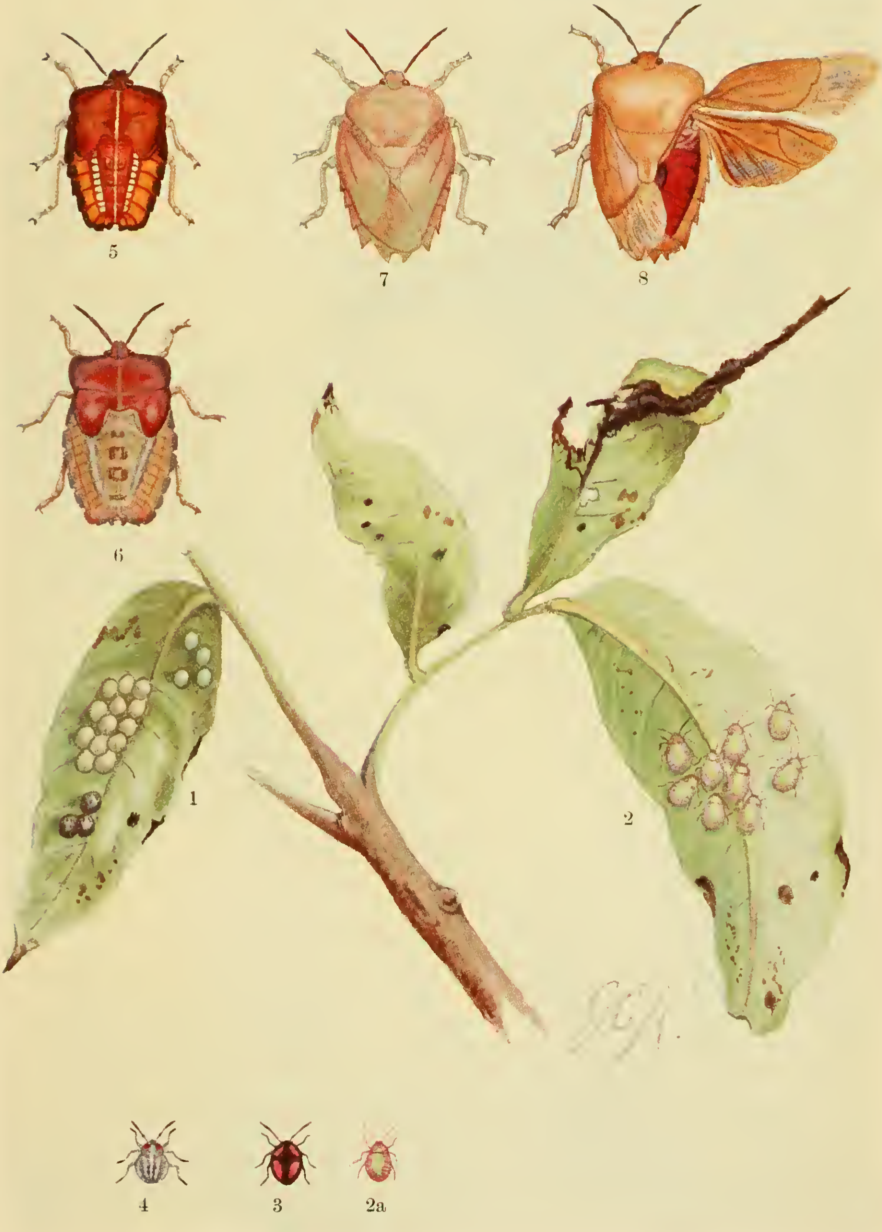
LIFE HISTORY OF SPINDASIS LOHITA.

Explanation of Plate XXIII.

Fig. 1. *Tessaratoma papillosa*, eggs in different stages of maturity :—
Green, just laid ; ochreous, usual colour ; purplish, just before hatching.

2. Nymphs just hatched.
2*a*. ,, ,, ,,
3. ,, second stage.
4. ,, third ,,
5. ,, fourth ,,
6. ,, fifth ,,
7. Adult just after final moult.
8. ,, ♀ several days after final moult.



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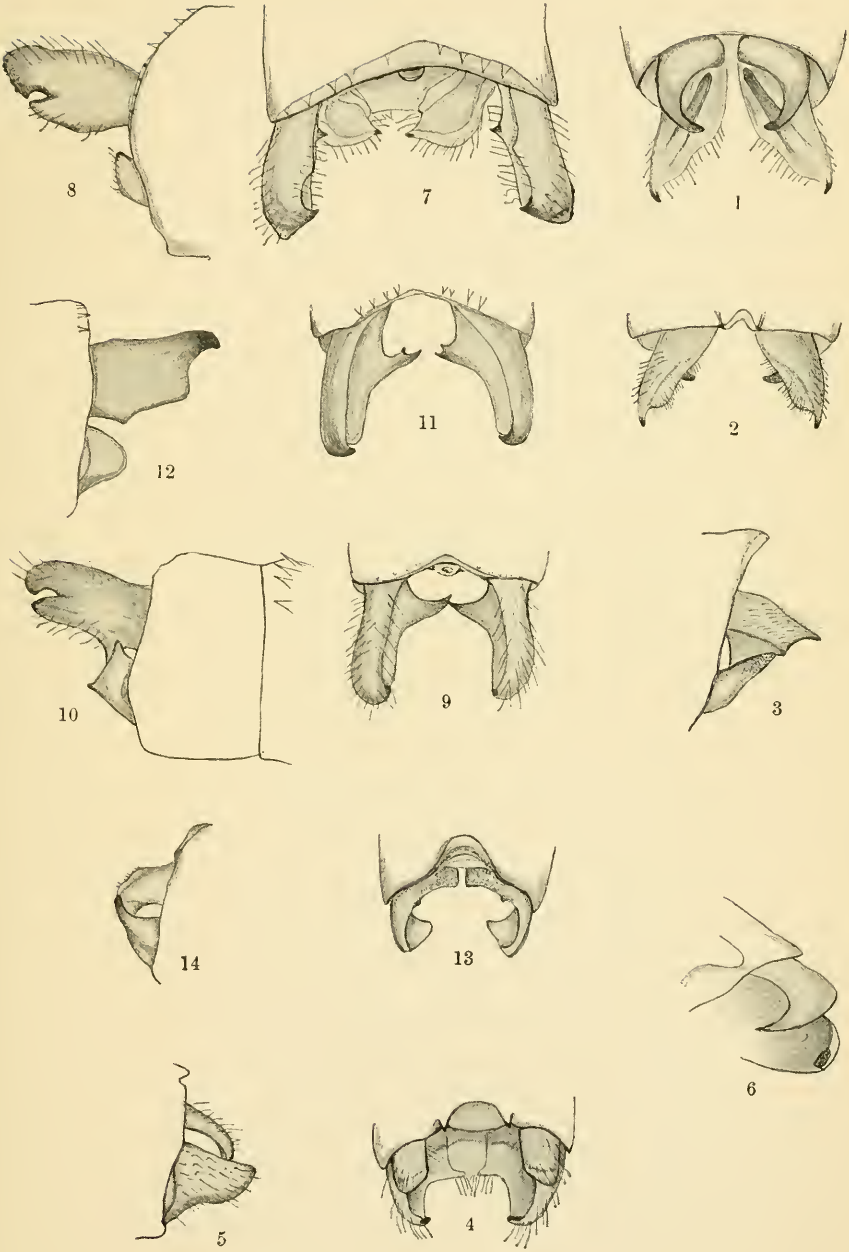
TESSARATOMA PAPILLOSA, THUNB.

Explanation of Plate XXIV.

Fig. 1.	*Ischnura forcipata*, ♂.—Apex of abdomen from beneath.				
2.	,,	,,	,,	,,	above.
3.	,,	,,	,,	,,	side.
4.	*Ischnura nursei*, ♂.		,,	,,	above.
5.	,,	,,	,,	,,	side.
6.	,,	,,	Inner view of app. seen obliquely from above.		
7.	*Pseudagrion decorum*, ♂.—Apex of abdomen from above.				
8.	,,	,,	,,	,,	side.
9.	*Pseudagrion hypermelas*, ♂.		,,	,,	above.
10.	,,	,,	,,	,,	side.
11.	*Pseudagrion bidentatum*, ♂.		,,	,,	above.
12.	,,	,,	,,	,,	side.
13.	*Enallagma parvum*, ♂.		,,	,,	above.
14.	,,	,,	,,	,,	side.



INDIAN ODONATA.

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Explanation of Plate XXV.

Eronia cleodora, Hübn.

Upper and under sides, also two specimens at rest on discoloured leaves of "u-Bomaan," *Isoglossa woodii*, Clarke.

Horace Knight, del. Witherby & Co., imp.

ERONIA CLEODORA, HÜBN.
ON THE WING AND AT REST.

Explanation of Plate XXVI.

Larvæ taken in September 1901.

Fig. 1. Egg, view from above showing ribs.

2. Dark type of larva.

3 & 4. „ „ before last moult.

5, 6, 7. Back, front, and side view of pupa.

8 & 9. Recently-hatched larva, side and back view.

10. After first moult.

11. After second moult.

12. After third moult; lilac-tinted variety.

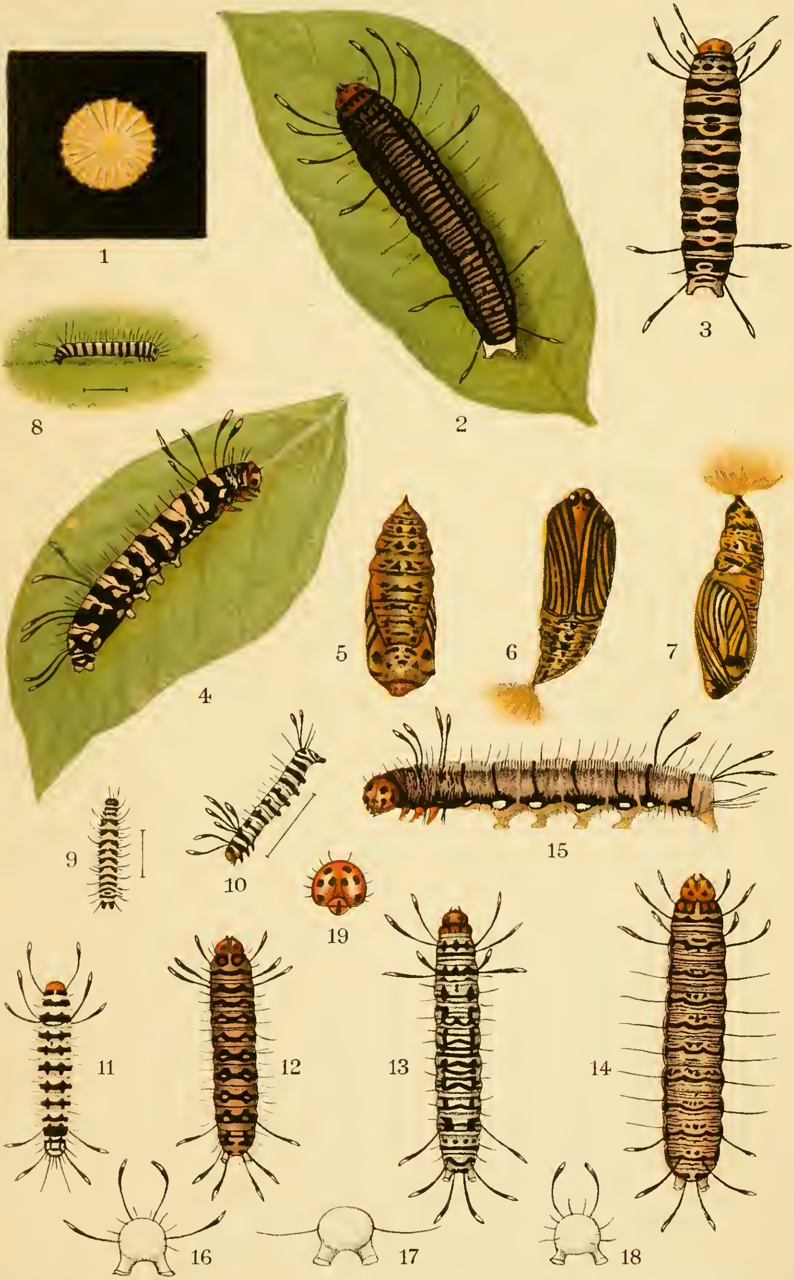
13. Pattern on a larva after the third moult.

14. The same larva just before pupating.

15. Lilac-tinted variety full grown.

16, 17, 18. Sections showing situation of hairs on various segments.

19. Front view of head, showing slightly enlarged dots.



L. Guppy jr. del.

West, Newman chromo.

LIFE-HISTORY OF CYDIMON LEILUS.

Explanation of Plate XXVII.

Larva taken in October 1901.

Fig. 1. A reddish-brown type, the only specimen I obtained.

2 & 2*a*. Side and back view of pupa, showing black lines absent.

3 & 4. The same form of larva as Figs. 3 & 4, Plate XXVI, after second moult; as will be seen, it turned reddish-brown after the last moult.

5 & 5*a*. Usual type (back view) at second moult; three segments are enlarged to show pattern.

6 & 6*a*. Young larva just after second moult.

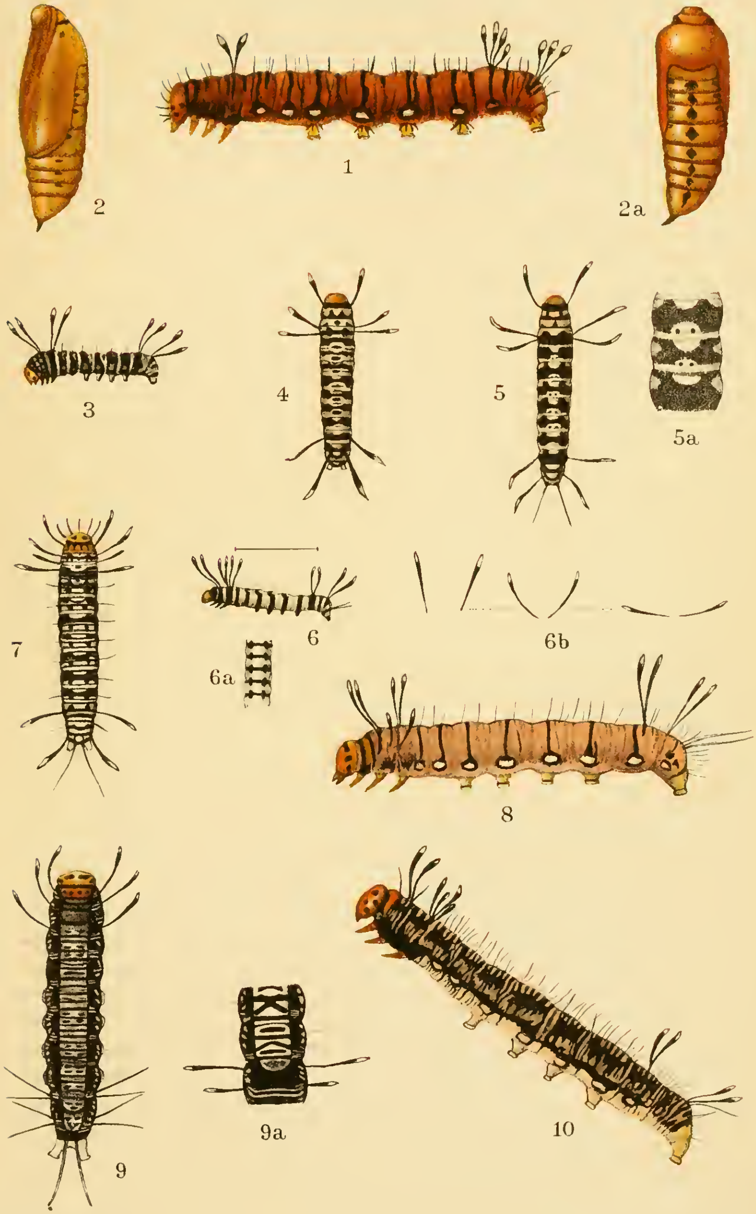
6*b*. Long white-pointed hairs.

7. Usual type after third moult.

8. Lilac-tinted variety.

9 & 9*a*. Back view, with sections enlarged, showing pattern on segments.

10. A mature larva.



L. Guppy jr. del. West, Newman chromo.

LIFE-HISTORY OF CYDIMON LEILUS.

Explanation of Plate XXVIII.

From Photograph by A. E. Tonge.

Winter cocoons of *Marasmarcha.*

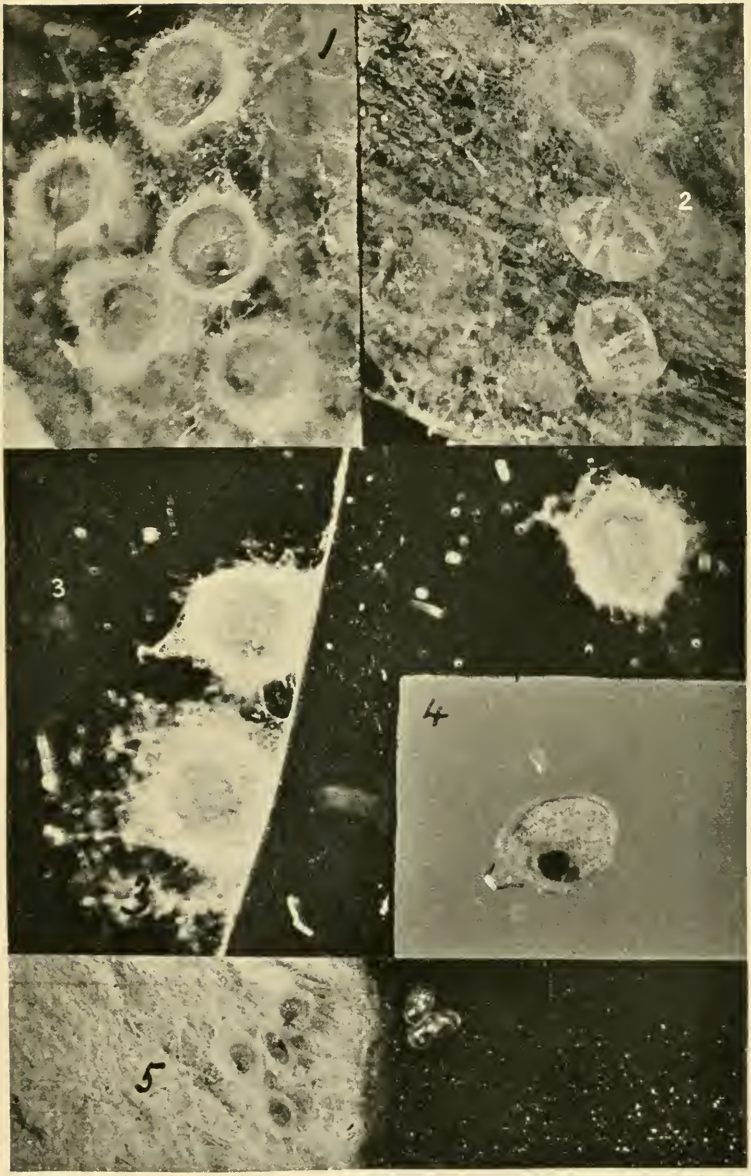
1. Cocoons, showing contained larvæ of *Marasmarcha lunædactylus*, × 26 diameters. The cocoons are between a dead leaf (background) and a thin glass (in front); the contained larvæ are consequently very easily seen, the silk against the glass being very thin.

2. Same as No. 1, except that two empty egg-shells appear in the field, permitting a comparison of the size of the egg and of the hibernating larva (× 26).

3. Three cocoons on glass (background), × 26. The silk on the free surface is dense enough to hide the larva; these give some measure of the amount of silk spun.

4. A cocoon found in sand, all the grains of sand (except one) removed, mounted in Farrant's medium, × 26. The medium renders much of the silk transparent, and invisible in the photograph.

5. Cocoons of *Marasmarcha tuttidactyla*, between glass (in front) and paper (background), with three empty egg-shells on black background. N.B.—This is only magnified × 10 diameters.



A. E. Tonge, Photo. *Andre & Sleigh, Ltd.*

HIBERNATING LARVÆ OF MARASMARCHA.

FIGS. 1—4, M. LUNÆDACTYLA × 26. FIG. 5, M. TUTTIDACTYLA × 10.

Explanation of Plate XXIX.

Fig. 1. *Euplœa goudoti*, Boisd.
2. *Antanartia mauritiana*, Manders.
3. *Salamis augustina*, Boisd.
4. *Libythea cinyras*, Trimen.
5. *Nacaduba mandersi*, Druce, ♂.
5a. ,, ,, ,, ♀.
6. *Papilio phorbanta*, L., ♂, $\frac{3}{4}$.
6a. ,, ,, ♀, ,,

Horace Knight del. *Andre & Sleigh. Ltd.*

Butterflies of Mauritius and Bourbon.

vol. 45. 1907.