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TRANSACTIONS
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ENTOMOLOGICAL SOCIETY
OF
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THE
TRANSACTIONS
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PROCEEDINGS.

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List of Fellows

OF THE

ENTOMOLOGICAL SOCIETY OF LONDON.

HONORARY FELLOWS.

Date of
Election.

- 1900 AURIVILLIUS, Professor Christopher, *Stockholm.*
 1915 BERLESE, Professor Antonio, *via Romana, 19, Firenze, Italy.*
 1905 BOLIVAR, Ignacio, *Museo nacional de Historia natural, Hipodromo, 17, Madrid.*
 1911 COMSTOCK, Prof. J. H., *Cornell University, Ithaca, New York, U.S.A.*
 1894 FOREL, Professor Auguste, M.D., *Yverne, Canton de Vaud, Switzerland.*
 1898 GRASSI, Professor Battista, *The University, Rome.*
 1915 HOWARD, Dr. L. O., *National Museum, Washington, U.S.A.*
 1914 LAMEERE, Professor A., *74, rue Defaszi, Bruxelles.*
 1918 MARCHAL, Dr. Paul, President of the Entomological Society of France, *89, rue du Cherche-Midi, Paris.*
 1908 OBERTHÜR, Charles, *Rennes, Ille-et-Vilaine, France.*
 1913 TIAN-SHANSKI, A. P. Semenov, *Vassili Ostror, 8 lin., 39, Petrograd, Russia.*
 1911 WASMANN, Fr. Erich, S.J., *Valkenburg (L.) Ignatius Kolleg, Holland.*

SPECIAL LIFE FELLOWS.

Date of
Election.

- 1916 (1894) MIALL, Louis Compton, F.R.S., (COUNCIL, 1903, 1908), *Norton Way N., Letchworth.*
 1916 (1888) YERBURY, Colonel John W., late R.A., F.Z.S., (COUNCIL, 1896, 1903-5), *2, Ryder-street, St. James's, S.W.*

FELLOWS.

(The names of those who have not yet paid either the Entrance Fee or the first year's subscription are not included.)

Marked * have died during the year.

Marked † have compounded for their Annual Subscriptions.

Date of
Election

- 1914 † ADAIR, E. W., B.A., *Turf Club, Cairo, Egypt.*
 1913 ADAMS, B. G., *15, Fernshaw-road, Chelsea, S.W.*

- 1877 ADAMS, Frederick Charlstrom, F.Z.S., 50, *Ashley-gardens, Victoria-street, S.W. 1.*
- 1902 ADKIN, Benaiah Whitley, *Trenoweth, Hope-park, Bromley, Kent.*
- 1885 ADKIN, Robert, (COUNCIL, 1901-2, 1911-13), *Hodestea, Meads, Eastbourne.*
- 1904 * AGAR, E. A., *La Haut, Dominica, B.W. Indies.*
- 1912 ALLEN, J. W., M.A., 266, *Wilkesden-lane, London, N.W. 2.*
- 1911 ANDERSON, T. J., *Entomological Laboratory, Kabeti, Brit. E. Africa.*
- 1910 † ANDREWES, H. E., 8, *North Grove, Highgate, N.*
- 1899 ANDREWS, Henry W., *Shirley, Welling S.O., Kent.*
- 1901 ANNING, William, 39, *Lime Street, E.C. 3.*
- 1908 † ANTRAM, Charles B., *Somerdale Estate, Oolacamund, Nilgiri Hills, S. India.*
- 1913 ARMYTAGE, Edward O., *Penrose, Millook, Poundstock, Bude.*
- 1907 ARNOLD, G., M.Sc., A.R.C.S., Curator, *Rhodesia Museum, Bulawayo, S. Africa.*
- 1899 † ARROW, Gilbert J., (COUNCIL, 1905-7), 9, *Rossdale-road, Putney, S.W. 15* ; and *British Museum (Natural History), Cromwell-road, S.W. 7.*
- 1911 ASHBY, Edward Bernard, 36, *Bulstrode-road, Hounslow, Middlesex.*
- 1907 † ASHBY, Sidney R., 39, *Park-lane, Wembley, Middlesex.*
- 1886 ATMORE, E. A., 48, *High-street, King's Lynn.*
- 1913 AVINOFF, André, *Liteyny, 12, Petrograd, Russia.*
- 1914 AWATI, P. R., Medical Entomologist, c/o Grindlay & Co., Bankers, 26, *Westmorland-street, Calcutta.*
- 1901 BACOT, Arthur W., (COUNCIL, 1916-), *York Cottage, York-hill, Loughton, Essex.*
- 1904 † BAGNALL, Richard S., *Penshaw Lodge, Penshaw, Durham.*
- 1909 BAGWELL-PUREFOY, Capt. Edward, *East Farleigh, Maidstone.*
- 1916 BALFOUR, Miss Alice, 4, *Carlton-gardens, S.W., and Whittingehame, Prestonkirk, Scotland.*
- 1912 BALLARD, Edward, Govt. Entomologist, *Agricultural College and Research Institute, Coimbatore, Madras, S. India.*
- 1886 BANKES, Eustace R., M.A.
- 1890 BARCLAY, Francis H., F.G.S., *The Warren, Cromer.*
- 1886 BARGAGLI, Marchese Piero, *Piazza S. Maria, Palazzo Tempi No. 1, Florence, Italy.*
- 1895 BARKER, Cecil W., 81, *Bellerue-road, Durban, Natal, South Africa.*
- 1902 BARRAUD, Philip J., *Chester Cottage, Benhill-road, Sutton, Surrey.*
- 1907 BARTLETT, H. Frederick D., 1, *Myrtle-road, Bournemouth.*
- 1894 † BATESON, Prof. William, M.A., F.R.S., Fellow of St. John's College, Cambridge, *The Manor House, Merton, Surrey.*
- 1908 BAYFORD, E. G., 2, *Rockingham-street, Barnsley.*
- 1904 BAYNE, Arthur F., c/o Messrs. Freeman, *Castle-street, Framlingham, Suffolk.*

- 1912 BAYNES, Edward Stuart Augustus, 120, *Warwick-street, Eccleston-square, S.W. 1.*
- 1896 † BEARE, Prof. T. Hudson, B.Sc., F.R.S.E., (V.-PRES., 1910; COUNCIL, 1909-11), 10, *Regent Terrace, Edinburgh.*
- 1908 BECK, Richard, *Heckitt, The Park, Yeovil.*
- 1905 BEDFORD, The Duke of, K.G., Pres. Z.S., etc., *Woburn Abbey, Beds.*
- 1912 BEDFORD, Gerald, Entomologist to the Union of South Africa, Veterinary Bacteriological Laboratory, *Oudestepoort, Pretoria, Transvaal.*
- 1913 BEDFORD, Capt. Hugh Warren, *Church Felles, Horley.*
- 1899 BEDWELL, Ernest C., (COUNCIL, 1917-), *Bruggen, Brighton-road, Coulsdon, Surrey.*
- 1914 BENDERITTER, Eugène, 11, *Rue St. Jacques, Le Mans, France.*
- 1904 BENGSSON, Simon, Ph.D., Lecturer, *University of Lund, Sweden*; Curator, Entomological Collection of the University.
- 1915 BENHAM, Prof. William Blaxland, M.A., D.Sc., F.R.S., *University of Otago, Dunedin, New Zealand.*
- 1906 BENTALL, E. E., *The Towers, Heybridge, Essex.*
- 1913 BEST-GARDNER, Charles C., *Rookwood, Neath, Glamorgan.*
- 1885 BETHUNE-BAKER, George T., F.L.S., F.Z.S., (PRES., 1913-14; V.-PRES., 1910-11, 1915; COUNCIL, 1895, 1910-15), 19, *Clarendon-road, Edgbaston, Birmingham.*
- 1918 BEVERIDGE, Col. W. W. O., C.B., D.S.O., R.A.M.C., c/o J. H. Durrant, Esq., *Natural History Museum, Cromwell-road, S. Kensington, S.W. 7.*
- 1891 BLABER, W. H., F.L.S., 34, *Cromwell-road, Hove, Brighton.*
- 1904 BLACK, James E., F.L.S., *Nethercroft, Peebles.*
- 1904 BLAIR, Kenneth G., (COUNCIL, 1918-), *Claremont, 120, Sunning-fields-road, Hardon, N.W. 4.*
- 1885 BLATHWAYT, Lt.-Col. Linley, F.L.S., *Eagle House, Batheaston, Bath.*
- 1904 BLISS, Maurice Frederick, M.R.C.S., L.R.C.P., 26 *Woodville-gardens, Ealing, W. 5.*
- 1916 BOCOCK, Charles Hanslope. *The Elms, Ashley, Newmarket.*
- 1912 BODKIN, G. C., Govt. Entomologist, *Georgetown, British Guiana.*
- 1903 BOGUE, W. A., *The Bank House, Watchet.*
- 1911 BOILEAU, H., 99, *Rue de la Côte St. Thibault, Bois de Colombes, Seine, France.*
- 1891 BOOTH, George A., F.Z.S., M.B.O.U., *The Hermitage, Kirkham, Lancs.*
- 1902 BOSTOCK, E. D., *Oulton Cross, Stone, Staffs.*
- 1913 BOWATER, Captain William, 20, *Russell-road, Moseley, Birmingham.*
- 1888 BOWER, Benjamin A., *Langley, Willow Grove, Chislehurst.*
- 1894 † BOWLES, E. Augustus, M.A., *Myddelton House, Waltham Cross.*
- 1912 † BOWRING, C. Talbot, *Hoihow, Hainan, S. China.*
- 1916 BOX, Leonard Charles, F.R.H.S., *Dominion Experimental Station, Fredericton, New Brunswick.*

- 1910 BOYD, A. Whitworth, *The Alton, Altrincham, Cheshire.*
- 1905 BRACKEN, Charles W., B.A., 5, *Caepra Terrace, Lipson, Plymouth.*
- 1917 BREIJER, Dr. H. G., Ph.D., Director of the Transvaal Museum, *Pretoria, Transvaal, S. Africa.*
- 1904 BRIDGEMAN, Commander The Hon. Richard O. B., R.N., 44, *Lowndes-square, S. W. 1*; and c/o Commander-in-Chief, *Cape of Good Hope Station, c/o G.P.O.*
- 1870 BRIGGS, Thomas Henry, M.A., *Rock House, Lynnmouth S.O., N. Devon.*
- 1894 BRIGHT, Percy M., *Cheriton, 26, Portchester-road, Bournemouth.*
- 1909 BRITTEN, Harry, 22, *Birch-grove, Levenshulme, Manchester.*
- 1902 BROUGHTON, Major T. Delves, R.E., *Mhow, India.*
- 1878 BROUN, Major Thomas, Chev. Legion of Honour, *Mount Albert, Auckland, New Zealand.*
- 1904 BROWN, Henry H., *Tower House, 8, Bruntsfield-terrace, Edinburgh.*
- 1910 BROWNE, Horace B., M.A., *Kenilworth, Scratcherd-lane, Morley, Yorks.*
- 1911 BRUTZER, Rev. Henry W., *Upton Vicarage, Peterborough.*
- 1909 BRYANT, Gilbert E., *Fir Grove, Esher, Surrey.*
- 1898 † BUCHAN-HEPBURN, Sir Archibald, Bart., J.P., D.L., *Smeaton-Hepburn, Prestoukirk.*
- 1917 BUCKLEY, Dr. George Granville, M.D., F.S.A., *Rye Croft South, Manchester-road, Bury, Lancs.*
- 1916 BUGNION, Prof. E., *La Luciole, Aix-en-Provence, France.*
- 1907 BULLEID, Arthur, F.S.A., *Wimboro, Midsomer Norton, Somersetshire.*
- 1896 † BURR, Malcolm, D.Sc., F.L.S., F.Z.S., F.G.S., A.R.S.M., (V.-PRES., 1912; COUNCIL, 1903, 4, 1910-12), *United University Club, Pall Mall East, S.W. 1.*
- 1909 BURROWS, The Rev. C. R. N., *The Vicarage, Mucking, Stanford-le-Hope, Essex.*
- 1868 † BUTLER, Arthur G., Ph.D., F.L.S., F.Z.S., (SEC., 1875; COUNCIL, 1876), *The Lilies, Beckenham-road, Beckenham.*
- 1883 BUTLER, Edward Albert, B.A., B.Sc., (COUNCIL, 1914-16), 14, *Drylands-road, Hornsey, N. 8.*
- 1902 BUTLER, William E., *Hayling House, Oxford-road, Reading.*
- 1905 BUTTERFIELD, Jas. A., B.Sc., *Ormesby, 21, Dorville-road, Lee, S.E.*
- 1914 † BUTTERFIELD, Rosse, Curator, *Corporation Museum, Keighley, Yorks.*
- 1912 † BUXTON, Patrick Alfred, M.B.O.U., *Fairhill, Tonbridge*; and 40, *Cudogun Place, London, S.W.*
- 1904 BYATT, Sir Horace A., K.C.M.G., B.A., *Dar-es-Salaam, E. Africa.*
- 1917 CAMERON, Dr. Alfred E., M.A., D.Sc., *The Entomological Branch, Department of Agriculture, Ottawa, Canada.*
- 1902 CAMERON, Malcolm, M.B., R.N., 7, *Blessington-road, Lee, S.E.*
- 1885 CAMPBELL, Francis Maule, F.L.S., F.Z.S., etc., *Brynllydwy, Machynlleth, Montgomeryshire.*
- 1898 CANDÈZE, Léon, *Mont St. Martin 75, Liège.*
- 1880 CANSDALE, W. D., *Sunny Bank, South Norwood, S.E. 25.*

- 1889 CANT, A., 33, *Festing-road, Putney, S.W.*; and c/o Fredk. Du Cane Godman, Esq., F.R.S., 45, *Pont-street, S.W. 1.*
- 1910 CARLIER, E. Wace, M.D., F.R.S.E., *Morningside, Granville-road, Dorridge, and The University, Birmingham.*
- 1892 CARPENTER, The Honble. Mrs. Beatrice, 22, *Grosvenor-road, S.W. 1.*
- 1910 CARPENTER, Geoffrey D. H., D.M., B.Ch., *Uganda Medical Service, Uganda Protectorate.*
- 1895 CARPENTER, Prof. George H., B.A., B.Sc., *Royal College of Science, Dublin.*
- 1898 CARPENTER, J. H., *Redcot, Belmont-road, Leatherhead.*
- 1915 CARR, Professor John Wesley, M.A., F.L.S., F.G.S., Professor of Biology, *University College, Nottingham.*
- 1915 CARR, William, B.Sc., *Station-road, Bentham, Lancaster.*
- 1911 CARSON, George Moffatt, Entomologist to the Government of New Guinea, *Port Moresby, Papua, via Australia.*
- 1895 CARTER, Sir Gilbert, K.C.M.G., *Greycliffe, Lower Warberry-road, Torquay.*
- 1912 CARTER, Henry Francis, Assistant Lecturer and Demonstrator in Medical and Economic Entomology, *Liverpool School of Tropical Medicine, University of Liverpool.*
- 1906 CARTER, H. J., B.A., *Garracillah, Kindore-street, Wahroonga, Sydney, N.S.W.*
- 1900 CARTER, J. W., 15, *Westfield-road, Heaton, Bradford.*
- 1889 † CAVE, Charles J. P., *Ditcham Park, Petersfield.*
- 1900 CHAMBERLAIN, Neville, *Westbourne, Edgbaston, Birmingham.*
- 1871 CHAMPION, George C., F.Z.S., A.L.S., LIBRARIAN, 1891- (COUNCIL, 1875-7); *Heatherside, Horsell, Woking*; and 45, *Pont-street, S.W. 1.*
- 1914 CHAMPION, Harry George, B.A., Assistant Conservator of Forests, *W. Almora, U.P., India.*
- 1891 CHAPMAN, Thomas Algernon, M.D., F.R.S., F.Z.S., (V.-PRES., 1900, 1904-5, 1908, 1916-17; COUNCIL, 1898-1900, 1903-5, 1907-9, 1916-), *Betula, Reigate.*
- 1897 CHAWNER, Miss Ethel F., *Forest Bank, Lyndhurst S.O., Hants.*
- 1913 CHEAVIN, Harold S., F.R.M.S., F.N.P.S., 70, *Somerset-road, Huddersfield.*
- 1902 CHEESMAN, E. M.
- 1889 CHRISTY, William M., M.A., F.L.S., *Watergate, Emsworth.*
- 1914 CRYSTAL, R. Neil, B.Sc., 277, *First-avenue, Ottawa, Canada.*
- 1909 CLARK, Major C. Turner, F.Z.S., *Hillcrest, St. Augustine's-avenue, S. Croydon.*
- 1908 CLARK, Edgar L., 34, *Smith-street, Durban, Natal.*
- 1914 CLEARE, L. D., Dept. of Science and Agriculture, *Georgetown, British Guiana.*
- 1914 CLEGHORN, Miss Mandie Lina West, F.L.S., 14, *Alipore-road, Calcutta, India.*
- 1908 CLUTTERBUCK, Charles G., *Heathside, 23, Heathville-road, Gloucester.*

- 1908 CLUTTERBUCK, P. H., *Indian Forest Department, Naini Tal, United Provinces, India.*
- 1904 COCKAYNE, Edward A., M.A., M.D., (COUNCIL, 1915-), 16, *Cambridge-square, London, W. 2.*
- 1917 COCKERELL, Prof. T. D. A., *University of Colorado, Colorado, U.S.A.*
- 1917 COCKS, Frederick, 26, *Crown-street, Reading.*
- 1914 COLEMAN, Leslie C., Dept. of Agriculture, *Bangalore, Mysore, India.*
- 1899 COLLIN, James E., F.Z.S., (V.-PRES., 1913; COUNCIL, 1904-6, 1913-15), *Sussex Lodge, Newmarket.*
- 1906 COLLINGE, Walter E., D.Sc. (St. And.), M.Sc. (Birm.), F.L.S., Research Fellow of the University of St. Andrews, *The Gatty Marine Laboratory, St. Andrews, Scotland.*
- 1918 COMSTOCK, Dr. John Adams, c/o the South-Western Museum, *Marmion-way and Avenue, Los Angeles, California, U.S.A.*
- 1913 CONEY, Miss Blanche A., *The Poplars, Pucklechurch, Gloucestershire.*
- 1916 CORNFORD, The Rev. Bruce, 13, *Havelock-road, Portsmouth.*
- 1911 COTTON, Sidney Howard, 1A, *Chesterfield-street, Mayfair, W. 1.*
- 1913 COWARD, Thomas Alfred, F.Z.S., 36, *George-street, Manchester.*
- 1895 CRABTREE, Benjamin Hill, *Holly Bank, Alderley Edge, Cheshire.*
- 1913 CRAGG, Capt. F. W., M.D., I.M.S., c/o Messrs. Cox & Co., *Hornby-road, Madras, India.*
- 1909 CRAWLEY, W. C., B.A., (COUNCIL, 1917-), 29, *Holland Park-road, W. 4.*
- 1890 CREWE, Sir Vauncey Harpur, Bart., *Calke Abbey, Derbyshire.*
- 1880 † CRISP, Sir Frank, LL.B., B.A., J.P.
- 1907 CROFT, Edward Octavius, M.D., 12, *North Hill-road, Headingley, Leeds.*
- 1908 CULPIN, Millais, M.B., F.R.C.S., *Military Hospital, Ewell, Surrey.*
- 1908 CURTIS, W. Parkinson, *Drake North, Sandringham-road, Parkstone, Dorset.*
- 1901 DADD, Edward Martin.
- 1900 DALGLISH, Andrew Adie, 7, *Keir-street, Pollokshields, Glasgow.*
- 1886 DANNATT, Walter, *St. Lawrence, Guibal-road, Lee, S.E.*
- 1911 DAVEY, H. W., Inspector of Department of Agriculture, *Melbourne, Victoria, Australia.*
- 1913 DAVIDSON, James, M.Sc., *Highfield, Neston, Cheshire.*
- 1905 DAVIDSON, James D., 32, *Drumshengh Gardens, Edinburgh.*
- 1912 DAVIS, Frederick Lionel, J.P., M.R.C.S., L.R.C.P., *Belize, British Honduras.*
- 1910 DAWSON, William George, 44, *London-road, Bromley, Kent.*
- 1903 DAY, F. H., 26, *Gurrock-terrace, Carlisle.*
- 1898 DAY, G. O., *Sahlatston, Duncan's Station, Vancouver Island, British Columbia.*
- 1913 DICKINSON, Barnard Ormiston, B.A., *Beech Hill, Newport, Salop.*
- 1917 DICKSEE, Arthur, 24, *Lyford-road, Wandsworth Common, S.W. 18.*

- 1875 DISTANT, William Ineas, (V.-PRES., 1881, 1900 ; SEC., 1878-80 ; COUNCIL, 1900-2), *Glenside*, 170, *Birchanger-road*, *South Norwood*, S.E. 25.
- 1887 DIXEY, Frederick Augustus, M.A., M.D., F.R.S., Fellow and Bursar of Wadham College, (PRES., 1909-10 ; V.-PRES., 1904-5, 1911 ; COUNCIL, 1895, 1904-6), *Wadham College*, *Oxford*.
- 1909 † DOBSON, Thomas, 399, *Plodder-lane*, *Farnworth*, nr. *Bolton*.
- 1905 DODD, Frederick P., *Kuranda*, via *Cairns*, *Queensland*.
- 1912 DOIG, Capt. Kenneth Alan Crawford, R.A.M.C., M.R.C.S., L.R.C.P., c/o Messrs. Holt & Co., 3, *Whitehall-place*, *London*, S.W. 1.
- 1906 DOLLMAN, Hereward, *Hove House*, *Newton-grove*, *Bedford-park*, W. 4.
- 1903 DOLLMAN, J. C., *Hove House*, *Newton-grove*, *Bedford-park*, W. 4.
- 1906 DONCASTER, Leonard, M.A., *The University Museum of Zoology*, *Cambridge*.
- 1891 DONISTHORPE, Horace St. John K., F.Z.S., (V.-PRES., 1911 ; COUNCIL, 1899-1901, 1910-12), *Durandesthorpe*, 19, *Hazlewel-road*, *Putney*, S.W. 15.
- 1913 DOW, Walter James, 5, *Great College-street*, *Westminster*, S.W. 1.
- 1910 DOWNES-SHAW, Rev. Archibald, *Scotton Rectory*, *Gainsborough*.
- 1884 DRUCE, Hamilton H. C. J., F.Z.S., (COUNCIL, 1903-5), *Trefusis Lodge*, 3, *Norfolk-road*, N.W. 8.
- 1900 DRURY, W. D., *Clarendon*, *Laton-road*, *Haslings*.
- 1894 DUDGEON, G. C., Director General of the Dept. of Agriculture, *Mead*, *Cairo*.
- 1913 DUFFIELD, Charles Alban William, *Stouting Rectory*, *Hythe*, and *Wye College*, *Kent*.
- 1906 DUKINFIELD JONES, E., *Castro*, *Reigate*.
- 1883 DURRANT, John Hartley, (V.-PRES., 1912-13 ; COUNCIL, 1911-13), *Merton*, 17, *Burstock-road*, *Putney*, S.W. 15 ; and *British Museum (Natural History)*, *Cromwell-road*, *South Kensington*, S.W. 7.
- 1910 EALES-WHITE, Capt. J. Cushny, 49, *Chester-terrace*, *Eaton-square*, S.W. 1.
- 1912 EARL, Herbert L., M.A., 12, *Aroundale-road North*, *Southport*, *Lancs.*
- 1865 EATON, The Rev. Alfred Edwin, M.A., (COUNCIL, 1877-9), *Richmond Villa*, *Northam S.O.*, *N. Decon*.
- 1902 EDELSTEN, Hubert M., *The Elms*, *Forty Hill*, *Enfield*, *Middlesex*.
- 1911 EDWARDS, F. W., 56, *Norton-road*, *Letchworth*.
- 1886 EDWARDS, James, *Colesborne*, *Cheltenham*.
- 1884 EDWARDS, Stanley, F.L.S., F.Z.S., (COUNCIL, 1912-14), 15, *St. Germans-place*, *Blackheath*, S.E. 3.
- 1913 EDWARDS, William H., *Natural History Dept.*, *The Museum*, *Birmingham*.
- 1916 EFFALATOUN, Hassan, 34, *Douglas Mansions*, 120, *Cromwell-road*, S.W. 7.
- 1900 ELLIOTT, E. A., 16, *Belsize Grove*, *Hampstead*, N.W.

- 1900 ELLIS, H. Willoughby, F.Z.S. (COUNCIL, 1916-), 3, *Lancaster-place, Belsize Park, N.W. 3.*
- 1903 ELTRINGHAM, Harry, M.A., D.Sc., F.Z.S., VICE-PRESIDENT, (V.-PRES., 1914; COUNCIL, 1913-15), *Woodhouse, Stroud, Gloucestershire*; and *Hope Department, University Museum, Oxford.*
- 1878 ELWES, Henry John, J.P., F.R.S., F.L.S., F.Z.S., (PRES., 1893-4; V.-PRES., 1889-90, 1892, 1895; COUNCIL, 1888-90), *Colesborne, Cheltenham.*
- 1914 * EMMETT, Capt. Charles P., 1, *High Cliff Villa, Felixstowe.*
- 1903 ETHERIDGE, Robert, *Curator, Australian Museum, Sydney, N.S.W.*
- 1908 EUSTACE, Eustace Mallabone, M.A., *Wellington College, Berks.*
- 1909 EVANS, F. J., *Calabar, Eastern Province, S. Nigeria.*
- 1917 * FARQUHARSON, Charles Ogilvie, M.A., B.Sc., *Moor Plantation, Ibadan, Nigeria.*
- 1907 FEATHER, Walter, *Kibwezi, British East Africa.*
- 1900 FELTHAM, H. L. L., *Mercantile Buildings, Summonds-street, Johannesburg, Transvaal.*
- 1861 FENN, Charles, *Eversden House, Burnt Ash Hill, Lee, S.E. 12.*
- 1910 FENYES, A., M.D., 170, *North Grange Grove-Avenue, Pasadena, California, U.S.A.*
- 1918 FERGUSON, Anderson, 22, *Pohrorth-gardens, Glasgow, W.*
- 1889 FERNALD, Prof. C. H., c/o H. T. Fernald, Esq., *Amherst, Mass., U.S.A.*
- 1900 FIRTH, J. Digby, F.L.S., *Boys' Modern School, Leeds.*
- 1900 FLEMYNG, The Rev. Canon W. Westropp, M.A., *Coolfin, Portlaw, co. Waterford.*
- 1898 FLETCHER, T. Bainbrigge, R.N., *Agricultural Research Institute, Pusa, Bihar, India.*
- 1883 † FLETCHER, William Holland B., M.A., *Aldwick Manor, Bognor.*
- 1905 FLOERSHEIM, Cecil, 16, *Kensington Court Mansions, S.W.*
- 1885 FOKKER, A. J. F., *Zierikzee, Zeeland, Netherlands.*
- 1914 FORDHAM, William John, M.R.C.S., L.R.C.P., *The Villa, Bubwith, Selby, Yorks.*
- 1913 FOSTER, Arthur H., M.R.C.S., L.R.C.P.(Eng.), M.B.O.U., *Sussex House, Hitchin, Herts.*
- 1900 FOULKES, P. Hedworth, B.Sc., *Harper-Adams Agricultural College, Newport, Salop.*
- 1898 FOUNTAINE, Miss Margaret, 1727, *Wilcox-avenue, Los Angeles, California, U.S.A.*
- 1880 FOWLER, The Rev. Canon, D.Sc., M.A., F.L.S., (PRES., 1901-2; V.-PRES., 1903; SEC., 1886-96), *Earley Vicarage, near Reading.*
- 1908 FRASER, Frederick C., Capt., M.D., I.M.S., *Government Maternity Hospital, Madras, India.*
- 1896 FREKE, Percy Evans, *Southpoint, Limes-road, Folkestone.*
- 1888 FREMLIN, H. Stüart, M.R.C.S., L.R.C.P., *Markwith, Nether-street, North Finchley.*
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- 1908 FROGGATT, Walter W., F.L.S., Government Entomologist, *Agricultural Museum, George-street North, Sydney, New South Wales.*
- 1891 FROHAWK, F. W., *Uplands, Thundersby, Essex.*
- 1906 † FRY, Harold Armstrong, *P.O. Box 46, Johannesburg, Transvaal Colony.*
- 1900 FRYER, H. Fortescue, *The Priory, Chatteris, Cambs.*
- 1907 FRYER, John Claud Fortescue, M.A., (COUNCIL, 1916-), *Board of Agriculture and Fisheries, Northumberland-avenue, W.C. 2.*
- 1876 FULLER, The Rev. Alfred, M.A., *The Lodge, 7, Sydenham-hill, Sydenham, S.E. 26.*
- 1898 FULLER, Claude, Government Entomologist, *Pietermaritzburg, Natal.*
- 1887 GAHAN, Charles Joseph, M.A., D.Sc., PRESIDENT, (V.-PRES., 1916 ; SEC., 1899-1900 ; COUNCIL, 1893 5, 1901, 1914-), 8, *Lonsdale-road, Bedford Park, W. 4 ;* and *British Museum (Natural History), Cromwell-road, S.W. 7.*
- 1890 GARDNER, John, *Laurel Lodge, Hart, West Hartlepool.*
- 1901 † GARDNER, Willoughby, F.L.S., F.S.A., *Deganwy, N. Wales.*
- 1913 DE GAYE, J. A., 1, *Castletown Mansions, 3, Castletown-road, W. Kensington, W. 14 ;* and *King's College, Lagos, S. Nigeria.*
- 1899 GELDART, William Martin, M.A., 10, *Chadlington-road, Oxford.*
- 1913 GIBB, Lachlan, 38, *Blackheath Park, Blackheath, S.E. 3.*
- 1915 GIBSON, Arthur, *Entomological Branch, Dept. of Agriculture, Ottawa, Canada.*
- 1908 GIFFARD, Walter M., *P.O. Box 308, Honolulu, Hawaii.*
- 1907 GILES, Henry Murray, Head Keeper of Zoological Gardens, *South Perth, W. Australia.*
- 1904 GILLIAT, Francis, B.A., *Windham Club, St. James's-square, Piccadilly, S.W. 1.*
- 1914 GODFREY, E. J., Education Dept., *Bangkok, Siam.*
- 1865 † GODMAN, Frederick Du Cane, D.C.L., F.R.S., F.L.S., F.Z.S., (PRES., 1891-2 ; V.-PRES., 1882 3, 1886, 1889 90, 1902 ; COUNCIL, 1880-1, 1900), *South Lodge, Lower Beeding, Horsham ;* and 45, *Pont-street, S.W.*
- 1904 GOODWIN, Edward, *Canon Court, Watlington, Kent.*
- 1898 GORDON, J. G. McH., *Corsemalzie, Waulphill S.O., Wigtownshire.*
- 1898 GORDON, R. S. G. McH., *Drumblair, Inverness.*
- 1855 GORHAM, The Rev. Henry Stephen, F.Z.S., (COUNCIL, 1882-3), *Highcroft, Great Malvern.*
- 1913 GOUGH, Lewis, Ph.D., Entomologist to the Govt. of Egypt, *Dept. of Agriculture, Cairo.*
- 1909 GOWDEY, Carlton C., B.Sc., *Biological Laboratory, P.O. Box. 5, Kampala, Uganda, E. Africa.*
- 1918 GRACE, George, B.Sc., A.R.C.Sc., *Inglcnook, Utley, Keighley, Yorks.*
- 1914 GRAVELEY, F. H., *The Indian Museum, Calcutta.*
- 1911 GRAVES, Capt. P. P., *Turf Club, Cairo, Egypt.*

- 1891 † GREEN, E. Ernest, F.Z.S., (V.-PRES., 1915 ; COUNCIL, 1914-16),
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- 1910 GREEN, Herbert A., *The Central Fire Station, Durban, Natal.*
- 1894 GREEN, J. F., F.Z.S., 49, *Victoria-road, Kensington, W. 8.*
- 1893 † GREENWOOD, Henry Powys, F.L.S., *Whitsbury House, Salisbury.*
- 1888 GRIFFITHS, G. C., F.Z.S., *Penhurst, 3, Leigh-road, Clifton, Bristol.*
- 1894 GRIMSHAW, Percy H., *Royal Scottish Museum, Edinburgh.*
- 1905 CRIST, Charles J., *The Croft, Carol Green, Berkswell, Coventry.*
- 1906 GURNEY, Gerard H., *Keswick Hall, Norwich.*
- 1910 GURNEY, William B., Asst. Govt. Entomologist, *Department of Agriculture, Sydney, Australia.*
- 1912 HACKER, Henry, *Butterfield-street, Bowen Bridge-road, Brisbane, Queensland.*
- 1906 HALL, Arthur, 7, *Park-lane-mansions, Croydon.*
- 1890 † HALL, Albert Ernest, c/o *City Librarian, Surrey-street, Sheffield.*
- 1885 HALL, Thomas William, *Ardestie, Station-road, Chorley Wood, Herts.*
- 1912 HALLETT, Howard Mountjoy, 64, *Westbourne-road, Penarth, Glamorganshire.*
- 1898 HAMLYN-HARRIS, R., D.Sc., F.L.S., F.Z.S., F.R.M.S., Director of the
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- 1915 HAMM, Albert Harry, 22, *Southfield-road, Oxford.*
- 1891 HANBURY, Frederick J., F.L.S., *Brockhurst, E. Grinstead.*
- 1905 † HANCOCK, Joseph L., 5454, *University-avenue, Chicago, U.S.A.*
- 1916 HANNYNGTON, Frank, c/o Messrs. Parry & Co., *Madras, India.*
- 1917 HARDING, William G., F.L.S., F.R.C.I., *Christ Church, Oxford.*
- 1903 HARE, E. J., 4, *New-square, Lincoln's Inn, W.C. 2.*
- 1904 HARRIS, Edward, 58, *Wilson-street, Finsbury, E.C.*
- 1910 HARWOOD, Philip Bernard, 2, *Fern Villas, Melford-road, Sudbury.*
- 1910 HAWKSHAW, J. C.
- 1913 † HAWKSHAW, Oliver, 3, *Hill-street, Mayfair, W. 1.*
- 1910 HEDGES, Alfred van der, *Stoke House, Stoke Manderille, Bucks.*
- 1910 HENDERSON, J., c/o Messrs. Osborne & Chappel, *Ipoih, Perak, Federated Malay States.*
- 1898 HERON, Francis A., B.A., 9, *Park House, Highbury Park, N. 5.*
- 1918 HERROD-HEMPSELL, Joseph, *Orchard House, Stockingstone-road, Luton, Beds.*
- 1903 HERROD-HEMPSELL, William, *W.B.C. Apiary, Old Bedford-road, Luton, Beds.*
- 1908 HEWITT, C. Gordon, D.Sc., Dominion Entomologist, *Dept. of Agriculture, Ottawa, Canada.*
- 1913 HEWITT, John, B.A., Director, *Albany Museum, Grahamstown, S. Africa.*
- 1913 HILL, Gerald F., Entomologist to the Australian Institute of
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- 1876 † HILLMAN, Thomas Stanton, *Eastgate-street, Lewes.*

- 1907 HOAR, Thomas Frank Partridge, *Mereia, Albany-road, Leighton Buzzard.*
- 1917 HOCKIN, John W., *Castle-street, Lauceston.*
- 1914 HODGE, The Rev. Prebendary Edward Grose, *The Vicarage, Pauldington, W. 2.*
- 1912 HODGE, Harold, *St. James' Mansions, 54, Piccadilly, W.*
- 1888 HODSON, The Rev. J. H., B.A., B.D., *Rhyddington, Clifton Drive, Lytham.*
- 1902 HOLE, R. S., c/o Messrs. King and Co., *Bombay.*
- 1910 HOLFORD, H. O., *Elstead Lodge, Godalming, Surrey.*
- 1887 HOLLAND, The Rev. W. J., D.D., Ph.D., *Carnegie Museum, Pittsburgh, Penn., U.S.A.*
- 1898 HOLMAN-HUNT, C. B., Asst. Entomologist, Department of Agriculture, *Kuala Lumpur, Federated Malay States.*
- 1910 HOLMES, Edward Morrell, *Ruthven, Sevenoaks.*
- 1901 HOPSON, Montagu F., L.D.S., R.C.S. Eng., F.L.S., 7, *Harley-street, W. 1.*
- 1897 HORNE, Arthur, *Bonn-na-coile, Murtle, Aberdeenshire.*
- 1903 HOUGHTON, J. T., 1, *Portland-place, Worksop.*
- 1907 † HOWARD, C. W., *Canton Christian College, Canton, China.*
- 1900 HOWES, W. George, 432, *George-street, Dunedin, New Zealand.*
- 1907 HOWLETT, Frank M., M.A., *Wymondham, Norfolk.*
- 1865 † HUDD, A. E., 108, *Pembroke-road, Clifton, Bristol.*
- 1888 HUDSON, George Vernon, *Hill View, Karori, Wellington, New Zealand.*
- 1907 HUGHES, C. N., 178, *Clarence Gate-gardens, Regent's Park, N.W. 1.*
- 1912 HUIE, Miss Lily, *Hollywood, Colinton-road, Edinburgh.*
- 1917 HUNTER, David, M.A., M.B., *The Coppice, Nottingham.*
- 1897 IMAGE, Prof. Selwyn, M.A., (COUNCIL, 1909-11), 78, *Parkhurst-road, Camden-road, N. 7.*
- 1912 † IMMS, A. D., D.Sc., M.A., F.L.S., *Rothamstead Experimental Station, Harpenden, Herts.*
- 1908 IRBY, Col. Leonard Paul, *Erington-place, Ashford, Kent.*
- 1918 ISAACS, P. V., Assistant Entomologist, *Madras Agricultural College and Research Institute, Coimbatore, India.*
- 1907 JACK, Rupert Wellstood, Government Entomologist, Department of Agriculture, *Salisbury, Rhodesia.*
- 1917 JACKSON, Miss Dorothy J., *Swordale, Eranton, Ross-shire.*
- 1907 JACKSON, P. H., 112, *Balham-park-road, S.W. 12.*
- 1911 JACOBS, Major J. J., R.E., *Holmesleigh, Burgess Hill, Sussex.*
- 1910 JACOBS, Lionel L., c/o Algoma Steel Corporation, *Sault Ste. Marie, Ontario, Canada.*
- 1914 JANSE, A. J. T., *1st-street, Gezina, Pretoria, S. Africa.*
- 1869 JANSON, Oliver E., 44, *Great Russell-street, Bloomsbury, W.C. 1. ; and Cestria, Claremont-road, Highgate, N. 6.*
- 1898 JANSON, Oliver J., *Cestria, Claremont-road, Highgate, N. 6.*

- 1912 JARDINE, Nigel K., *Summerhill House, Willesborough, nr. Ashford, Kent.*
- 1912 * JEMMETT, C., *Witherslane House, Wye, Kent.*
- 1886 JENNER, James Herbert Augustus, *East Gate House, Lewes.*
- 1909 JEPSON, Frank P., *Department of Agriculture, Suva, Fiji Islands.*
- 1917 JERMYN, Col. Turenne, *Highcliffe, Weston-super-Mare.*
- 1886 JOHN, Evan, *Llantrisant S.O., Glamorganshire.*
- 1907 JOHNSON, Charles Fielding, *West Bank, Didsbury-road, Heaton Mersey.*
- 1917 JOHNSON, Jesse, 16 and 17, *Marston-road, Stafford.*
- 1889 JOHNSON, The Rev. W. F., M.A., *Acton Rectory, Poyntz Pass, co. Armagh.*
- 1908 JOICEY, James J., *The Hill, Willey, Surrey.*
- 1888 JONES, Albert H., VICE-PRESIDENT, (V.-PRES., 1912; TREAS., 1904-17; COUNCIL, 1898-1900), *Shrublands, Eltham, S.E.*
- 1894 † JORDAN, Dr. K., (V.-PRES., 1909; COUNCIL, 1909-11), *The Museum, Tring.*
- 1910 JOSEPH, E. G., 23, *Clanricarde-gardens, W. 2.*
- 1910 JOY, Ernest Cooper, *Eversley, Dale-road, Purley.*
- 1902 JOY, Norman H., M.R.C.S., L.R.C.P., *Theale, Berks.*
- 1911 KANNAN, Kunhi, M.A., Asst. Entomologist to the Govt. of Mysore, *Bangalore, South India.*
- 1876 † KAY, John Dunning, *Leeds.*
- 1896 † KAYE, William James, (COUNCIL, 1906-8), *Caracas, Ditton Hill, Surbiton.*
- 1907 KELLY, Albert Ernest McClure, Division of Entomology, Department of Agriculture, *Pretoria, S. Africa.*
- 1890 KENRICK, Sir George H., *Whetstone, Somerset-road, Edgbaston, Birmingham.*
- 1904 KERSHAW, G. Bertram, *Ingleside, West Wickham, Kent.*
- 1906 KEYNES, John Neville, M.A., D.Sc., 6, *Harvey-road, Cambridge.*
- 1900 KEYS, James H., 7, *Whimble-street, Plymouth.*
- 1912 KING, Harold H., Govt. Entomologist, *Gordon College, Khartoum, Sudan.*
- 1889 KING, Prof. James J. F.-X., 1, *Athole Gardens-terrace, Kelvinside, Glasgow.*
- 1913 KIRBY, W. Egmont, M.D., *Hilden, 46, Sutton Court-road, Chiswick, W. 4.*
- 1917 KIRKPATRICK, Thos. W., *The Deanery, Ely, and Room 270, War Office, Whitehall, S.W. 1.*
- 1887 † KLEIN, Sydney T., F.L.S., F.R.A.S., *Hatherlow, Raglan-road, Reigate.*
- 1916 LAING, Frederick, *Natural History Museum, Cromwell-road, S.W. 7.*
- 1910 LAKIN, C. Ernest, M.D., F.R.C.S., 2, *Park-crescent, Portland-place, W. 1.*

- 1911 † LAMBORN, W. A., M.R.C.S., L.R.C.P., *Zomba, Nyasaland, E. Africa.*
- 1917 LANGHAM, Sir Charles, Bart., *Tempo Manor, Co. Fermanagh.*
- 1916 LATTA, Prof. Robert, D.Phil., *University of Glasgow.*
- 1912 LATOUR, Cyril Engelhart, *Port of Spain, Trinidad, British West Indies.*
- 1895 LATTER, Oswald H., M.A., *Charterhouse, Godalming.*
- 1899 LEA, Arthur M., Government Entomologist, *Museum, Adelaide, S. Australia.*
- 1914 LEECHMAN, Alleyne, M.A., F.L.S., F.C.S., *Corpus Christi College, Oxford*; and *St. Hubert's, Main-street, Georgetown, British Guiana.*
- 1910 LEIGH, H. S., *The University, Manchester.*
- 1900 LEIGH-PHILLIPS, Rev. W. J., *Burtle Vicarage, Bridgewater.*
- 1903 † LEVETT, The Rev. Thomas Prinsep, *Frenchgate, Richmond, Yorks.*
- 1876 LEWIS, George, F.L.S., (COUNCIL, 1878, 1884), 30, *Shorncliffe-road, Folkestone.*
- 1908 † LEWIS, John Spedan, *Grove Farm, Greenford Green, South Harrow*; and 277, *Oxford-street, W.*
- 1892 LIGHTFOOT, R. M., *South African Museum, Cape Town, Cape of Good Hope.*
- 1914 LISTER, J. J., *St. John's College, Cambridge*; and *Merton House, Grantchester, Cambs.*
- 1903 LITTLER, Frank M., *Box 114, P.O., Launceston, Tasmania.*
- 1865 † LLEWELYN, Sir John Talbot Dillwyn, Bart., M.A., F.L.S., *Penllerygare, Swansea.*
- 1881 † LLOYD, Alfred, F.C.S., *The Dome, Bognor.*
- 1885 † LLOYD, Robert Wylie, (COUNCIL, 1900-1), 1, 5 and 6, *Albany, Piccadilly, W. 1.*
- 1903 LOFTHOUSE, Thomas Ashton, *The Croft, Linthorpe, Middlesbrough.*
- 1908 LONGSDON, D., *The Flower House, Southend, Catford, S.E. 6.*
- 1904 † LONGSTAFF, George Blundell, M.A., M.D., (V.-PRES., 1909, 1915, 1917; COUNCIL, 1907-9, 1915-17), *Highlands, Putney Heath, S.W. 15.*
- 1899 LOUNSBURY, Charles P., B.Sc., Government Entomologist, *Box 513, Pretoria, S. Africa.*
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- 1893 LOWER, Oswald B., *Pinarro, South Australia.*
- 1901 LOWER, Rupert S., *Argent-street, Broken Hill, New South Wales.*
- 1898 LUCAS, William John, B.A., (COUNCIL, 1904-6), 28, *Knights Park, Kingston-on-Thames.*
- 1903 LYELL, G., *Gisborne, Victoria, Australia.*
- 1912 LYLE, George Trevor, *Mayfield, Linsfield-road, Cambridge.*
- 1909 LYON, Francis Hamilton, 89, *Clarence Gate-gardens, Upper Baker-street, N.W. 1.*
- 1887 M^oDOUGALL, James Thomas, *St. Lawrence, Isle of Wight.*
- 1910 MACDOUGALL, R. Stewart, M.A., D.Sc., F.R.S.E., *Edinburgh University.*
- 1900 MACKWOOD, The Hon. F. M., M.L.C., *Colombo, Ceylon.*

- 1899 † MAIN, Hugh, B.Sc., (COUNCIL, 1908-10), *Almondale, Buckingham-road, South Woodford, N.E.*
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- 1895 MARSHALL, Guy Anstruther Knox, D.Sc., F.Z.S., (COUNCIL, 1907-8), 6, *Chester-place, Hyde Park-square, W. 2.*
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- 1865 MATHEW, Gervase F., F.L.S., Paymaster-in-chief, R.N., (COUNCIL 1887), *Lee House, Dovercourt, Harwich.*
- 1887 MATTHEWS, Coryndon, *Stentaway, Plymstock, S. Devon.*
- 1912 MAULIK, Samarendra, 211, *Piccadilly, W.*
- 1900 MAXWELL-LEFROY, H., *Imperial College of Science and Technology, South Kensington, S.W.*
- 1916 MAY, Harry Haden, *Blackfriars House, Plymouth.*
- 1913 MEADEN, Louis, *Melbourne, Dyke-road, Preston, Brighton.*
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- 1907 MELVILLE, Mrs. Catharine Maria, *Redvers, Essa-road, Saltash.*
- 1914 MENON, J. R., B.A., *Trichur, Cochin State, S. India.*
- 1887 MERRIFIELD, Frederic, (PRES., 1905-6; V.-PRES., 1893, 1907; SEC. 1897-8; COUNCIL, 1894, 1899), 14, *Clifton-terrace, Brighton.*
- 1912 METCALFE, Rev. J. W., *The Vicarage, Ottery St. Mary, Devon.*
- 1880 MEYRICK, Edward, B.A., F.R.S., F.Z.S., *Thornhanger, Marlborough.*
- 1883 MILES, W. H., c/o E. Step, Esq., 158, *Dora-road, Wimbledon Park, S.W. 19.*
- 1913 MILLER, F. V. Bruce, *Livingston, N. Rhodesia, Africa.*
- 1905 MITFORD, Robert Sidney, C.B., *Thorlea, Weybridge.*
- 1914 MIYAKÉ, Dr. Tsunekata, *The Agricultural College, Tokyo Imperial University, Komaba, Tokyo, Japan.*
- 1918 MONRO, Lieut. James W., R.A.M.C., *2nd Sanitary Coy., Duke of York's Head Quarters, Chelsea, S.W.*
- 1879 MONTEIRO, Dr. Antonio Augusto de Carvalho, 70, *Rua do Alecrim, Lisbon.*
- 1902 MONTGOMERY, Arthur Meadows, 34, *Shalimar Gardens, Pembroke-road, North Acton, W. 11.*
- 1899 MOORE, Harry, 12, *Lower-road, Rotherhithe.*
- 1916 MOORE, Ralph Headley, B.A., *Heathfield, Plymstock, Devon.*
- 1886 MORGAN, A. C. F., F.L.S., 135, *Oakwood-court, Kensington, W. 14.*
- 1889 † MORICE, The Rev. F. D., M.A., F.Z.S., Fellow of Queen's College, Oxford, (PRES., 1911, 1912, V.-PRES., 1902, 1904, 1913; COUNCIL, 1902-4), *Brunswick, Mount Hermon, Woking.*

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- 1893 MORTON, Kenneth J., 13, *Blackford-road, Edinburgh.*
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- 1911 MOSS, Rev. A. Miles, c/o Messrs. Booth & Co., *Para, Brazil.*
- 1907 † MOULTON, Capt. John C., M.A., B.Sc., F.L.S., F.Z.S., &c., 4th
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- 1911 MOUNSEY, J. Jackson, 24, *Glencairn-erescent, Edinburgh.*
- 1901 † MUIR, Frederick, *U.S.P.A. Experiment Station, Honolulu, Oahu,
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- 1912 † MULLAN, Jal Phirozshah, M.A., F.L.S., F.Z.S., Professor of Biology,
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- 1917 MUSCHAMP, Percy A. H., *Charterhouse School, Godalming.*
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- 1901 NEVINSON, E. B., *Mortland, Cobham, Surrey.*
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- 1913 NEWMAN, Leslie John William, *Bernard-street, Claremont,
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- 1890 NEWSTEAD, Prof. Robert, M.Sc., F.R.S., A.L.S., Hon. F.R.H.S.,
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- 1914 NICHOLSON, Charles, 35, *The Avenue, Hale-end, Chingford, E. 4.*
- 1909 NICHOLSON, Gilbert W., M.A., M.D., (COUNCIL, 1913-15), *Oxford
and Cambridge Club, Pall Mall, S.W. 1.*
- 1918 NIMMY, Ernest William, 210, *Whippendell-road, Watford, Herts.*
- 1906 NIX, John Ashburner, *Tilgate, Crawley, Sussex.*
- 1916 NOHIRA, Akio, *Tchijoji, Otajiguu, Kyoto, Japan.*
- 1914 NORRIS, Frederic de la Mare, *The Agricultural Department, Kuala
Lumpur, Federated Malay States.*
- 1915 NORTHCOTE, Dr. A. B., *Blenheim House, Monkgate, York.*
- 1878 NOTTIDGE, Thomas, *Ashford, Kent.*
- 1895 NURSE, Lt.-Colonel C. G., 145, *Beaufort-street, Chelsea, S.W. 3.*
- 1877 OBERTHÜR, René, *Rennes (Ille-et-Vilaine), France.*
- 1893 † OGLE, Bertram S., *Steeple Aston, Oxfordshire.*
- 1910 OLDAKER, Francis A., M.A., *The Red House, Haslemere.*

- 1918 O'NEIL, Rev. Fr., S.J., *Salisbury, Rhodesia.*
- 1913 ORMISTON, Walter, *Kalupahani, Haldummulle, Ceylon.*
- 1895 PAGE, Herbert E., (COUNCIL, 1918-), *Bertrose, Gellatly-road, St. Catherine's Park, S.E. 15.*
- 1916 PALMER, Arthur Raymond, *Ingleholme, Norton Way, Letchworth, Herts.*
- 1918 PARRIS, R. Stanway, 6 *High-street, Bishop's Stortford.*
- 1918 PARSONS, Dr. Allan Chilcott, M.R.C.S., L.R.C.P., D.Ph., etc., *School of Army Sanitation, Aldershot.*
- 1912 PATERSON, Edward J., *Fairholme, Crowborough.*
- 1913 PEACOCK, Alexander David, *Armstrong College, Newcastle-on-Tyne..*
- 1911 PEARSON, Douglas, *Chilwell House, Chilwell, Notts.*
- 1916 PEEBLES, Howard M., 13, *Chesham-street, S.W. 1.*
- 1915 PEILE, Major Harry Diamond, I.M.S., c/o *Alliance Bank of Sind, Peshawar, India.*
- 1914 PENDLEBURY, Major Wm. J. von Monté, *Broadlands, Shrewsbury, and Keble College, Oxford.*
- 1883 PÉRINGUEY, Louis, D.Sc., F.Z.S., Director, *South African Museum, Cape Town, South Africa.*
- 1903 † PERKINS, R. C. L., M.A., D.Sc., F.Z.S., *Park Hill House, Paigton, Devon*; and Board of Agriculture, Division of Entomology, *Honolulu, Hawaii.*
- 1907 † PERRINS, J. A. D., 3rd Scaforth Highlanders, *Dareham, Malvern.*
- 1897 PHILLIPS, Capt. Hubert C., M.R.C.S., L.S.A., 17, *Hereford-road, Bayswater, W. 2.*
- 1903 † PHILLIPS, Montagu A., F.R.G.S., F.Z.S., *Deronsire House Preparatory School, Reigate.*
- 1917 PICKARD CAMBRIDGE, Arthur D., M.A., *Balliol College, Oxford.*
- 1891 PIERCE, Frank Nelson, 1, *The Elms, Dingle, Liverpool.*
- 1903 * PILCHER, Col. Jesse George, I.M.S., F.R.C.S., 133, *Gloucester-road, Kensington, S.W. 7.*
- 1913 PLATT, Ernest Edward, 403, *Essenwood-road, Durban, Natal.*
- 1885 POLL, J. R. H. Neerwort van der, *Poste restante, Geneva, Switzerland.*
- 1870 † PORRITT, Geo. T., F.L.S., (COUNCIL, 1887), *Elm Lea, Dalton, Huddersfield.*
- 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, (PRES., 1903 4; V.-PRES., 1894-5, 1902, 1905; COUNCIL, 1886-8, 1892, 1896, 1905-7), *Wykeham House, Banbury road, Oxford.*
- 1905 POWELL, Harold, 7, *Rue Mircille, Hyères (Var), France.*
- 1908 PRATT, William B., 10, *Lion Gate Gardens, Richmond, Surrey.*
- 1878 PRICE, David, 48, *West-street, Horsham.*
- 1908 PRIDEAUX, Robert M., (COUNCIL, 1917), *Woodlands, Brasted Chart, Sevenoaks.*
- 1904 PRISKE, Richard A. R., 9, *Melbourne Avenue, West Ealing.*

- 1893 PROUT, Louis Beethoven, (COUNCIL, 1905-7), 84, *Albert-road, Dalston, E. S.*
- 1910 PUNNETT, Professor Reginald Crundall, M.A., *Caius College, Cambridge.*
- 1900 RAINBOW, William J., *The Australian Museum, Sydney, N.S.W.*
- 1912 RAIT-SMITH, W., *Hollybrook, Rose Heyworth-road, Abertillery, Monmouthshire.*
- 1914 RAMAKRISHNA, Aiyar, T. V., B.A., F.Z.S., *The Agricultural College, Coimbatore, S. India.*
- 1913 RAO, H. Ananthaswamy, *Curator of the Government Museum, Bangalore, India.*
- 1916 RAO, Yelseti Ramachandra, M.A., c/o Imperial Entomologist, *Pusa, Behar, India.*
- 1907 RAYWARD, Arthur Leslie, 91 and 93, *Southwark-street, S.E. 1.*
- 1898 REUTER, Professor Enzo, *Helsingfors, Finland.*
- 1910 DE RHÉ-PHILIPPE, G. W. V., Chief Examiner of Accounts, North-Western Ry., *Abbott-road, Lahore, India.*
- 1912 RILEY, Norman Denbigh, 94, *Drakefield-road, Upper Tooting, S.W. 17;* and *British Museum (Natural History), S. Kensington, S.W. 7.*
- 1908 RIPPON, Claude, M.A., 28, *Walton-street, Oxford*
- 1917 ROBERTS, A. W. Rymer, M.A., *Rothamsted Experimental Station, Harpenden*
- 1905 ROBINSON, Herbert C., *Curator of State Museum, Kuala Lumpur, Selangor.*
- 1904 ROBINSON, Lady, *Worksop Manor, Notts.*
- 1869 † ROBINSON-DOUGLAS, William Douglas, M.A., F.L.S., F.R.G.S., *Orchardton, Castle Douglas.*
- 1908 ROGERS, The Rev. K. St. Aubyn, M.A., Church Missionary Society, *Mombasa, British East Africa.*
- 1907 ROSENBERG, W. F. H., 57, *Haverstock-hill, N.W. 3.*
- 1868 ROTHNEY, George Alexander James, *Pembury, Tudor-road, Upper Norwood, S.E.*
- 1888 † ROTHSCHILD, The Right Honble. Lord, D.Sc., F.R.S., F.L.S., F.Z.S., (COUNCIL, 1900). *Zoological Museum, Tring.*
- 1894 † ROTHSCHILD, The Honble. Nathaniel Charles, M.A., F.L.S., F.Z.S., (PRES., 1915-16; V.-PRES., 1914, 1917; COUNCIL, 1904, 1913-17), *Arundel-house, Kensington Palace Gardens, W. 8.*
- 1890 ROUTLEDGE, G. B., *Tarn Lodge, Heads Nook, Carlisle.*
- 1913 ROWDEN, Alfred Oliver, 3, *Archibald-road, Exeter.*
- 1887 ROWLAND-BROWN, Henry, M.A., (V.-PRES., 1908, 1910; SEC., 1900-10; COUNCIL, 1914-16), *Osney-grove, Harrow Weald.*
- 1910 RUDGE, Charles Henry.
- 1892 RUSSELL, S. G. C., *Moul's Wood, Heatherside, Park-road, Woking.*
- 1905 ST. QUINTIN, W. H., *Scampton Hall, Rillington, York.*
- 1906 SAMPSON, Colonel F. Winn, 115, *Tannysfield-road, Sydenham.*

- 1910 SAUNDERS, H. A., *Brookfield-house, Swanage.*
- 1901 SCHAUS, W., F.Z.S., *U.S. National Museum, Washington, D.C., U.S.A.*
- 1907 SCHMASSMANN, W., *Beulah Lodge, London-road, Enfield, N.*
- 1912 SCHUNCK, Charles A., *Ewelme, Wallingford.*
- 1911 SCORER, Alfred George, *Hill Crest, Chilworth, Guildford.*
- 1909 SCOTT, Hugh, M.A., F.L.S., Curator in Entomology, *University Museum of Zoology, Cambridge.*
- 1911 SELOUS, Cuthbert F., M.D., M.R.C.S., L.R.C.P., *Sleaford, Penn Hill, Parkstone, Dorset.*
- 1911 † SENNETT, Noel Stanton, 24, *de Vere-gardens, Kensington, W. 8.*
- 1862 SHARP, David, M.A., M.B., F.R.S., F.L.S., F.Z.S., (PRES., 1887-8; V.-PRES., 1889, 1891-2, 1896, 1902-3; SEC., 1867; COUNCIL, 1893-5, 1902-4), *Lawnside, Brockenhurst, Hants.*
- 1902 SHARP, W. E., (COUNCIL, 1912-13), *The Bungalow, Crowthorne, Berks.*
- 1915 SHAW, Dr. A. Eland, c/o R. Kelly, Esq., Solicitor, 59, *Swanston-street, Melbourne, Victoria, Australia.*
- 1886 SHAW, George T. (Librarian of the Liverpool Free Public Library), *William Brown-street, Liverpool.*
- 1905 SHIELDON, W. George, (TREASURER, 1918-), *Youlgreave, South Croydon.*
- 1900 † SHEPHEARD-WALWYN, H. W., M.A., *Dolwchinnie, Kenley, Surrey.*
- 1887 † SICH, Alfred, (COUNCIL, 1910-12), *Corney House, Chiswick, W. 4.*
- 1911 SIMES, James A., *Mon Repos, Monkham's-lane, Woodford-green, Essex.*
- 1904 SIMMONDS, Hubert W., *Sussex View, Cumberland-gardens, Tunbridge Wells.*
- 1913 SITWELL, Capt. F., *Wooler, Northumberland.*
- 1902 SLADEN, Frederick William Lambert, *Dept. of Agriculture, Central Experimental Farm, Ottawa, Canada.*
- 1902 SLOPER, Gerard Orby, F.Z.S., J.P., *Badminton Club, Piccadilly, W. 1.*
- 1907 SLY, Harold Baker, 16, *Sussex-square, Brighton.*
- 1906 SMALLMAN, Raleigh S., *Eliot Lodge, Albemarle-road, Beckenham, Kent.*
- 1916 SMART, Capt. H. Douglas, R.A.M.C., *Shelley, Huddersfield.*
- 1915 SMITH, Adam Charles, *Horton, Mornington-road, Woodford Green.*
- 1901 SMITH, Arthur, *County Museum, Lincoln.*
- 1911 SMITH, B. H., B.A., *Frant Court, Frant, Tunbridge Wells.*
- 1918 SMITH, Patrick Aubrey Hugh, *Sconner House, St. German's, Corn-wall, and 28, Bruton-street, Berkeley-square, W.*
- 1912 SMITH, Roland T., 131, *Queen's-road, Wimbledon, S.W. 19.*
- 1918 SMITH, 2nd Lieut. William Proctor, F.Z.S., *Haddon House, Ashton-on-Mersey.*
- 1898 SOPP, Erasmus John Burgess, F.R.Met.S., 34, *Ferndale-road, Hove.*
- 1885 SOUTH, Richard, (COUNCIL, 1890-1), 4, *Mapesbury-court, Shoot-up Hill, Broudesbury, N.W. 2.*
- 1916 SOWERBY, Lieut. F. W., R.N.D., 94, *Ainslie-street, Grimshy.*
- 1908 SPEYER, Edward R., *Ridgehurst, Shenley, Herts.*

- 1910 STANLEY, The Rev. Hubert George, *Marshfield Vicarage, Cardiff.*
- 1898 STARES, C. L. B., M.R.C.S., L.R.C.P., *The Limes, Swanley Junction, Kent.*
- 1898 STEBBING, Henry, *Chasewood, Round Oak-road, Weybridge.*
- 1910 STENTON, Rupert, *St. Edward's, St. Mary Church, Torquay.*
- 1918 STIFF, Rev. Alfred T., *Grantham, Victor Drive, Leigh-on-Sea.*
- 1910 STONEHAM, Hugh Frederick, Capt. 1st Batt. E. Surrey Regt., *Stoneleigh, Reigate.*
- 1913 STOREY, Gilbert, *Dept. of Agriculture, Cairo, Egypt.*
- 1915 STOTT, Charles Ernest, *Edon, London road, Reigate.*
- 1896 STRICKLAND, T. A. Gerald, *Southcott, Poulton, Fairford.*
- 1900 STUDD, E. A. C., *P.O. Box 906, Vancouver, British Columbia.*
- 1895 STUDD, E. F., M.A., B.C.L., *Orton, Exeter.*
- 1908 SWIERSTRA, Corn. J., 1st Assistant, *Transvaal Museum, Pretoria.*
- 1884 SWINHOE, Colonel Charles, M.A., F.L.S., F.Z.S., (V.-PRES., 1894; COUNCIL, 1891-3; 1902-4), 4, *Gunterstone-road, West Kensington, W. 14.*
- 1894 SWINHOE, Ernest, 4, *Gunterstone-road, West Kensington, W. 14.*
- 1876 SWINTON, A. H., *Oak Villa, Braishfield, Romsey, Hants.*
- 1911 SWYNNERTON, C. F. M., *Gungunyana, Melssetter, S.-E. Rhodesia.*
- 1910 TAIT, Robt. junr., *Roseneath, Harborough-road, Ashton-on-Mersey.*
- 1908 TALBOT, G., 13, *Arthenden-road, Brockley, S.E. 4.*
- 1918 TAPP, Mrs. Eleanor Eva, *Loos, 88, Wickham Way, Beckenham, Kent.*
- 1918 TAPP, Capt. William Henry, F.R.A.S., F.R.G.S., *Loos, 88, Wickham Way, Beckenham, Kent.*
- 1916 TATCHELL, Leonard Spencer, 43, *Spratt Hall-road, Wanstead, N.E.*
- 1911 TAUTZ, P. H., *Cranleigh, Pinner, Middlesex.*
- 1911 TAYLOR, Frank H., *Dalmeally Station, viâ Roma, Queenstand.*
- 1903 TAYLOR, Thomas Harold, M.A., *Yorkshire College, Leeds.*
- 1914 TEMPERLEY, Reginald, *Sharpe House, Wiveliscombe, Somerset.*
- 1910 THEOBALD, Prof. F. V., M.A., *Wye Court, Wye, Kent.*
- 1901 THOMPSON, Matthew Lawson, 40, *Gosford-street, Middlesbrough.*
- 1892 THORNLEY, The Rev. A., M.A., F.L.S., "*Hughenden,*" *Coppice-road, Nottingham.*
- 1907 TILLYARD, R. J., M.A., B.Sc., F.L.S., Linnean Macleay Fellow in Zoology, *Kuranda, Mount Errington, Hornsby, New South Wales.*
- 1911 TODD, R. G., 54, *Hornsey-lane, Highgate, N.*
- 1897 TOMLIN, J. R. le B., M.A., (COUNCIL 1911-3), *Lakefoot, Hamilton-road, Reading.*
- 1907 TONGE, Alfred Ernest, (COUNCIL, 1915-17), *Aircraft, Reigate, Surrey.*
- 1914 DE LA TORRE BUENO, J. R., 25, *Broad-street, New York, U.S.A.*
- 1907 TRAGARDH, Dr. Ivar, *The University, Upsala, Sweden.*
- 1906 TULLOCH, Col. B., *The King's Own Yorkshire Light Infantry, c/o Messrs. Cox & Co., 16, Charing Cross, S.W.*
- 1895 TUNALEY, Henry, *Castleton, Scarle-road, Farnham.*

- 1910 TURATI, Conte Emilio, 4, *Piazza S. Alessandro, Milan, Italy.*
- 1898 TURNER, A. J., M.D., *The Manor War Hospital, Epsom, and Wickham Terrace, Brisbane, Australia.*
- 1893 TURNER, Henry Jerome, (COUNCIL, 1910-12), 98, *Drakefell-road, New Cross, S.E. 14.*
- 1906 TURNER, Rowland E., (COUNCIL, 1909-10).
- 1915 TYTLER, Col. H. C., c/o Mrs. Tytler, Messrs. Grindlay & Co., *Parliament-street, S.W. 1.*
- 1893 URICH, Frederick William, C.M.Z.S., *Port of Spain, Trinidad, British West Indies.*
- 1904 † VAUGHAN, W., *The Old Rectory, Beckington, Bath.*
- 1914 VEITCH, Robert, Entomologist, c/o C.S.R. Co., *Lantoka Mills, Lantoka, Fiji Islands.*
- 1909 VIDLER, Leopold A., *The Carmelite Stone House, Rye.*
- 1911 VITALIS DE SALVAZA, R., *Vientiane, Laos, Indo-China.*
- 1895 WACHER, Sidney, F.R.C.S., *Dane John, Canterbury.*
- 1897 WAINWRIGHT, Colbran J., (COUNCIL, 1901, 1912-14), 139, *Hamstead-road, Hantsworth, Birmingham.*
- 1918 WALFORD, Lionel Julian, *The Cavalry Club, Piccadilly, W.*
- 1878 WALKER, James J., M.A., R.N., F.L.S., SECRETARY, 1905- ; (V.-PRES., 1916 ; COUNCIL, 1894 ; SEC. 1899), *Aorangi, Lonsdale-road, Summertown, Oxford.*
- 1912 WALLACE, Henry S., 6, *Kayll-road Villas, Sunderland.*
- 1914 WALSH, Mrs. Maria Ernestina, *Soekaboemi, Java, Dutch East Indies.*
- 1866 † WALSINGHAM, The Right Honble. Lord, F.R.S., (PRES., 1889-90 ; V.-PRES., 1882, 1888, 1891-2, 1894-5 ; COUNCIL, 1896), *British Museum (Natural History), Cromwell-road, S.W. 7.*
- 1910 WARD, John J., *Rusinarbe House, Somerset-road, Coventry.*
- 1908 WARREN, Brisbane C. S., *Hotel Moy, Oberhofen, Lac de Thoune, Switzerland.*
- 1901 † WATERHOUSE, Gustavus A., B.Sc., F.C.S., *Allonrie, Stanhope-road, Killara, New South Wales, Australia.*
- 1914 WATERSTON, Rev. James, B.D., B.Sc., 32, *Blandford-road, Bedford Park, W. 4.*
- 1914 WATT, Morris N., *St. John's Hill, Wanganui, New Zealand.*
- 1893 WEBB, John Cooper, 89, *Dulwich Village, S.E. 21.*
- 1876 † WESTERN, E. Young, 27, *Pembridge-square, Notting Hill Gate, W. 2.*
- 1918 WESTON, John Henry, 70, *Ashford road, Withington, Manchester.*
- 1906 WHEELER, The Rev. George, M.A., F.Z.S., SECRETARY, 1911- ; (V.-PRES., 1914), 37, *Gloucester-place, W. 1.*
- 1910 WHITE, Major Edward Barton, M.R.C.S., *Welsh Metropolitan War Hospital, Whitchurch, Cardiff.*
- 1918 WHITE, Ronald Senior, *Sudunganga Estate, Malale, Ceylon.*
- 1913 † WHITLEY, Percival N., *Brantwood, Halifax ; and New College, Oxford.*

- 1913 † WHITTAKER, Oscar, *Ormidale, Ashlands, Ashton-upon-Mersey.*
- 1911 WHITTINGHAM, Rev. Canon W. G., *Glaston Rectory, Uppingham.*
- 1917 WICKHAM, Rev. Prebendary A. P., *East Brent Vicarage, High-bridge, Somerset.*
- 1906 WICKWAR, Oswin S., *Woodford, Matiland Crescent, Colombo, Ceylon.*
- 1903 WIGGINS, Clare A., M.R.C.S., *Entebbe, Uganda.*
- 1896 WILEMAN, A. E., *Thatched House Club, St. James's-street, S.W. 1.*
- 1910 WILLCOCKS, Frank C., Entomologist to the Khedivial Agricultural Society, *Cairo, Egypt.*
- 1911 WILLIAMS, C. B., M.A., *Port of Spain, Trinidad, and 20, Slaty-road, Birkenhead.*
- 1915 WILLIAMS, Harold Beck, 49, *Marchmont-road, Wallington, Surrey.*
- 1915 WINN, Albert F., *Library of McGill University, Westmount, Montreal, Canada.*
- 1894 WOLLEY-DOD, F. H., *Millarville P. O., Alberta, N.W.T., Canada.*
- 1905 WOODBRIDGE, Francis Charles, *Briar Close, Latchmore-avenue, Gerrard's Cross S.O., Bucks.*
- 1914 WOODFORDE, Francis Cardew, B.A., 2, *Isis-street, Oxford.*
- 1918 WOODRUFFE-PEACOCK, Rev. E. Adrian, F.L.S., F.G.S., *Cadney Vicarage, Brigg, Lincolnshire.*
- 1892 YOUNDALE, William Henry, F.R.M.S., 21, *Belle Isle-street, Workington.*

ADDITIONS TO THE LIBRARY

DURING THE YEAR 1918.

- ANDREWS (A. W.). Coleoptera collected in North-eastern Nevada by the Walker-Newcomb expedition of the University of Michigan.
[Univ. Michigan, Occas. Papers, No. 48, 1917.]
- . Diptera collected on Whitefish Point, Chippewa County, Michigan.
[Univ. Michigan, Occas. Papers, No. 53, 1918.] *The University.*
- ANSORGE (E. C.). [See LEFROY (H. Maxwell).]
- ARKWRIGHT (J. A.), BACOT (A.) and DUNCAN (F. M.). Preliminary notice on the association of Rickettsia bodies in lice with trench fever.
[Reprinted from Brit. Medical Journ., Sept. 21, 1918.] *Lister Institute.*
- ARROW (G. J.). [See Report on the Coleoptera of New Guinea.]
- BACK (E. A.) and PEMBERTON (C. E.). The Melon-fly (*Bactrocera cucurbitae*, Coq.).
[U. S. Dept. Agric., Bull. No. 643, 1918.] *U. S. Dept. Agric.*
- BACOT (A.). The unreliability of sulphur for the destruction of lice in clothing.
[Brit. Medical Journ., Oct. 26, 1918.]
- . Mosquitoes and the danger of Malaria in England.
[Essex Naturalist, Vol. XVIII, 1918.] *The Author.*
- . [See ARKWRIGHT (J. A.).]
- BAIRD (A. B.). Some Notes on the Natural Control of the Cherry-tree ugly nest Tortricid, *Archips cerasivorana*, Fitch.
[Agric. Gazette of Canada, Vol. V, 1918.] *Canad. Dept. Agric.*
- BEMMELEN (J. F. van). The Wing-markings of *Arctiidæ*.
[Koninkl. Akad. Wet. Amsterdam, Vol. XX, 1917.] *The Author.*
- BEYER (H.). [See LUGINBILL (P.).]
- BLAIR (K. G.). [See Report on the Coleoptera of New Guinea.]
- BOTKE (J.). Les Motifs primitifs du dessin des ailes des Lépidoptères et leur origine phylétique.
[Zool. Lab. der Rijksuniversiteit Groningen, 1916.] *Dr. J. F. van Bemmelen.*
- BRADLEY (J. C.). Contributions toward a Monograph of the *Mutillidæ* and their allies of America north of Mexico. I. A Revision of *Ephuta*, Say, a genus of *Mutillidæ* equivalent to the species group *Scrupea* of Fox.
[Trans. Amer. Ent. Soc., Vol. XLII, 1916.]
- . Contributions toward a Monograph of the *Mutillidæ* and their allies of America north of Mexico. II. A Revision of *Timulla*, Ashmead, a subgenus of *Mutilla* equivalent to the species group *Hexagona* of Fox.
[Trans. Amer. Ent. Soc., Vol. XLII, 1916.]
- . Contributions toward a Monograph of the *Mutillidæ* and their allies of America north of Mexico. III. The *Mutillidæ* of the Eastern United States.
[Trans. Amer. Ent. Soc., Vol. XLII, 1916.]

- BRADLEY (J. C.). Contributions toward a Monograph of the *Mutillidae* and their allies of America north of Mexico. IV. A Review of the *Myrmosidae*.
[Trans. Amer. Ent. Soc., Vol. XLIII, 1917.]
- Taxonomic notes on *Agathinae* (Hymenoptera-Braconidae).
[Psyche, Vol. XXIII, 1916.] *The Author.*
- BROOKS (F. E.). Papers on Deciduous-fruit Insects. I. The Grape Curculio (*Craponius inaequalis*, Say). II. The Grape Root-borer (*Memythius polistiformis*, Harris).
[U. S. Dept. Agric., Bull. No. 730, 1918.] *U. S. Dept. Agric.*
- BROWN (Major T.). Descriptions of new genera and species of Coleoptera. Part V.
[New Zealand Institute, Bull. No. 1, June 1917.] *The Author.*
- BUTLER (A. G.). A Monograph of the Lepidoptera hitherto included in the genus *Elymnias*.
[Proc. Zool. Soc. Lond., 1871.]
- On Two Collections of Lepidoptera sent by H. H. Johnston, Esq., C. B., from British Central Africa.
[Proc. Zool. Soc. Lond., 1893.]
- On a Collection of Lepidoptera from British East Africa made by Dr. J. W. Gregory between the months of March and August 1893.
[Proc. Zool. Soc. Lond., 1894.]
- On Lepidoptera recently collected in British East Africa by Mr. G. F. Scott Elliot.
[Proc. Zool. Soc. Lond., 1895.]
- On a small Collection of Butterflies made by Consul Alfred Sharpe at Zomba, British Central Africa.
[Proc. Zool. Soc. Lond., 1895.] *E. A. Elliott.*
- CALVERT (P. P.). Progress in our knowledge of the Odonata from 1895 to 1912.
[Trans. Second Entom. Congress, 1912.]
- An Entomologist in Costa Rica.
[Abstract of Address before Ent. Soc. Amer., Cleveland, Ohio, Jan. 1, 1913.]
- The Fossil Odonate *Phenacolestes*, with a Discussion of the Venation of the legion *Polagrion*, Selys.
[Proc. Acad. Nat. Sci. Phil., 1913.]
- The Desirability of a Bibliographical Dictionary of Entomologists.
[Entom. News, Vol. XXV, 1914.]
- The Completion of a Great Work ("Biologia Centrali-Americana"). (Notice of, with portraits of the Editors.)
[Entom. News, Vol. XXVII, 1916.] *G. C. Champion.*
- CAMERON (A. E.). The Insect association of a local environmental complex in the District of Holmes Chapel, Cheshire.
[Trans. Royal Soc. Edinburgh, Vol. LII, Part I, 1917.]
The Society.
- Life-history of the leaf-eating Crane-fly, *Cylindrotoma splendens*, Doane.
[Ann. Ent. Soc. Amer., Vol. XI, 1918.]
- Some Blood-sucking Flies of Saskatchewan.
[Agric. Gazette of Canada, Vol. V, 1918] *Canad. Dept. Agric.*
- and TREHERNE (R. C.). The Pear Thrips (*Taeniothrips pyri*, Dan.) in British Columbia.
[Agric. Gazette of Canada, Vol. III, 1916.] *Canad. Dept. Agric.*

- CAMERON (A. E.) and TREHERNE. The Pear Thrips (*Taeniothrips inconsequens*, Uzel) and its control in British Columbia.
[Canad. Dept. Agric., Entom. Branch, Bull. No. 15, 1918.]
Canad. Dept. Agric.
- CAMERON (M.). Synoptic Table of the British Species of *Aleuonota*, Thoms., *Atheta*, Thoms., and *Sipalia*, Rey.
[Trans. Ent. Soc. Lond., 1913.]
- Descriptions of new species of *Staphylinidae* from India.
[Trans. Ent. Soc. Lond., 1914.]
- On a new group of *Staphylinidae*.
[Ent. Monthly Mag., 3rd Ser., Vol. III, 1917.]
- Description of a new genus of *Staphylinidae* (*Paraphytosus*).
[Ent. Monthly Mag., 3rd Ser., Vol. III, 1917.]
- Description of a new genus of *Staphylinidae* (*Paractocharis*).
[Ent. Monthly Mag., 3rd Ser., Vol. III, 1917.]
- Description of a new species of *Thinobius*.
[Ent. Monthly Mag., 3rd Ser., Vol. III, 1917.]
- New Oriental *Staphylinidae*, I-III.
[Ent. Monthly Mag., 3rd Ser., Vol. IV, 1918.] *The Author.*
- CARPENTER (G. H.). The *Apterygota* of the Seychelles.
[Proc. Royal Irish Acad., Vol. XXXIII. Sect. B, No. 1, 1916.]
- Zoological Results of the Abor Expedition, 1911-12. *Collembola*.
[Records Indian Mus., Vol. VIII, 1917.] *The Author.*
- and POLLARD (F. J. S.). The presence of lateral spiracles in the larva of *Hypoderma*.
[Proc. Royal Irish Acad., Vol. XXXIV, Sect. B, No. 4, 1918.]
The Author.
- CARSNER (Eubanks). [See STAHL (C. F.).]
- CASEY (T. L.). Memoirs on Coleoptera, Vol. VIII, 1918.
The Author.
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PARTS I, II.

December 31, 1918.

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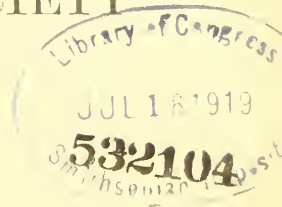
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TRANSACTIONS
OF THE
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FOR THE YEAR 1918.



- I. *Coleoptera* of the families Ostomidae, Monotomidae, Colydiidae and Notiophygidae from the Seychelles and Aldabra Islands. By the late ANTOINE GROUVELLE. Communicated by HUGH SCOTT, M.A., F.L.S.

PLATES I, II.

[Read December 5th, 1917.]

[THE material here reported on forms part of the entomological collections made by the Percy Sladen Trust Expedition of 1905 and 1908-9 in the Seychelles and other islands of the Western Indian Ocean. The late author of the paper had already dealt with certain other families of Clavicorn Coleoptera obtained in those islands, in the special series of the Linnean Society's Transactions set apart for results of that Expedition: see Trans. Linn. Soc. London, ser. 2, Zool., vol. xvi, pp. 93-116 (1913), and vol. xvii, pp. 141-159 (1914). The manuscript of the paper printed below was received from him in Oct. 1915, but circumstances hitherto have prevented its publication, while the author's death on June 9, 1917, renders it a posthumous work. The correction of the proofs has presented some difficulty, therefore indulgence is asked, especially from French readers, towards any textual and grammatical errors.

I am responsible for the notes on localities, and on reduction of wings and eyes in certain species (pp. 24, 41, 45). As in most groups, the greater part of the collection was obtained in the endemic forests in the mountains of the Seychelles proper. The spaces between the leaf-bases of growing endemic palms and *Pandanus* proved a good hunting-ground for these insects, the material of six of the

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new forms described below being derived partly or wholly from this source.

The first set of specimens, with types of all new genera and species here described, is in the British Museum. A second series is in the Cambridge University Museum.—
[HUGH SCOTT.]

Ce mémoire énumère 34 espèces, dont 26 nouvelles, appartenant à 22 genres différents, dont 4 nouveaux. Ce simple énoncé fait ressortir l'importance des découvertes faites par la Percy Sladen Trust Expedition.

DISTRIBUTION GÉOGRAPHIQUE DES ESPÈCES CATALOGUÉES DANS CE MÉMOIRE

	Groupe des Seychelles.	Groupe Chagos.	Groupe Farquhar (incl. St. Pierre et Providence).	Groupe Amirantes.	Groupes Aldabra (incl. Aldabra Astore, Assump- tion et Cosmoledo).	Provenance des espèces déjà décrites.
OSTOMIDÆ.						
<i>Alindria costulata</i>						
<i>Lophocateres pusillus</i>						Cosmopolite.
MONOTOMIDÆ.						
<i>Monotoma madagascariensis</i>						Madagascar.
<i>Shoguna polita</i>						Christmas Island.
COLYDIDÆ.						
<i>Sarothrias eximius</i>						
<i>Pycnomerus confertus</i>						Madagascar.
<i>Ditoma cavicollis</i>						
<i>Xuthia sicana</i>						Archipel Malais Inde.
<i>Cicones scotti</i>						
— <i>compactus</i>						
<i>Colobicones singularis</i>						
<i>Diplotoma capito</i>						
<i>Neotrichus gardineri</i>						
— <i>parallelocollis</i>						
<i>Lascotenus scotti</i>						
<i>Paralyreus scotti</i>						
<i>Tyrtæus singularis</i>						
<i>Mecodanum</i> sp.						
<i>Bothrideres fryeri</i>						
<i>Cerylon nitidum</i>						Seychelles.
— <i>longius</i>						
— <i>perparvulum</i>						
— <i>tantillum</i>						
— <i>gardineri</i>						
— <i>hiliputanum</i>						
— <i>curtulum</i>						
<i>Axiocerylon cavicolle</i>						
<i>Thyroderus sculpticollis</i>						
<i>Myhocerus albaudi</i>						Seychelles.
NOTIOPHYGIDÆ.						
<i>Aphanocephalus insularis</i>						
— <i>binotatus</i>						
— <i>4-plagiatus</i>						
— <i>subdepressus</i>						
— <i>acuminatus</i>						

* Also Mauritius (see p. 50).

OSTOMIDAE.

Cette famille est représentée par deux espèces dans les collections récoltées par la Percy Sladen Trust Expedition. La première, *Alindria costulata*, appartenant à la sous-famille des Temnochilinae, est nouvelle et semble spéciale à la faune de ces îles. Le genre *Alindria* se rencontre dans toute l'Afrique tropicale et sub-tropicale, ainsi que dans l'Asie méridionale en remontant jusqu'aux frontières de la Chine, il est représenté à Madagascar et dans l'Inde par des formes locales, il n'a pas encore été retrouvé aux Iles Maurice et de la Réunion.

La deuxième, *Lophocateres pusillus* (Klug), appartient à la sous-famille des Ostominae; elle est cosmopolite.

TEMNOCHILINAE.

ALINDRIA, Erichson, 1844, in Germ., Zeitschr., V, p. 151.

1. *Alindria costulata*, n. sp.

Parallela, fere sexies longior quam latior, convexa, in disco subdepressa, clytris subcostata, glabra, nitida, viridi-aenea; clytrorum costis aeneis, antennis pedibusque rufo-piceis, illis ad apicem cyaneo-aeneis. Antennae pro genere sat elongatae; 3^o articulo quadrato, 9^o quam 8^o minus duplo latiore, clava apice striete pubescenti. Caput disco subdepressum, tenuissime alutaceum, sat dense punctatum. Prothorax paulo longior quam latior, vix perspicue alutaceus, subdense punctatus; punctis in disco elongatis; margine antico ad extremitates marginato; angulis anticis vix productis. Elytra basi haud marginata, in longitudinem costulata, punctata; punctis elongatis praecipue in costularum intervallis densatis et sublineato-dispositis, ad latera minoribus, subelongatis, fere confusis. Long. 7.5 mill.

Parallèle, presque six fois plus long que large, convexe, sub-déprimé sur le disque, glabre, brillant, marqué sur les élytres de côtes peu accentuées, bronzé-verdâtre, côtes des élytres simplement bronzées; antennes et pattes plus ou moins roux de poix; les premières bleu-métallique vers l'extrémité; dessous du corps noir. Antennes assez allongées pour le genre: 1^{er} article épais, un peu plus long que large, 2^{me} environ deux fois plus large que long, 3^{me} carré, 4^{me} à 8^{me} s'élargissant progressivement, subégaux, le 4^{me} un peu plus court que le 3^{me}, 8^{me} presque deux fois plus large que 3^{me}, 9^{me} et 10^{me} transversaux, subégaux, moins de deux fois plus larges que 8^{me}, 11^{me} un peu

plus long que 10^{me}, bordé à l'extrémité par une très étroite marge pubescente. Tête un peu plus longue que large, subdéprimée sur le front, couverte d'une ponctuation un peu allongée, assez serrée; yeux légèrement éloignés de la base de l'antenne. Prothorax un peu plus long que large, couvert d'une ponctuation assez dense, très nettement allongée sur le disque; bord antérieur à peine cilié sur les extrémités, très brièvement rebordé de chaque côté; angles antérieurs à peine saillants en avant; côtés subparallèles, finement rebordés; angles postérieurs obtus; base arquée, finement rebordée. Ecusson petit, suborbiculaire. Elytres environ quatre fois plus long que large ensemble, arrondis ensemble au sommet, non rebordés à la base, marqués de points linéaires, plus ou moins serrés, et plus ou moins disposés en lignes sur les intervalles des côtes, beaucoup plus rares sur celles-ci, fins, peu allongés, espacés et confus sur les marges latérales; celles-ci finement rebordées. Hanches antérieures rougeâtres: saillies du premier segment de l'abdomen entre les hanches postérieures ne s'engageant pas dans une échancrure du métasternum.

1 exemplaire.

Loc. ALDABRA. Ile Esprit, xii. 1908 (*Fryer*).

OSTOMINAE.

LOPHOCATERES, Olliff, 1883, Trans. Ent. Soc. Lond., p. 180;
1883, Cistula Ent. iii, p. 58.

2. *Lophocateres pusillus*, Klug.

Peltis pusillus, Klug, 1832, Abh. Akad. Wiss. Berlin, p. 159.

Peltis africanus, Motschulsky, 1853, Bull. Soc. Nat. Moscou, XXXVI, ii, p. 508.

Peltis yvani, Allibert, 1847, Rev. Zool., p. 12.

Ostoma yvani, Reitter, 1876, Verh. Nat. Ver. Brünn, XIV, p. 63.

Espèce cosmopolite. 1 exemplaire.

Loc. SEYCHELLES. Silhouette, viii. 1908.

MONOTOMIDAE.

Deux espèces appartenant à deux genres différents figurent dans les collections de la Percy Sladen Trust Expedition. Le genre *Monotoma* se rencontre dans toutes les parties du monde, le genre *Shoguna* est représenté jusqu'à ce point par un petit nombre d'espèces appartenant

à la faune de l'ancien monde et de l'Océanie. Les espèces du même groupe qui se rencontrent dans l'Amérique Centrale sont cataloguées dans un genre *Thione*, Sharp (1899, Biol. Centr.-Am., Col. II, 1, p. 544), très voisin de *Shoguna*. La position systématique de ces deux genres dans les Monotomidae ne me semble pas nettement établie.

MONOTOMA, Herbst, 1793, Käf., V, p. 22.

3. *Monotoma madagascariensis*, Grouvelle.

Monotoma madagascariensis, Grouvelle, 1906, Ann. Soc. Ent. France, LXXV, p. 126.

Le type de l'espèce provient de Madagascar, l'exemplaire des Seychelles est presque identique à ce type; ses calus huméraux sont un peu moins accentués.

Loc. SEYCHELLES. Mahé: "One specimen, from country above Port Glaud, between 500 and 1000 feet, 5. xi. 1908."

SHOGUNA, Lewis, 1884, Ann. Mag. Nat. Hist., Ser. 6. IV, p. 274; Ser. 6, XIII, 1894, p. 485.

Holocephala, Fairm., 1886, Ann. Soc. Ent. France, 6 Ser., VI, p. 32.

Pachycephala, Fairm., 1883, Ann. Soc. Ent. Belg., XXVII, p. 4.

4. *Shoguna polita*, Arrow.

Shoguna polita, Arrow, 1900, Monog. Christmas Island, p. 92.

Le type de l'espèce provient de Christmas Island. *Shoguna polita*, Arrow, diffère de *S. chlorotica*, Fairm., par ses élytres à peine striés en dehors de la région suturale; il est beaucoup plus rapproché de *S. termitiformis*, Fairm., de Samoa.

Loc. SEYCHELLES. Mahé: "A single specimen caught by daylight on the wing near the house at Cascade Estate, 800 feet, 1909, in the vicinity of much imported vegetation."

COLYDIIDAE.

Les Colydiidae des Seychelles et surtout les Cerylini sont relativement nombreux; 25 espèces ont été récoltées. Toutes sauf trois sont nouvelles, 5 ont nécessité des genres nouveaux.

Sarothrius.—Nouveau genre établi pour un insecte de forme et de structure tout-à-fait spéciales, appartient à la tribu des Apistini. Il doit être localisé dans la région des Seychelles.

Pycnomerus.—Une seule espèce, déjà connue de Madagascar, elle se rapporte au sous-genre *Penthelispa*.

Ditoma.—Une seule espèce nouvelle qui comme aspect et structure générale ne s'écarte en rien du groupe cosmopolite des *Ditoma*.

Xuthia.—Une seule espèce, *X. sicana*, Pasc., répandue dans tout l'Archipel malais, les Indes, etc.

Cicones.—Deux espèces nouvelles. La première, *C. scotti*, rentre bien dans le type classique du genre *Cicones* : la seconde, *C. compactus*, s'écarte de ce type et rentre dans un ensemble de formes qui toutes répondent aux caractéristiques du genre mais montrent l'opportunité de subdivisions établies sur l'étude de matériaux importants. Malheureusement ces formes voisines des *Cicones* proprement dit sont en général représentées par des exemplaires uniques, qui ne permettent pas toutes les études de détail qui seraient nécessaires.

Colobicones.—Nouveau genre établi pour une espèce nouvelle, venant se placer entre les *Ditoma*, les *Cicones* et les *Colobicus*.

Diptotoma.—Ce genre, établi par Erichson pour deux Colydiidae de Madagascar, décrits postérieurement par Reitter, semble pour le moment localisé dans la région de Madagascar, des Mascareignes et des Seychelles ; mais il serait prématuré de formuler une conclusion absolue à cet égard. L'espèce des Seychelles est nouvelle et ne présente rien de bien saillant par rapport aux espèces connues.

Neotrichus.—Deux espèces nouvelles. Ce genre est représenté dans presque toutes les faunes tropicales et sub-tropicales.

Lascotomus.—Une espèce nouvelle. Ce genre comprend déjà une espèce de l'Afrique orientale et deux des Indes orientales.

Paralyreus.—Genre nouveau établi pour un petit Colydien qui rappelle les insectes subhypogées de la faune paléarctique.

Tyrtacus.—Ce genre a été établi par Champion pour deux espèces de l'Amérique centrale ; il semble avoir des représentants dans toute la zone tropicale ; je connais en effet trois autres espèces qui doivent lui être rapportés : l'une provient

de la Guadeloupe, les deux autres de Sumatra. Le genre *Tyrtaeus* me semble placé avec raison parmi les *Colydiidae*, l'écartement modéré, de ses hanches postérieures et l'ensemble de ses autres caractères le rangerait entre les *Ditomiini* et les *Coxelini*; provisoirement je le rapporterais à cette dernier tribu. Les *Tyrtaeus* vivent probablement de matières cryptogamiques.

Mecedanum.
Bothrideres. { [The late author left no remarks on these two genera in his MS. According to an earlier statement by him (Ann. Soc. Ent. France, LXXV, 1906, p. 107), several species of *Mecedanum* are known, from Madagascar and W. Africa. *Bothrideres* is represented in all parts of the world.]

Cerylon. Les *Cerylon* sont nombreux aux Seychelles. Les collections de la Percy Sladen Trust Expedition renferment sept espèces dont six nouvelles; quelques unes sont représentées par un nombre considérable d'exemplaires. Le genre *Cerylon* se retrouve dans toutes les régions, ses espèces sont très nombreuses.

Axiocerylon.—Genre nouveau établi pour un des *Cerylini* très remarquable par sa forme et sa sculpture. Ce genre a d'autre représentants dans l'Afrique occidentale.

Thyroderus.—Genre établi sur une espèce du Japon et de Ceylan. La forme nouvelle des Seychelles est particulièrement intéressante; sa capture, comme du reste celle des minuscules *Cerylon* rapportés par la Percy Sladen Expedition, fait prévoir de nombreuses découvertes dans le monde des petits *Colydiens* du groupe des *Cerylini*.

Myhocerus.—Ce genre établi par Erichson pour un insecte inédit de Cuba, *M. ferrugineus*, puis adopté par Zimmerman pour le *M. depressus*, Lec., semble répandue dans toutes les faunes tropicales et subtropicales.

COLYDIINAE. APISTINI.

SAROTHRAS, nov. gen.

Antennae II-articulatae, supra oculos insertae et ab his remotae, crassae, pubescentes; tribus ultimis articulis vix perspicue incrassatis. Coxae anticae subglobosae, inter se contingentes; acetabulis clausis. Coxae intermediae in longitudinem oblongae, parum remotae. Metasternum elongatissimum, sulco profundo, apice excavato, in longitudinem secatum. Coxae posticae in longitudinem

suboblongae, postice subangulosae, valde remotae. Abdomen, quam metasternum multo brevius, subtus inspectum abrupte valdeque inflexum; primo segmento inter coxas posticas elevato et ante metasterni sulcum emarginato.

Ce nouveau genre entre dans la tribu des Apistini; l'insecte très curieux pour lequel il est établi, rappelle jusqu'à un certain point, lorsqu'il est vu de dessus, un minuscule *Dictrillus*.

5. *Sarothrias eximius*, n. sp. (Pl. I, fig. 7.)

Subovatus, antice angustatus, convexus, nitidulus, glaber, ater; tibiis apicem versus piccis. Antennae incrassatae, apicem versus ampliatae; tribus ultimis articulis vix abrupte latioribus; 2° articulo transverso, 3°-8° transversissimis, 9°-11° transversis, omnibus pubescentibus. Caput subtriangulare, fere duplo latius quam longius, antice subtruncatum, utrinque juxta antemmarum basin lobato-elevatum, antice inter hos lobos transversim impressum; oculis modice prominulis; lateribus aute oculos parallelis. Prothorax subparallelus, sesquilongior quam latior, tenuissime asper, parce punctulatus, in longitudinem sulcato-striatus; sulco antice posticeque attenuato. Eyltra basi quam prothorax fere latiora, lateribus in primo brevissime sinuata, dein arcuata, ampliata, apicem versus attenuata, sinuata et apice breve truncata, magis duplo longiora quam sinu latiora, praecipue basin versus valde lineato-punctata, substriata; lineis juxta basin vicissim in puncto valido junctis, his punctis prothoracis basin praetextentibus. Long. 2 mill.

Subovale, environ trois fois et demie plus long que large dans sa plus grande largeur, convexe, un peu brillant, glabre; antennes et pattes brun de poix. Antennes épaisses; 1^{er} article arqué près de la base, environ une fois et demie plus long que large après la courbure de la base; 2^{me} subtransversal; 3^{me} environ deux fois plus large que long, 4^{me} un peu plus court que le précédent; 5^{me} à 8^{me} subégaux, environ trois fois plus larges que longs, 9^{me} un peu plus long et à peine plus large que le 8^{me}; 10^{me} et 11^{me} subégaux, un peu plus longs que 4^{me}, le dernier un peu plus étroit que le précédent. Tête triangulaire, deux fois plus large au niveau des yeux que longue; éparsément et irrégulièrement pointillée; côtes parallèles relevés chacun en lobe gibbeux, allongé, séparés par un intervalle subconcave, limité en avant par une faible impression; bord antérieur subtronqué; yeux assez saillants, placés au dessous de la base des antennes et séparés de celles-ci par un vague sillon antennaire. Prothorax faiblement bisinué de chaque côté, parallèle, plus convexe

en avant qu'à la base, environ aussi large que la tête au niveau des yeux, une fois et demie plus long que large, éparsément pointillé, coupé dans la longueur par une strie sulciforme, atténuée aux extrémités; bord antérieur arqué en avant, base saillante anguleusement en arrière au milieu; bords latéraux arrondis, marges latérales fortement infléchies, biimpressionnés. Ecusson très petit, oblong, allongé. Elytres émoussés aux épaules, alors un peu plus larges que le prothorax à la base, très brièvement sinués, puis arqués, élargis, présentant leur plus grande largeur vers le milieu de la longueur, longuement sinués et atténués vers l'extrémité, brièvement subtronqués ensemble au sommet. Ponctuation grosse, disposée en lignes substriées, atténuées vers le sommet; intervalles étroits, un peu relevés; lignes réunies deux à deux à la base, dans un gros point; ces divers points placés dans une large impression sulciforme bordant la base. Extrémité des élytres brièvement infléchie, subtronquée; stries suturales enfoncées au sommet. Métasternum éparsément pointillé de chaque côté du sillon longitudinal. Extrémité de l'abdomen brun de poix clair. Pattes robustes; tibias antérieurs et intermédiaires munis à l'angle apical interne d'une épine recourbie, saillante latéralement; tibias postérieurs prolongés à cet angle par une petite épine.

4 exemplaires.

Loc. SEYCHELLES. Silhouette: "High forest near Mont Pot-à-eau, ca. 1500 feet, and above Mare aux Cochons, over 1000 feet, viii.-ix. 1908."

PYCNOMERINI.

PYCNOMERUS, Erichson, 1848, in Wieg. Arch. I, p. 211.
subg. *Penthelispa*, Pascoe, 1860, Journ. of Ent. I,
p. 111.

6. *Pycnomerus (Penthelispa) confertus*, Reitter.

Penthelispa conferta, Reitter, 1878, Deutsche Ent. Zeitschr.,
p. 123.

Le type de l'espèce provient de Madagascar. *P. conferta*, Reitt., est très variable, comme taille, comme épaisseur des antennes et sculpture du prothorax. Sa caractéristique générale se réduit à: antennes courtes, articles 2^{me} et 3^{me} transversaux, 4^{me} à 9^{me} très transversaux; pronotum couvert d'une ponctuation irrégulièrement serrée, assez forte, en général un peu allongée, laissant libre, sur la moitié basilaire, un petit espace longitudinal; disque plus ou moins

biimpressionné. Stries des élytres bien marquées, fortement ponctuées; intervalles plus étroits que les stries. La forme voisine dans la faune indienne est *P. nitidicollis*, Reitt. Chez cette espèce la ponctuation du prothorax est en général un peu plus arrondie et les intervalles des stries des élytres sont aussi larges que les points.

Environ 215 exemplaires.

Loc. SEYCHELLES. Mahé, Silhouette, Praslin: "Mahé and Silhouette, throughout the mountain-forests, 1000-2000 feet. Praslin, one specimen from Côtés d'Or Estate, xi. 1908."

DITOMINI.

DITOMA, Herbst, 1793, Käfer, V, p. 26.

7. *Ditoma cavicollis*, n. sp. (Pl. I, fig. 6.)

Elongata, parallela, convexa, vix nitidula, flavo-pubesceus, ferruginea. Antennae breves, 11-articulatae; clava 3-articulata, 1° articulo quam 2° angustiore. Caput modice transversum, antice truncatum, inter antennarum bases profunde biimpressum et juxta basin reflexo-elevatum; fronte inter oculos dense punctato; epistomo crebre et vix perspicue punctulato; oculis magnis, modice prominulis. Prothorax subquadratus, lateribus tenuiter crenulatus, utrinque in longitudinem extus carinatus, retro intus hebetato-subcarinatus; intervallis: 1° inter latera et carinas concavis, fere bilineato-granosis; 2° inter carinas et elevationes hebetatas juxta carinam profunde impressis; 3° inter elevationes hebetatas antice valde longeque impresso et juxta basin triimpresso. Elytra circiter 2 et $\frac{1}{2}$ longiora quam simul latiora, in disco quadri-carinata: suturali et 1^a dorsali integris, 2^a dorsali et humerali fere juxta apicem evanescentibus; intervallis carinarum bilineato-punctatis; punctis subquadratis. Long. 2 mill.

Parallèle, environ trois fois et trois quart plus long que large, convexe, à peine brillant, ferrugineux, couvert d'une pubescence flave rappelant celle des *Ditoma*. Antennes de onze articles, terminées par une massue de trois articles; 1^{er} article cylindrique, un peu plus long que large, 2^{me} un peu moins épais, 3^{me} à 7^{me} progressivement un peu plus épais, 3^{me} un peu allongé, 4^{me} à 8^{me} serrés, les trois premiers plus transversaux que le dernier; 1^{er} article de la massue plus étroit * que les suivants, le dernier subglobuleux, environ

* D'après les auteurs, *Ditoma crenata*, Herbst, type du genre *Ditoma*, n'a pas de sillons antennaires et a les antennes terminées par une massue de deux articles. En réalité cet insecte a des rudiments de sillons antennaires qui permettent aux antennes de venir s'étendre dessous la tête pendant la position de repos, et ses antennes

deux fois plus long que les précédents. Tête un peu moins de deux fois plus large au niveau des yeux que longue, tronquée au bord antérieur, relevée de chaque côté contre la base de l'antenne et le bord interne de l'oeil, marquée contre ce relèvement, entre les yeux, par une impression striée oblique, arquée en dedans à la base, plus accentuée devant l'antenne et se réunissant en arrière par l'intermédiaire d'une faible impression arquée à l'impression correspondante; front subdéprimé, densément ponctué; épistome transversalement convexe, opaque; yeux gros, échanerant à peine les marges latérales du front. Prothorax subcarré, à peine plus large que long, finement crénelé sur les bords latéraux, marqué dans la longueur de quatre élévations granuleuses; les deux externes caréniformes, réfléchies contre le bord antérieur; les deux internes très légèrement flexueuses, caréniformes contre le bord antérieur, puis largement obtuses, se dilatant avant la base, enfermant alors une impression allongée et atteignant le sillon marginal de la base; intervalles: 1^o entre les bords latéraux et les carènes latérales concaves, marqués d'une double ligne de granulations presque régulière; 2^o entre les carènes latérales et les élévations internes, larges en avant contre le bord antérieur, rétrécis lorsque les élévations internes deviennent obtuses: 3^{me} entre les élévations internes, granuleux, largement et assez profondément excavé en avant, très étroit entre les dilatations basilaires des élévations internes; base bordée par un sillon entre les carènes latérales. Ecusson petit, suborbiculaire. Elytres environ deux fois et demie plus longs que larges, arrondis ensemble au sommet, carénés comme ceux des *Ditoma*; carènes suturales et 1^{eres} dorsales entières, 2^{me} dorsale et humérale s'arrêtant très près du bord marginal; lignes de points des intervalles des carènes séparées par un intervalle égal aux points, ceux-ci subcarrés. Marges latérales avec deux lignes de points, une carène entière et une ligne marginale de points. Sillons antennaires nuls; yeux gros, entaillant fortement les marges latérales-inférieures de la tête.

2 exemplaires.

Loc. SEYCHELLES. Silhouette: "Forest near Mare aux Cochons, ca. 1000 feet, viii.-ix. 1908."

ont une massue de deux articles préparée par un article beaucoup plus étroit que la massue décrite par les auteurs, mais nettement plus large que l'article précédent. Enfin les yeux s'étendent en dessous de la tête, alors que chez les *Trionus*, Fairm., anciens *Ditoma* à sillons antennaires, ils se trouvent limités par ce sillon et sont par suite entièrement latéraux.

Les *Xuthia*, Pas., présentent les mêmes caractères et sont en fait très rapprochés des *Ditoma* type *crenata*. Ils ont le bord latéral du prothorax épais, sillonné.

XUTHIA, Pascoe, 1863, Journ. of Ent., II, p. 28, pl. 8, f. 1.

8. *Xuthia sicana*, Pascoe.

Xuthia sicana, Pascoe, 1863, l. c.

Xuthia maura, Pascoe, 1863, l. c.

Xuthia rufina, Pascoe, 1863, l. c.

Espèce répandue dans toutes les Indes orientales; très variable.

66 exemplaires.

Loc. SEYCHELLES. Silhouette, Mahé, Félicité: "Silhouette; sixty specimens from under bark of felled trunks of a dicotyledonous tree, near the coast at Pointe Etienne, 17. ix. 1908; also four specimens from elevations of 1000 feet or more. Mahé, one specimen from Mare aux Cochons district, 1000-2000 feet, i. 1909. Félicité, one specimen from forest, xii. 1908."

CICONES, Curtis, 1826, Brit. Ent., IV, f. 149.

9. *Cicones scotti*, n. sp. (Pl. II, fig. 9.)

Ovatus, modice convexus, nitidulus, squamulis plus minusve albido-ochraceis, ex parte infuscatis vestitus, brunneus; elytris ochraceo-testaceo-variegatis, antennis clava excepta piceo-testaccis, pedibus dilutioribus. Antennae breves; clava globosa, quam articulis praecedentibus multo latiore. Caput modice transversum, antice sinuatum, fronte depressum, antice, inter oculos, utrinque oblique substriolatum; fronte tenuiter punctulata, subdense squamosa; oculis elongatis, parum prominulis. Prothorax antice quam postice angustior, lateribus arcuatus, circiter in maxima latitudine sesquialior quam longior; margine antico medio rotundato-producto, utrinque sat valde sinuato; angulis anticis subacutis; lateribus antice subsinuatis, vix perspicue crenulatis, tenuissime ciliatis; angulis posticis obtusis; basi utrinque late subsinuata, tenuiter striato-marginata, praecipue medio ciliata; disco plus minusve dense tenuissimeque punctulato, dense squamoso, aliquibus squamulis obscuris intermixtis. Elytra humeris subangulosa, lateribus arcuata, amplata, apice conjunctim subacuminata, circiter sesquilongiora quam in maxima latitudine latiora, striato-punctata; intervallis latis, unilineato-punctulatis, praecipue ad basin transversim vix striolatis; squamulis validioribus in intervallis, minoribus in striis instructis; squamulis infuscatis in partibus obscurioribus praecipue congregatis. Long. 2-2.7 mill.

Ovale, atténué vers l'avant, environ deux fois et demie plus long que large dans sa plus grande largeur, modérément convexe, un peu brillant, couvert de squamules blanchâtres ou d'un jaune-blanchâtre entremêlées de squamules foncées, localisées, sur les élytres, sur la partie foncée du tégument; brun un peu rougeâtre, varié sur les élytres de taches, testacées, un peu ferrugineuses. Antennes courtes; 1^{er} article épais, un peu plus long que large; 2^{me} encore épais, une fois et demie plus long que large; 3^{me} plus de deux fois plus long que large, 4^{me} allongé, 5^{me} à 9^{me} progressivement un peu plus épais, 5^{me} subarrêté, les autres subégaux, 10^{me} subglobuleux, un peu plus long que large, plus de quatre fois plus large que le précédent, bordé sauf contre l'insertion avec l'article précédent par une marge feutrée. Tête nettement moins de deux fois plus large au niveau des yeux que longue, sinuée au bord antérieur, déprimée sur le front, finement pointillée, densément couvert de squamules allongées, couchées, orientées dans la longueur, serrées, bordant l'orbite des yeux et entremêlées de quelques squamules plus petites; yeux allongés, peu saillants, échancrant modérément les marges latérales du front; épistome un peu convexe, très densément et très finement pointillé, séparé du front par deux faibles stries obliques; labre assez grand. Prothorax un peu plus rétréci en avant qu'à la base, arrondi sur les côtés, présentant sa plus grande largeur un peu au delà du milieu de la longueur à partir de la base; bord antérieur subtronqué, assez fortement sinué de chaque côté, cilié plus fortement au milieu; angles antérieurs aigus, un peu saillants en avant, côtés très brièvement sinués en avant, à peine visiblement crénelés, très finement ciliés; angles postérieurs obtus; base arrondie au milieu, sinuée de chaque côté, étroitement rebordée-striée, ciliée au milieu; squamules serrées, couvrant la majeure partie du pronotum, laissant libres, de chaque côté, trois petits espaces mal définis: le premier longitudinal, près du milieu, sur la moitié basilaire de la longueur, le 2^{me} allongé, contre la base, plus près de l'angle postérieur que du milieu, le 3^{me} sur le prolongement du 2^{me}, sur la moitié antérieure du disque; squamules en général transversales ou subtransversales en avant, obliques en arrière. Ecusson très transversal, largement arrondi au sommet, bordé de squamules à la base. Elytres un peu plus larges à la base que le prothorax, à peine arrondis aux épaules, arqués sur les côtés, présentant leur plus grande largeur vers le premier tiers de la longueur à partir du sommet, atténués ensuite vers l'extrémité et subacuminés ensemble au sommet, striés-punctués. Stries atténuées vers le sommet; intervalles larges, subondulés, chacun avec une ligne de petits points. Squamules fortes placées sur les intervalles des stries; squamules plus faibles placées sur les stries; squamules claires dessinant principalement: 1^o une tache

scutellaire; 2° une bande arquée, partant sur chaque élytre de l'épaule et atteignant presque la suture; 3° après et contre le milieu une bande transversale, plus ou moins interrompue, remontant sur la suture; 4° une bande transversale, antéapicale, très atténuée sur la suture; 5° une tache apicale. Marges latérales étroitement réfléchies, bordées par une frange de petites squamules. Dessous du corps brun rougeâtre; sillons antennaires convergents.

15 exemplaires.

Loc. SEYCHELLES. Silhouette: "From forests near Mont Pot-à-eau and Mare aux Cochons, between 1000 and 2000 feet, viii.-ix. 1908."

10. *Cicones compactus*, n. sp. (Pl. II, fig. 16.)

Vix ovatus, convexus, opacus, nigro-brunneus, antennis, pedibus et prothoracis marginibus reflexis rufo-testaceus, setis squamiformibus, brevissimis, albido-ochraceis vestitus. Antennae breves, graciles; 3° articulo subquadrato, clava glandiformi, sesquilongiore quam latiore, fere quater latiore quam 9° articulo. Caput transversum, fronte depressum, antice subtruncatum, parce punctulatum et squamosum; marginibus lateralibus squamoso-ciliatis. Prothorax antice quam postice parum magis angustatus, lateribus extra basin valde rotundatus, modice arcuatus, in maxima latitudine paulo magis duplo latior quam longior; margine antico medio arcuato utrinque sinuato, breviter squamoso-ciliato; angulis anticis subrectis, hebetatis; lateribus sublatae concavo-explanatis, tenuiter ciliatis; angulis posticis rectis; basi medio arcuata, utrinque late sinuata, sulco et linea squamosa marginata; disco ante basin quatuor impressionibus laevibus, magnis, notato; squamulis praecipue circa impressiones densatis. Elytra humeris rotundata, tunc quam prothorax vix latiora, apicem versus subrecte parum ampliata, dein arcuata et apice conjunctim late subacuminata, fere sesquilongiora quam simul in maxima latitudine latiora; squamulis ineatodispositis. Long. 1.5 mill.

A peine ovale, atténué vers l'avant, presque deux fois et demie plus long que large dans sa plus grande largeur, convexe surtout sur les élytres, opaque, brun noirâtre sur les élytres, un peu rougeâtre sur la tête et le prothorax; marges réfléchies de ce dernier, antennes et pattes roux testacé; vestiture composée de squamules courtes, jaune-blanchâtres, disposées en lignes sur les élytres. Antennes courtes, grêles; 1^{er} article épais, plus long que large, caché lorsque l'insecte est vu de dessus, 2^{me} encore épais, subcarré; 3^{me} et 4^{me} subcarrés, 5^{me} à 9^{me} transversaux; 9^{me} à peine plus large que 8^{me}, massue glandiforme, environ une fois et demie plus long que large,

presque quatre fois plus large, dans sa plus grande largeur, que 9^{me}. Tête environ deux fois plus large au niveau des yeux que longue, déprimée, subtronquée au bord antérieur, légèrement élargie en avant des yeux; très opaque, couverte de squamules espacées et bordée sur les marges latérales par une frange de squamules serrées; yeux échançant les marges latérales du front, allongés, peu saillants, leurs bords internes convergents en avant. Prothorax un peu plus rétréci en avant qu'à la base, arqué sur les côtés, un peu plus de deux fois plus large dans sa plus grande largeur que long; bord antérieur arrondi dans le milieu, sinué de chaque côté, cilié; angles antérieurs à peine aigus, émoussés; côtés finement ciliés; marges latérales assez largement explanées-concaves; angles postérieurs droits; base arrondie au milieu, longuement sinuée de chaque côté, bordée par un sillon et par un bourrelet portant une ligne de squamules; disque fortement convexe contre le sillon basilaire, marqué sur la moitié basilaire de quatre impressions oblongues, allongées, assez rapprochées, peu profondes, les deux externes moins accentués, et sur le milieu du disque, en avant, d'une petite impression également oblongue et allongée; squamules assez serrées, laissant libre l'impression antérieure et les deux impressions médiales postérieures. Ecusson petit, suborbiculaire. Elytres arqués de chaque côté à la base, arrondis aux épaules, à peine arqués ensuite sur les côtés et un peu élargis, présentant leur plus grande largeur vers le deuxième tiers de la longueur à partir de la base, atténués vers l'extrémité sur le dernier tiers de la longueur, et largement subaeuminés ensemble au sommet, presque une fois et demie plus longs que larges ensemble, couverts de squamules disposées en lignes sur le disque et bordant la base; intervalles larges, chacun avec une ligne de gros points et de très petites soies; marges latérales étroitement réfléchies, finement ciliées. Dessous du corps brun rougeâtre. Sillons antennaires allongés, convergents. Saillie prosternale carénée. Cavités des hanches antérieures ouvertes. Hanches intermédiaires et postérieures assez écartées; saillie du premier segment de l'abdomen arrondie. 3^{me} segment de l'abdomen échancré au sommet. Pattes grêles; tibias sans épine terminale.

1 exemplaire.

Loc. SEYCHELLES. Mahé: " Cascade Estate, about 1000 feet, 1908."

COLOBICONES, nov. gen.

Antennae 10-articulatae; clava uniaarticulata, globosa. Suli antennarum nulli. Mandibulae productae, apice bicuspes. Tempora elongata; capitis anguli postici obtusi. Prothorax utrinque

in longitudinem granoso-bilineatus. Elytra punctato-striata. Coxae anticae intermediaeque valde admotae. Abdominis segmenta apice truncata; 1° inter coxas posticas acuto-producto; ultimo excavato. Tibiae lineares, apice spina minima armatae.

Ce nouveau genre appartient à la tribu des Ditomini; il vient se placer entre les *Cicones*, les *Ditoma* et les *Colobicus*.

11. *Colobicones singularis*, n. sp. (Pl. I, fig. 8.)

Oblongo-elongatus, fere 3 et $\frac{2}{3}$ longior quam lator, convexus, nitidulus, ferrugineus, setis flavis erectis sat elongatis parcissime vestitus. Antennae subbreves; articulis 3°-9° densatis, plus minusve transversis; 10° subgloboso, apice pubescenti. Caput fere tam elongatum quam latum, antice attenuatum, apice latissime arcuatum, inter oculos transversim impressum et granoso-lineatum; fronte convexiuscula, in longitudinem pluribus sulcis vix impressis secata. Prothorax antice quam postice vix angustior, lateribus subrectus, 1 et $\frac{1}{3}$ lator quam longior, in maxima parte tuberculis, magnis, depressisimis, densatis, ocellatis instructus, utrinque in longitudinem granoso-bilineatus; margine antico medio subarcuato, ad extremitates sinuato; angulis anticis subacutis; lateribus vix undulatis; angulis posticis obtusis, vix perspicue spinosis; basi arcuata, sulco punctato marginata. Scutellum minutissimum, laeve. Elytra subparallela, apice conjunctim subaeuminata, circiter 2 et $\frac{1}{4}$ longiora quam simul latiora, punctata-striata; punctis juxta apicem attenuatis; intervallis striarum in disco quam punctis parum angustioribus; striis suturalibus praecipue ad apicem magis impressis. Long. 1.5 mill.

Allongé, un peu oblong, presque trois fois et deux tiers plus long que large dans sa plus grande largeur, convexe, un peu brillant, ferrugineux, présentant sur la partie postérieure des élytres * des poils flaves, dressés, assez longs, très espacés. Antennes assez courtes, insérées contre les yeux; 1^{er} article environ une fois et demie plus long que large, 2^{me} un peu plus long que large, 3^{me} à peine plus long que large, 4^{me} à 9^{me} subégaux, transversaux, 10^{me} subglobuleux, environ trois fois plus large que le 9^{me} article, terminé par une calotte pubescente. Tête subovale, moins de deux fois plus large au niveau des yeux que longue, très largement arquée au bord antérieur, coupée entre les yeux par une impression large, peu profonde, marquée d'une ligne de granulations; région en avant.

* The erect hairs are most noticeable on the posterior part of the elytra, but are present also on other parts of the body, as indicated in the figure.

de cette impression transversalement relevé entre les naissances des antennes, présentant à la base deux petits tubercules, région en arrière présentant de chaque côté quatre courtes carènes longitudinales peu accentuées; yeux petits, non saillants; tempes plus longues que les yeux, subparallèles; angles postérieurs obtus; labre subtrapézoïdal, environ trois fois plus large à la base que long. Prothorax un peu plus large en avant qu'à la base, très faiblement arqué sur les côtés, environ une fois et un tiers plus large que long, couvert, sauf sur le milieu de la marge antérieure, de gros tubercules très déprimés, ocellés et serrés, présentant de chaque côté deux lignes rapprochés de granulations; ligne externe un peu plus accentuée que l'interne, atteignant la base, infléchie en dedans au sommet; ligne interne effacée à la base; bord antérieur un peu arqué dans le milieu, brièvement et assez fortement sinué vers les extrémités, bordé au milieu par une ligne de petites granulations; angles antérieurs aigus, un peu saillants en avant; bords latéraux légèrement ondulés, armés de quelques soies dressées; angles postérieurs obtus; base arquée en arrière, bordée par un assez fort sillon ponctué. Ecusson très petit, lisse. Elytres brièvement arrondis aux épaules, arqués sur les côtés, à peine élargis, brièvement arrondis ensemble au sommet, environ deux fois et un quart plus longs que larges ensemble dans leur plus grande largeur, assez fortement ponctués en lignes, substriés; points atténués contre le sommet et vers les marges latérales; intervalles discoïdaux, au plus aussi larges que les points; stries suturales relativement enfoncées, surtout sur le disque. Menton présentant à la base trois courtes carènes longitudinales. Prosternum et métasternum grossièrement, peu profondément et densément ponctué. Abdomen presque lisse.

1 exemplaire.

Loc. SEYCHELLES. Mahé: "Cascade Estate, about 1000 feet, 1908."

DIPLOTOMA, Erichson, 1845, in Germar, Zeitschr., p. 257, note 4.

12. *Diplotoma capito*, n. sp. (Pl. II, fig. 11.)

Suboblonga, convexa, nitidula, ferruginea, capite subinfusca, scis squamiformibus, brevissimis, albido-ochraceis vestita. Antennae subgraciles; 3^o articulo parum elongato; clava bi-articulata, fere duplo longiore quam latiore, 2^o articulo quam primo angustiore. Caput transversum, convexiusculum, antice breviter subtruncatum, subdense squamosum; marginibus lateralibus antice squamosociliatis. Prothorax antice quam postice paulo angustior, lateribus

antice rotundatus, postice longe subarcuatus, circiter duplo latior quam longior, præcipue ad marginis antici medium subdense squamosus; margine antico arcuato, ciliato, ad extremitates vix sinuato; angulis anticis fere rotundatis; lateribus tenuiter marginatis, ciliatis; angulis posticis obtusis; basi medio subangulose producta, utrinque sinuata, sulco et pulvino squamoso marginata. Scutellum infuscatum. Elytra humeris vix perspicue angulosa, lateribus arcuata, parum ampliata, apice conjunctim late subaeuminata, fere sesquolongiora quam simul in maxima latitudine latiora; squamulis lineato-dispositis. Long. 1.4 mill.

Suboblong, atténué vers l'avant, environ deux fois et demie plus long que large dans sa plus grande largeur, convexe, un peu brillant; ferrugineux, assombri sur le front et sur l'écusson, plus clair sur les antennes et les pattes, couvert de squamules blanchâtres, disposées en lignes sur les élytres. Antennes courtes, modérément grêles; 1^{er} article épais, allongé, caché lorsque l'insect est vu de dessus, 2^{me} encore épais, un peu allongé, 3^{me} subarrêté, 4^{me} à 9^{me} progressivement plus transversaux, 10^{me} et 11^{me} formant une massue environ deux fois plus longue que large, dont le 1^{er} article est environ trois fois plus large en avant que le 9^{me} article, et dont le dernier article, plus étroit que le 10^{me}, est suboblong. Tête grosse, égale en longueur environ aux deux tiers de la longueur du pronotum, environ deux fois plus large au niveau des yeux que longue, légèrement convexe, brièvement subtronquée au bord antérieur, assez saillante en avant des bases des antennes, assez densément couverte de squamules; bords latéraux très convergents en avant des bases des antennes, modérément entre les antennes et la base des yeux, échancrés par ceux-ci, ciliés surtout en avant; yeux plutôt gros, médiocrement saillants. Prothorax un peu plus rétréci en avant qu'à la base, arrondi sur les côtés, puis longuement subarqué, faiblement atténué vers la base, environ deux fois plus large dans sa plus grande largeur que long; bord antérieur faiblement arqué, très brièvement sinué aux extrémités, assez longuement cilié dans le milieu; angles antérieurs presque arrondis; côtés ciliés et étroitement rebordés par un fin bourrelet limité en dedans par une ligne de squamules allongées; angles postérieurs obtus; base saillante anguleusement en arrière dans le milieu, longuement sinuée de chaque côté, bordée par une ligne de squamules et un sillon droit; disque assez fortement et très brièvement convexe contre le sillon basilair, assez densément couvert de squamules dessinant un point de convergence vers le milieu du bord antérieur, squamules laissant libre de chaque côté contre la bordure latérale une marge relativement large. Escusson petit, suborbiculaire. Elytres arrondis

séparément à la base, arrondis aux épaules, à peine visiblement anguleux, alors un peu plus larges ensemble que le prothorax dans sa plus grande largeur, s'élargissant presque en ligne droite jusqu'au deuxième tiers de la longueur à partir de la base, puis arqués-atténués vers l'extrémité et largement subacuminés ensemble au sommet, presque une fois et demie plus longs que larges ensemble dans leur plus grande largeur, ponctués en lignes; squamules disposées en ligne sur les intervalles. Marges latérales fortement infléchies; ligne ponctuée marginale plus marquée, un peu enfoncée; bord marginal bordé par un fin bourrelet squameux. Dessous du corps ferrugineux, un peu rougeâtre; poitrine enfoncée. Sillons antennaires nuls. Cavités des hanches antérieures ouvertes. Saillie du premier segment de l'abdomen entre les hanches postérieures aigüe, émoussée. Pattes linéaires; tibias sans épine apicale.

1 exemplaire.

Loc. SEYCHELLES. Mahé: "From stunted forest vegetation on summit of Mount Sebert, about 1800 feet, i. 1909."

NEOTRICHUS, Sharp, 1885, Journ. Linn. Soc. Lond., Zool., XIX, p. 60.

13. *Neotrichus gardineri*, n. sp.

Elongatus, subparallelus, modice convexus, opacus, setis flavis, brevissimis parce vestitus, ater, antennis extra ultimum articulum pedibusque rufo-fuscis. Antennae breves, 10-articulatae, ultimo articulo obconico, apice pulvino minimo dilutiore instructo. Caput transversum, lateribus antrorsum attenuatum, antice medio truncatum et ad extremitates sinuatum, sat dense tenuiterque granosum; oculis modice prominulis; temporibus nullis. Prothorax antice capite latior, lateribus rectus, basin versus parum angustatus, in maxima latitudine paulo longior quam antice latior, densius et validius quam caput granosus; margine antico antrorsum arcuato, utrinque sat valide sinuato; lateribus denticulatis, denticulis basin versus paulatim majoribus; basi retrorsum arcuata, sulcato-marginata. Scutellum minimum, subtrapezoidale. Elytra basi quam prothorax latiora, 3 et $\frac{1}{2}$ longiora quam simul latiora, apice separatim breviter rotundata, punctato-striata; punctorum intervallis transversim striolatis; setis in striarum intervallis insertis. Long. 3.5-4.5 mill.

Allongé, subparallèle, modérément convexe, étroitement déprimé sur le disque des élytres, opaque, noir avec les antennes sauf le dernier article roux-enfumé, couvert de soies flaves, dressées, très

courtes, insérées sur les intervalles des stries des élytres. Antennes courtes, de 10 articles, terminées par une massue d'un article; 1^{er} article subcarré, épais, caché lorsque l'insecte est vu de dessus, 2^{me} encore épais, suborbiculaire, 3^{me} plus de deux fois plus long que large, 4^{me} et 5^{me} subglobuleux, 6^{me} à 8^{me} à peine plus étroit que les précédents, transversaux, oblongs, 9^{me} à peine plus long et à peine plus large que 8^{me}, 10^{me} en forme de tronc de cône renversé, sensiblement aussi long que large en avant, au moins deux fois et demie plus large en avant que le 9^{me} article, terminé par un petit bouton plus clair, cylindrique. Tête presque deux fois plus large au niveau des yeux que longue, subtronquée au milieu du bord antérieur et sinuée de chaque côté, droite sur les côtés et atténuée en avant, déprimée et couverte de granulations serrées, assez fines sur le front, presque impressionnée en arc entre les bases des antennes et infléchi-déprimée; éparsément ponctuée en avant de cette impression. Yeux moyens, à peine pubescents, n'échancrant pas les marges latérales du front, un peu saillants. Sillons antennaires légèrement convergents. Prothorax plus large en avant que la tête, faiblement rétréci vers la base, environ aussi long dans sa plus grande longueur que large en avant, couvert de granulations plus fortes et un peu plus serrées que celles de la tête; bord antérieur arqué en avant, assez profondément sinue de chaque côté, très légèrement relevé en bourrelet vers les extrémités; angles antérieurs aigus, émoussés, saillants en avant; côtés droits, armés de denticules très fins et très serrés en avant, progressivement plus forts et plus espacés vers la base; marges latérales fortement infléchies, surtout au milieu, bordées par la denticulation; angles postérieurs obtus; base fortement arquée en arrière, à peine subsinuée aux extrémités, étroitement bordée par un sillon et par un bourrelet granuleux. Ecusson petit, suboblong, transversal. Elytres parallèles, plus larges que le prothorax en avant, environ trois fois et demie plus longs que larges ensemble, brièvement et séparément arrondis au sommet, assez densément ponctués-striés; points crénelant les intervalles et leur donnant un aspect ondulé; ceux-ci marqués d'une ligne de très petits points; stries des marges latérales se réunissant vers le sommet aux stries discoïdales et enfermant les stries des régions humérales et subhumérales; marges latérales très fortement infléchies, étroitement bordées par une strie marquée de gros points espacés. Dessous du corps brun rougeâtre, densément et peu profondément ponctué; dernier segment de l'abdomen concave. Tibias linéaires, sans épines à l'extrémité

3 exemplaires.

Loc SEYCHELLES. Silhouette, Mahé: .. Silhouette, one

specimen from the high forest near Mont Pot-à-eau, ca. 1500 feet, and one from a low elevation near Pointe Etienne, viii.-ix, 1908. Mahé, one specimen from Cascade Estate, at about 1000 feet."

14. *Neotrichus parallelocollis*, n. sp.

Elongatus, parallelus, modice convexus, subopacus, setis brevissimis, squamiformibus, in elytris lineato-dispositis, flavis vestitus, nigricans; pedibus fusco-rufis, antennis dilutioribus. Antennae subbreves, 10-articulatae; ultimo articulo obconico, apice pulvinae minimo instructo. Caput transversum, lateribus antrorsum attenuatum, antice medio truncatum et ad extremitates sinuatum, subdense tenuiterque granosum, inter antennarum bases oblique bimpressum; oculis parum productis. Prothorax antice capite latior, lateribus parallelus, fere in maxima latitudine tam longior quam latior, densius et paulo validius quam caput granosus; margine antico antrorsum arcuato, ad extremitates sinuato, pulvinato-marginato; lateribus tenuiter denticulatis, denticulis basin versus paulatim majoribus; basi retrorsum arcuata, vix perspicue sulcato-marginata. Scutellum minimum, suboblongum. Elytra basi prothorace paulo latiora, fere ter longiora quam simul latiora, apice vix separatim breviter rotundata, stricte et sat profunde punctato-striata; striarum intervallis transversim striolatis et irregulariter bilineato-granosis. Long. 3.7 mill.

Allongé, parallèle, modérément convexe, étroitement subdéprimé sur le disque des élytres, à peine brillant, noirâtre; avec les pattes roux-enfumé et les antennes plus claires, couvert de soies squamiformes, flaves, très courtes, dressées, disposées en lignes sur les élytres. Antennes médiocrement courtes, de 10 articles, terminés par une massue d'un article; 1^{er} article épais, subcarré, caché lorsque l'insecte est vu de dessus, 2^{me} encore épais, suboblong, un peu plus long que large, 3^{me} presque trois fois plus long que large, 4^{me} à 9^{me} s'épaississant faiblement et progressivement, subégaux, transversaux, 10^{me} presque en forme de tronc de cône renversé, environ deux fois aussi large en avant que l'article précédent et aussi long que large en avant, terminé par un petit bouton cylindrique. Tête environ deux fois plus large au niveau des yeux que longue, subtronquée au milieu du bord antérieur et sinuée aux extrémités, droite sur les côtés et atténuée en avant, déprimée sur le front, couverte de granulations assez serrées, fines, marquée de chaque côté entre les bases des antennes d'une forte impression arquée en dedans, ponctuée sur la marge antérieure. Yeux moyens, à peine

pubescents, n'échancrant pas les marges latérales du front, un peu saillants. Sillons antennaires convergents. Prothorax plus large en avant que la tête, parallèle, environ aussi long dans sa plus grande longueur que large, couvert de granulations plus denses et un peu plus fortes que celles de la tête; bord antérieur arqué en avant, très brièvement sinué aux extrémités, bordé par un bourrelet modérément accentué, dilaté dans la partie médiane; angles antérieurs droits; côtés droits, armés de petits denticules progressivement un peu plus forts vers la base; marges latérales un peu obliquement infléchies; angles postérieurs un peu obtus; base arquée en arrière, bordée par un bourrelet granuleux et par un sillon, tous deux peu marqués. Ecusson petit, oblong, transversal. Elytres arrondis aux épaules, parallèles, alors un peu plus larges que le prothorax à la base, presque trois fois plus longs que larges ensemble, presque brièvement et séparément arrondis au sommet, étroitement et assez profondément ponctués-striés; intervalles coupés transversalement par des stries partant des points des stries; intervalles entre ces stries avec deux granulations irrégulières souvent réunies, donnant l'impression lorsque l'insecte est vu dans la longueur de deux lignes de granulations dont l'interne est plus accentuée. Sculpture sur la marge basilaire réduite à des granulations disposées en lignes, cinquième et onzième intervalle de ces lignes brièvement un peu relevés. Marges latérales fortement infléchies, à peine rebordées. Dessous du corps noirâtre, densément ponctué; dernier segment de l'abdomen concave. Tibias linéaires, sans épine à l'extrémité.

2 exemplaires.

Loc. SEYCHELLES. Mahé: "Cascade Estate, about 1000 feet."

LASCOTONUS, Grouvelle, 1895. Bull. Museum Paris, No. 4, p. 156.

15. *Lascotonus scotti*, n. sp. (Pl. I, fig. 3.)

Elongatus, parallelus, convexus, opacus, setis flavis, brevibus, erectis sat dense vestitus, nigricans; antennis pedibusque rufifuscis, elytris sordido-aurantiaco-variegatis. Antennae breves; 3° articulo subtransverso, clava fere triarticulata, 1° articulo transversissimo basi quam praecedente vix abrupte latiore, 2° quam 1° latiore, transversissimo, 3° quam praecedente angustiore, subgloboso, 2° et 3° dilutioribus. Caput transversum, subparallelum, antice medio rotundato-productum, utrinque breviter truncatum, granosum; oculis glabris, modicissime productis. Prothorax basin

versus vix attenuatus, I et $\frac{1}{5}$ longior quam antice latior, dense granosus; margine antico antrorsum arcuato, ad extremitates sinuato, pulvinato-marginato, pulvino ad medium ampliato et retrorsum angulatum producto; lateribus tenuiter denticulatis; basi arcuata, ad extremitates subsulcato-marginata. Scutellum minimum, oblongo-elongatum. Elytra circiter 3 et $\frac{1}{3}$ longiora quam simul latiora, apice conjunctim breviter rotundata, striato-punctata; intervallis planis quam punctis latioribus; setis erectis in punctis insertis; singulo elythro duabus maculis aurantiacis notato: 1^a humerali, magna, subquadrata; 2^a juxta suturam, discoidali, elongatissima, lata, extus medio quadratim laciniata. Long. 3.5-4.5 mill.

Allongé, parallèle, environ quatre fois et deux tiers plus long que large, convexe, opaque, noirâtre, varié sur les élytres de jaune-orange un peu sale, couvert de soies flaves, dressées, courtes, assez serrées, insérées sur les élytres sur les points des stries. Antennes et pattes roux, plus ou moins un peu enfumé; les deux derniers articles des antennes un peu plus clairs que les précédents. Antennes courtées; 1^{er} article court, épais, caché lorsque l'insecte est vu de dessus; 2^{me} épais, obconique, aussi long que large en avant; 3^{me} modérément transversal; 4^{me} à 8^{me} subégaux, plus courts que 3^{me}; 9^{me} à 11^{me} formant une massue légèrement dissymétrique, dont le 1^{er} article, obconique, très large en avant, est à peine plus large à la base que le précédent, le 2^{me} est un peu plus long et nettement plus large que le 1^{er}, et le 3^{me} est suboblong, subégal au 2^{me} et plus étroit que lui. Tête environ une fois et un tiers plus large au niveau des yeux que longue, parallèle, largement arrondie au milieu du bord antérieur, tronquée vers les extrémités, densément couverte de granulations; front déprimé, très légèrement concave entre les naissances des antennes; labre très transversal; yeux glabres, peu saillants; tempes petites, convergentes en avant; angles postérieurs de la tête un peu obtus. Prothorax à peine rétréci vers la base, droit sur les côtés, environ une fois et un cinquième plus long que large, couvert de granulations déprimées, serrées, plus fortes que celle de la tête; bord antérieur arqué en avant, sinué aux extrémités, bordé par un bourrelet qui s'élargit vers le milieu et s'avance vers l'arrière en angle obtus; côtés assez finement denticulés, étroitement rebordés; base faiblement arquée vers l'arrière, bordée, sauf au milieu, par un sillon peu marqué, prolongeant le sillon qui borde les marges latérales. Écusson petit, oblong, plus long que large. Elytres environ trois fois et un tiers plus longs que larges ensemble, brièvement arrondis ensemble au sommet, striés-punctués; stries entières, intervalles plans, sur le disque plus larges que les points

des stries; marges latérales très fortement infléchies, bordées par une forte strie ponctuée. Chaque élytre marqué de deux taches orangées, un peu enfumées: la 1^{ère} humérale, assez grande, subrectangulaire; la 2^{me} sur le disque, contre la suture, un peu plus rapprochée du sommet que de la base, s'étendant environ sur la moitié de la longueur de l'élytre, atteignant en avant et en arrière la strie humérale et découpée au milieu du bord externe, presque en carré, jusqu'à la 2^{me} strie discoidale. Dessous du corps brun rougeâtre, finement granuleux. Antennes du mâle un peu plus longues et un peu moins épaisses que celles de la femelle.

Lorsque la coloration de l'insecte n'est pas complètement développée, la teinte orangée envahit plus ou moins la tête et le pronotum.

17 exemplaires.

Loc. SEYCHELLES. Silhouette: "Three specimens from near Mont Pot-à-eau, ca. 1500 feet, viii. 1908, and fourteen specimens from under the bark of felled trees, in company with the large series of *Xuthia sicana*, near the coast at Pointe Etienne, ix. 1908."

COXELINI.

PARALYREUS, nov. gen.

Antennae 8-articulatae; basi occulta; clava uniarticulata, oblonga. Sulci antennales nulli. Oculi nulli.* Coxarum anticarum acetabulae apertae. Metasternum et abdominis primum segmentum aequalia. Processus intercoxale coxarum postiarum sublatum, subtruncatum. Pedes lineares. Tarsi omnes breves, triarticulati.

Le type de ce genre, *Paralyreus scotti*, est représenté par un exemplaire unique, qui comme aspect général rappelle, jusqu'à un certain point, les *Anommatus*. Sa position générique parmi les Coxelini, à côté des *Lyreus*, se trouve nettement définie par l'insertion des antennes cachée sous les marges du front, l'écartement relatif des hanches postérieures, l'absence de sillons et fossettes antennaires.

* The single specimen of *Paralyreus scotti* is entirely devoid of metathorac wings: [cf. *Cerylon curtulum* and *Thyroderus sculpticollis*, pp. 41, 45, footnote.] The diagnosis contains the words "oculi nulli." A compound microscope, however, shows that reduced eyes are present, consisting of a single, round, simple facet on either side of the head. They are very minute and not easy to distinguish, since they are not black-pigmented, but of the same colour as the surrounding chitin.—H. S.

16. *Pa:alyreus scotti*, n. sp. (Pl. II, fig. 15.)

Oblongo-clongatus, fere ter longior quam latior, convexus, nitidus, pilis brevibus, erectis, sparsis, vix perspicuis vestitus, testaceus. Antennae breves, 8-articulatae; 1^o incrassato, subquadrato, 2^o paulo angustiore, subtransverso; 3^o-7^o paulatim vix incrassatis, 3^o subtransverso, aliis transversis, densatis; 8^o oblongo, quam praecedente magis ter latiore, intus quam extus paulo magis ampliato, in tribus partibus transversis diviso. Caput ad basin, ante antennarum bases, sat longe subparallelum, antice subtriangulare, antice truneatum, inter antennarum bases tenuiter striatum, parce tenuiterque punctatus; oculis deletis; labro magno, subhemicirculare. Prothorax postice quam antice vix angustior, lateribus modice arcuatus, sesquolongior quam latior, parce subtenuiterque punctatus, margine antico vix arcuato, angulis anticis obtusis; lateribus tenuissime marginatis et vix perspicue crenulatis; basi subtruncata, tenuiter marginata. Scutellum subtriangulare, minimum. Elytra basi quam prothoracis basis vix latiora, humeris obtuse angulosa, tunc quam prothorax vix latiora, lateribus arcuata, subampliata, apice conjunctim subacuminata, circiter sesquilingiora quam simul latiora, confuse subdenseque punctata; marginibus lateralibus strictissime marginatis, vix perspicue crenulatis. Pedes tenues; tibiis linearibus. Long. 1.5 mill.

Oblong, presque trois fois plus long que large dans sa plus grande largeur, convexe, brillant, testacé, un peu rembruni sur le milieu de la poitrine, orné d'une pubescence peu visible formée de petits poils, dressés, fins, espacés, visibles surtout lorsque l'insecte est vu de profil. Antennes très courtes, un peu épaisses, de 8 articles; le 1^{er} subcarré, épaissi, caché lorsque l'insecte est vu de dessus, le 2^{me} encore un peu épaissi, subtransversal, les 3^{me} à 7^{me} serrés, progressivement et très faiblement épaissis, 3^{me} subtransversal, 4^{me} à 7^{me} plus ou moins transversaux, 8^{me} suboblong, environ une fois et un tiers plus long que large, plus de trois fois plus large que le sommet de l'article précédent, un peu plus dilaté en dedans qu'en dehors, partagé en trois zones successivement un peu plus étroites, plus ou moins pubescentes, la première aussi longue que les deux autres réunies. Tête environ aussi longue que large, subparallèle à la base jusqu'à l'insertion des antennes, triangulaire en avant; yeux nuls; front faiblement convexe, éparsément pointillé, légèrement relevé de chaque côté à la base de l'antenne, séparé de l'épistome par une strie fortement arquée aux extrémités, celui-ci convexe, médiocrement arrondi en avant des bases des antennes; labre presque demi-circulaire, cachant presque les mandibules,

celles-ci bifides à l'extrémité. Prothorax à peine plus étroit à la base qu'au sommet, un peu plus large au bord antérieur que la tête, arqué sur les côtés, environ une fois et demie plus large dans sa plus grande largeur que long, un peu moins éparsément et plus fortement ponctué que le front; bord antérieur faiblement arqué; angles antérieurs obtus, un peu émoussés; côtés bordés par un bourrelet très étroit, un peu plus accentué vers la base, à peine visiblement crénelés; vus de face sinués contre la base; angles postérieurs obtus; base tronquée, bordée par une marge très étroite ponctué vers les extrémités. Écusson subtriangulaire, transversal. Elytres très faiblement un peu plus larges à la base que la base du prothorax, en angle obtus aux épaules, arqués sur les côtés, à peine élargis, à peine plus larges dans leur plus grande largeur que le prothorax dans la sienne, acuminés ensemble au sommet, environ une fois et demie plus longs que larges ensemble dans leur plus grande largeur. Ponctuation relativement forte, confuse, irrégulièrement un peu serrée, atténuée vers le sommet. Marges latérales subpliées, fortement infléchies, moins fortement ponctuéées que le disque, bordées par une strie ponctuéée assez enfoncée. Segments de l'abdomen 1 à 3 subégaux, plus courts que le métasternum, soudés. Hanches postérieures un peu écartées; saillie du premier segment de l'abdomen subtronquée. Tarses de quatre articles; dernier article sans ses crochets plus long que les précédents réunis; crochets relativement longs, fins, dentés à la base.

1 exemplaire.

Loc. SEYCHELLES. Mahé: "Forest between Trois Frères and Morne Seychellois, 1500-2000 feet, xii. 1908."

TYRTAEUS, Champion, 1913, Trans. Ent. Soc. Lond., p. 76.

17. *Tyrtaeus singularis*, n. sp. (Pl. I, fig. 2.)

Oblongo-clongatus, subparallelus, circiter quater longior quam latior, modice convexus, nitidus, pilis brevibus, tenuibus, erectis, subparce vestitus, fulvo-rufus. Antennae breves, 7-articulatae; articulis 2-6 paulatim incrassatis, 7^o multo latiore, subelongato, glandiformi. Caput transversum, subtriangulare, antice truncatum, paulo post antennarum bases transversim striatum, fronte convexiuscula, parce tenuiterque punctulatum; labro subhemicirculari, mandibularum apicem fere obtegente; oculis sat magnis, modice prominulis; temporibus nullis. Prothorax antice quam postice vix angustior, lateribus arcuatus, in maxima latitudine quam caput paulo latior, in disco subparce, ad latera densius, punctulatus; margine antice subtruncato; angulis anticis obtusis,

hebetatis; lateribus substriete marginatis; angulis posticis obtusis; basi tenuiter marginata. Scutellum subtriangulare. Elytra humeris breviter rotundata, tunc quam prothorax in maxima latitudine vix angustiora, lateribus subparallela, apice conjunctim rotundata, circiter 2 et $\frac{1}{2}$ longiora quam latiora, subregulariter lineato-punctulata; punctis juxta basin et ad apicem confusis, apicem versus attenuatis; lineis punctatis haud densatis; marginibus lateralibus rotundato-plicatis, valde inflexis, marginatis. Long. 2.2 mill.

Subparallèle, environ quatre fois plus long que large dans sa plus grande largeur, modérément convexe, brillant, roux fauve; vestiture formée de très petits poils dressés, peu serrés, visibles surtout lorsque l'insecte est vu de profil. Antennes courtes, de 7 articles, insérées presque contre les yeux, dessous le bord du front; 1^{er} article un peu épais, subcarré, 2^{me} à 6^{me} serrés, s'épaississant progressivement, subégaux, 2^{me} transversal, 6^{me} très transversal, 7^{me} oblong, plus de deux fois plus large que l'article précédent à sa partie antérieure, partagé en trois zones transversales: les deux premières garnies seulement de quelques très petits poils dressés, la dernière pubescente, l'ensemble donnant l'impression de trois articles soudés. Tête transversale, subtriangulaire, rétrécie vers l'arrière, avant les yeux un peu convexe et finement et éparsément pointillée sur le front, tronquée au bord antérieur, finement striée entre les bords antérieurs des bases des antennes, faiblement, brièvement et transversalement substriée entre ces bases; yeux échançant modérément les marges du front, peu saillants; labre presque en forme de demi-cercle, cachant presque complètement les mandibules. Prothorax environ aussi large en avant que la tête avec les yeux, à peine plus large à la base, arrondi sur les côtés, présentant sa plus grande largeur un peu en avant du milieu, environ une fois et demie plus large dans sa plus grande largeur que long, lisse sur une étroite bande longitudinale sur le milieu du disque, finement et presque éparsément ponctué de chaque côté de cette bande, un peu plus fortement vers les côtés; bord antérieur subtronqué; angles antérieurs obtus, légèrement émoussés; côtés bordés par une strie et un fin bourrelet subcrénelé; angles postérieurs obtus; base tronquée, étroitement bordée par une strie dans le milieu, très étroitement vers les extrémités. Ecusson subtriangulaire, plutôt petit. Elytres à la base de la largeur de la base du prothorax, brièvement arrondis aux épaules, alors à peine plus étroites que le prothorax dans sa plus grande largeur, subparallèles, arrondis ensemble au sommet, environ deux fois et demie plus longs que larges ensemble, ponctués en lignes peu serrées, un peu irrégulières; ponctuation confuse près de la base, atténuée vers le sommet;

marges latérales pliées-arrondies, puis fortement infléchies, bordées par une très étroite marge concave. Pièce prébasilaire en angle très obtus au milieu, subsinuée de chaque côté; menton petit, subcarré. Saillie prosternale dépassant les hanches, tronquée à l'extrémité; hanches peu écartées, subglobuleuses. Métasternum enfoncé contre les hanches intermédiaires; celles-ci peu écartées. Hanches postérieures médiocrement écartées; saillie du 1^{er} segment en angle obtus; celui-ci plus court que le métasternum. 1^{er}, 2^{me} et 3^{me} segments de l'abdomen soudés. Pattes médiocrement épaisses; tibias sublinéaires, sans épéron. Tarses de trois articles.

15 exemplaires.

Loc. SEYCHELLES. Mahé: "All from the forest between Trois Frères and Morne Seychellois, 1500-2000 feet, xii. 1908."

COLYDIINI.

MECEDANUM, Erichson, 1845, Naturg. Ins. Deutschl., III, p. 274; Sharp, 1893, Ent. Month. Mag., XXIX, p. 256.

18. *Mecedanum*, sp.

Ce genre est représenté dans les collections de la Percy Sladen Trust Expedition par deux exemplaires en mauvais état qui ne permettent pas une détermination précise.

Loc. SEYCHELLES. Silhouette: "Forest at edge of Mare aux Cochons plateau, ca. 1000 feet, ix. 1908."

CERYLINAE. BOTHRIDERINI.

BOTHRIDERES, Erichson, 1845, Naturg. Ins. Deutschl., III, p. 288.

19. *Bothrideres fryeri*, n. sp. (Pl. I, fig. 1.)

Oblongo-elongatus, angustus, convexus, nitidulus, glaber, castaneus; capite prothoraceque paulo obscurior. Antennae primo articulo apice obliquissime truncato, 2^o juxta basin valde incurvato, 3^o subquadrato; clava circiter tam elongata quam lata, 2^o articulo quam 1^o paulo latiore. Caput transversum, disco subconceavum et subdense punctatum, marginibus anticis, posticis lateralibusque minus valide punctatum; punctis in disco elongatis; oculis subhemiglobosis. Prothorax cordiformis, antice quam caput in maxima latitudine paulo minor, 1 et $\frac{1}{5}$ longior quam latior, dense punctatus et in longitudinem sulco laevi striis terminato secatus;

sulco prope marginem anticum in impressione lata initium capiente, in primo lato, vix profundo, postea constricto, magis impresso, paulatim attenuato, marginem basilarem attingente. Scutellum triangulare. Elytra basi quam prothorax latiora, humeris rotundata, lateribus areolata, vix ampliata, paulo ante apicem sinuata, fere conjunctim rotundata, 3 et $\frac{1}{2}$ longiora quam simul latiora, punctato-striata; intervallis alternis latioribus; 1^o praecipue ad apicem elevato, 2^o juxta striam externam et prope apicem breviter carinato. Long. 4 mill.

Allongé, oblong, étroit, environ cinq fois plus long que large dans sa plus grande largeur, convexe, glabre, assez brillant, marron un peu assombri sur la tête et sur le prothorax. Antennes à peine épaissies pour le genre; 1^{er} article, environ aussi long que large, fortement arrondi au bord interne, très obliquement tronqué, subsinué au sommet; deuxième insérée presque latéralement sur le premier, recourbi de suite à angle droit, presque deux fois plus long que large, 3^{me} subarrêté, 4^{me} à 7^{me} serrés, transversaux, 8^{me} et 9^{me} un peu plus longs que les précédents, 10^{me} et 11^{me} formant une massue presque lâche, à peu près aussi longue que large, dont le 1^{er} article est environ trois fois plus large que le précédent et dont le 2^{me} plus étroit et plus long que le premier est subtrapézoïdal, pubescent à l'extrémité. Tête environ deux fois plus large au niveau des yeux que longue, tronquée en avant, subeoneave entre les yeux, couverte entre les yeux d'une ponctuation allongée, assez forte et assez dense, en avant d'une ponctuation fine, assez serrée, sur les côtés d'une ponctuation fine, espacée; yeux saillant presque en forme de demi-sphère, échanerant modérément les marges latérales du front, non contigus au bord antérieur du pronotum. Prothorax subcordiforme, à peine rétréci en avant, fortement à la base, presque aussi large au bord antérieur que la tête au niveau des yeux, environ une fois et un cinquième plus long que large dans sa plus grande largeur; bord antérieur arrondi au milieu, sinué de chaque côté; angles antérieurs aigus, un peu saillants en avant; bords latéraux cachés, sauf à la base lorsque l'insecte est vu de dessus; angles postérieurs presque droits; base bordée par un bourrelet et par une strie très brièvement interrompue au milieu. Ponctuation assez forte, assez serrée, sauf sur la région des angles postérieurs. Disque coupé longitudinalement par un enfoncement en partie sulciforme, commeneant en avant par une large impression à bords non marqués, presque contigue au bord antérieur, se continuant par un sillon assez large, lisse au fond, peu profond, limité par des stries, commeneant dans l'impression antérieure, se rétrécissant vers le dernier quart de la longueur et se continuant au fond par un sillon étroit,

enfoncé, atténué vers la base, qui n'atteint pas tout à fait le rebord marginal de celle-ci. Ecusson triangulaire, un peu plus long que large, et un peu enfoncé. Elytres largement arrondis aux épaules, alors nettement plus larges que le prothorax dans sa plus grande largeur, subparallèles, à peine élargis, puis atténués lentement vers l'extrémité, sinués près du sommet et arrondis ensemble; bordés à l'extrémité, après le sinus par un bourrelet bien marqué. Sur le disque à partir de la suture: 1°, un intervalle sutural, assez large, très finement ponctué en ligne; 2°, une strie ponctuéée, enfoncée, commençant près de la base, s'accroissant vers le sommet, atteignant la dépression formée par le bourrelet apical; 3°, une strie semblable à la précédente, déterminant avec elle un intervalle étroit, un peu élevé vers l'extrémité; 4°, une strie ponctuéée, fine, entière, déterminant avec la précédente un intervalle large, relevé en carène plus accentuée vers l'extrémité, atteignant le rebord apical; 5°, une strie parallèle à la précédente, déterminant avec elle un intervalle étroit, faiblement écourtée au sommet, bordée vers l'extrémité par une fine carène; 6°, une strie humérale, finement carénée, déterminant un intervalle large. Tarses plus longs que les tibias.

1 exemplaire.

Loc. ALDRABRA: Takamaka, xi, 1908 (*Fryer*).

CERYLINI.

CERYLON, Latreille, 1807, Gen. Crust. et Ins., III, p. 205.

20. *Cerylon nitidum*, Grouvelle.

Cerylon nitidum, Grouvelle, 1896, Ann. Soc. Ent. France, LXV, p. 85 et 86; 1906, LXXV, p. 114; (1908) 1909, Rev. d'Ent. Caen, XXVII, p. 167.

Oblongum, convexum, nitidum, glabrum, castaneum; antennis pedibusque dilutioribus. Antennae vix incrassatae; 2° articulo sesquilingiore quam latiore, 9° clavam parante; clava oblonga, subglandiformi. Caput transversum, convexum, antice truncatum, fronte in disco tenuiter, utrinque validius punctulatum. Prothorax antice angustatus, lateribus antice arcuatus, postice parallelus, modice transversus, in disco tenuissime, ad latera validius punctulatus, punctis quam illis capitis majoribus; margine antico subtruncato; lateribus pulvino et canaliculo concavo marginatis; basi medio retrorsum producta, ad extremitates tenuiter marginata. Scutellum transversissimum, apice arcuatum. Elytra humeris angulosa, vix dentata, lateribus arcuata, vix ampliata, apice fere

conjunctim rotundata, paulo magis duplo longiora quam simul in maxima latitudine latiora, tenuiter substriato-punctata; intervallis planis, latis; punctis ad apicem et ad latera attenuatis; lateribus stricte marginatis. Long. 2 mill.

Oblong, environ trois fois plus long que large dans sa plus grande largeur, convexe, glabre, brillant, marron modérément foncé; pattes et antennes plus claires. Antennes s'épaississant progressivement à partir du 3^{me} article; 2^{me} environ une fois et demie plus long que large, 3^{me} à peine plus long que large, 4^{me} à 8^{me} progressivement un peu plus transversaux, 9^{me} très transversal, amorçant la massue, 10^{me} oblong, environ une fois et demie plus long que large, partagé en trois zones transversales: la première glabre, les deux autres pubescentes. Tête moins de deux fois plus large que longue, convexe, tronquée en avant, densément et plus fortement pointillé sur les côtés que sur le disque; yeux saillants. Prothorax modérément transversal, subparallèle sur la majeure partie de sa longueur, fortement arqué en dedans dans sa partie antérieure, presque lisse sur le disque sauf à la base, progressivement plus fortement pointillé de chaque côté vers les marges latérales, celles-ci fortement infléchies, presque lisses; bord antérieur subtronqué, à peine sinué vers les extrémités; angles antérieurs à peine marqués, arrondis; côtés bordés par un étroit bourrelet et par une fine gouttière limitée en dedans par une ligne ponctuée; angles postérieurs presque droits, émoussés; base très faiblement arquée au milieu et subsinuée de chaque côté, bordée vers les extrémités par une ligne de petits points. Eusson environ trois fois plus large à la base que long, très largement arrondi. Elytres ovales, subdentés aux épaules, à peine élargis sur les côtés, présentant leur plus grande largeur vers le premier quart de leur longueur, arrondis presque ensemble au sommet, un peu plus de deux fois plus longs que larges ensemble dans leur plus grande largeur, finement ponctués-substriés; intervalles plans, très larges; stries ponctuées, atténuées vers le sommet et sur les marges latérales; stries suturales à peine accentuées au sommet, presque effacées à la base; marges latérales fortement infléchies, bordées par un étroit bourrelet, impressionnées à la base, contre la bordure basilaire de l'élytre. Tibias postérieurs élargis progressivement vers l'extrémité à partir du milieu de la longueur. Mésosternum concave; métasternum ponctué sur les côtés.

29 exemplaires.

Loc. SEYCHELLES. Mahé: "This species was found on cultivated islets off Port Victoria, as well as at considerable elevations in the main island of Mahé. Long Island, from

a felled coconut palm trunk, and Round Island, from fungus, vii. 1908; also from the high forests of Morne Blanc and Pilot, and above Cascade Estate. Originally discovered by Alluaud, 1892, in Mahé."

21. *Cerylon longius*, n. sp.

Elongato-oblongum, convexum, nitidum, glabrum, castaneum; antennis pedibusque dilutioribus. Antennae vix incrassatae; 2^o articulo vix sesquilongiore quam latiore, 9^o clavam parante, clava oblonga, subglandiformi. Caput transversum, subdepressum, antice truncatum, vix perspicue punctulatum. Prothorax antice angustatus, lateribus arcuatus, basin versus subparallelus, fere tam elongatus quam basi latus, in disco tenuiter, ad latera validius, parce punctulatus; margine antico utrinque sinuato; angulis anticis obtusis, hebetatis; lateribus pulvino et canaliculo coneavo, ambobus strictis, marginatis; angulis posticis acutis, retrorsum productis; basi medio arcuata, utrinque sinuata. Scutellum transversissimum, subpentagonale. Elytra humeris angulosa, lateribus arcuata, vix perspicue ampliata, apice conjunctim rotundata, magis duplo longiora quam simul latiora, tenuiter substriato-punctata; intervallis planis, latis; striis punctatis ad apicem et ad latera attenuatis; lateribus strictissime marginatis. Long. 1.4-1.8 mill.

Oblong, plus de trois fois plus long que large dans sa plus grande largeur, convexe, glabre, brillant, marron médiocrement foncé, pattes et antennes plus claires. Antennes s'épaississant progressivement à partir du 3^{me} article: 2^{me} environ une fois et demie plus long que large, 3^{me} subégal au 2^{me}, 4^{me} subcarré, 4^{me} à 8^{me} progressivement transversaux, 9^{me} transversal, 10^{me} suboblong, moins d'une fois et demie plus long que large, partagé en trois zones transversales: la première glabre, les deux autres pubescentes. Tête moins de deux fois plus large que longue, subdéprimée, tronquée en avant, à peine visiblement pointillée, yeux saillants. Prothorax rétréci en avant, arqué sur les côtés, subparallèle contre la base, presque aussi long que large à la base, couvert d'une ponctuation éparsse, fine sur le disque, un peu plus forte vers les marges latérales; celles-ci lisses, fortement déclives surtout vers le milieu; bord antérieur arrondi en avant dans le milieu, subsinué de chaque côté; angles antérieurs obtus, émoussés; côtés bordés par un étroit bourrelet et par une très étroite uttière limitée en dedans par une fine ligne ponctuée; angles postérieurs aigus, saillants en arrière, base faiblement arquée en arrière dans le milieu, subsinuée puis subarquée de chaque côté, brièvement rebordée vers les extrémités. Ecusson subpentagonal, environ trois fois plus large

que long. Elytres ovales, anguleux aux épaules, arrondis sur les côtés, à peine élargis vers le premier sixième de la longueur à partir de la base, arrondis ensemble au sommet; nettement plus de deux fois plus longs que larges ensemble dans leur plus grande largeur, finement ponctués-substriés; intervalles plans, très larges; stries ponctuées, atténuées vers le sommet et sur les marges latérales; stries suturales un peu accentuées au sommet, presque effacées à la base; marges latérales fortement infléchies, bordées très étroitement surtout dans la partie apicale. Tibias postérieurs élargis dans la partie apicale. Mésosternum concave; métasternum à peine visiblement alutacé, ponctué sur les côtés. Dessous du corps en partie pubescent.

15 exemplaires.

Loc. SEYCHELLES. Silhouette, Praslin: "Silhouette, several specimens from Mont Pot-à-eau, ca. 1500 feet; also several from near Point Etienne, taken at the same time and place as the series of *Xuthia sicana* and *Lascotomus scotti* mentioned above. In Praslin seven specimens were found in the forest of C'oco-de-mer palms (*Lodoicea*), C'ôtes d'Or Estate, xi. 1908."

22. *Cerylon perparvulum*, n. sp.

Subparallellum, paulo magis ter longius quam latius, convexiusculum, nitidulum, pilis erectis, tenuissimis parcissime vestitum, dilute castaneum. Antennae subincrassatae; 2° articulo fere sesquilingiore quam latiore, 3° longiore, 3°-9° paulatim parum incrassatis, clava oblonga, subglandiformi. Caput transversum, convexiusculum, antice subtruncatum, inter oculos arcuatim substriatum; fronte vix perspicue punctulatum. Prothorax fere tam antice quam postice latus, lateribus extra extremitates parallelus, modice transversus, plus minusve parce punctulatus; margine antico subtruncato; angulis anticis rotundatis; lateribus tenuiter marginatis; angulis posticis obtusis; basi medio retrorsum arcuata, utrinque vix perspicue sinuata. Scutellum subpentagonale, transversum. Elytra humeris obtuse angulosa, lateribus arcuata, vix ampliata, apice conjunctim rotundata, magis duplo longiora quam simul in maxima latitudine latiora, punctato-striata; striae ad latera attenuatis, apicem versus evanescentibus; intervallis in disco quam punctis paulo latioribus, laeviter convexiusculis; striae suturalibus integris, apicem versus magis impressis; lateribus strictissime marginatis. Long. 1 mill.

Subparallèle, un peu plus de trois fois plus long que large dans sa plus grande largeur, faiblement convexe, un peu brillant, présentant

sur son tégument des poils dressés, très fins et relativement courts, très espacés, marron clair, antennes et pattes encore plus claires. Antennes assez épaisses; 1^{er} article dilaté-arrondi en dedans, presque deux fois plus long que large, 2^{me} moins épais, presque une fois et demie plus long que large, 3^{me} subcarré, 3^{me} a 9^{me} s'épaississant progressivement, 4^{me} à 9^{me} transversaux, 10^{me} glandiforme, environ une fois et demie plus long que large, et deux fois et demie plus large que le précédent. Tête presque deux fois plus large au niveau des yeux que longue, faiblement convexe, subtronquée en avant, coupée entre les yeux par une faible impression arquée; partie avant cette impression à peine visiblement ponctuée, partie en avant lisse, infléchie au niveau des bases des antennes; marges latérales profondément sinuées en avant des yeux; ceux-ci médiocrement saillants. Prothorax à peu près aussi large en avant qu'en arrière, subparallèle sur les côtés sauf vers les extrémités, qui sont brièvement arquées, environ une fois et un quart plus large que long, couvert d'une ponctuation fine, irrégulièrement éparse; bord antérieur subtronqué; angles antérieurs arrondis; côtés bordés par un fin bourrelet et par une étroite gouttière ponctuée, l'un et l'autre brièvement réfléchis contre la base; angles postérieurs obtus; base arquée en arrière, à peine subsinuée aux extrémités, bordée aux extrémités, sur la partie réfléchie de la bordure latérale et au milieu, par une ligne de petits points. Ecusson subpentagonal, environ deux fois plus large que long. Elytres tronqués à la base, en angle obtus aux épaules, arqués sur les côtés, à peine élargis, alors un peu plus larges que le prothorax, arrondis ensemble au sommet, plus de deux fois plus longs que larges ensemble dans leur plus grande largeur, striés-ponctués; stries ponctuées atténuées sur les marges latérales, effacées au sommet; stries suturales entières, fortement enfoncées vers le sommet; intervalles légèrement convexes, à peine plus larges sur le disque, que les points; marges latérales arrondies, puis verticales par rapport au plan de l'insecte, masquant en partie le bord latéral lorsque l'insecte est vu de dessus, étroitement rebordées. Tibias postérieurs élargis dans la moitié apicale. Mésosternum incliné par rapport au plan du métasternum. Dessous du corps éparsément pointillé.

22 exemplaires.

Loc. SEYCHELLES. Silhouette, Mahé, Praslin: "In Silhouette five specimens were taken in the high forest near Mont Pot-à-eau, ca. 1500 feet, one being recorded as from a fallen and decayed trunk of 'Bois Rouge' (*Wormia ferruginea*). In Mahé several were obtained in the most elevated and dampest forests; Morne Blanc, Morne Sey-

chellois, and Mare aux Cochons district. In Praslin eleven were found in the Coko-de-mer palm forest, Côtes d'Or Estate."

23. *Cerylon tantillum*, n. sp.

Elongato-oblongum, convexum, nitidum, pube flavo-cinerea, brevi, tenui, erecta, in elytris inclinata, subdense vestitum, piceum; antennis pedibusque rufis. Antennae subincrassatae; 2° et 3° articulo subaequalibus; clava glandiformi, sesquilongiore quam latiore. Caput transversum, fronte convexusculum et dense punctulatum, ante antennarum bases arcuatim inflexum, antice truncatum; oculis valde prominulis. Prothorax antice quam postice paulo angustior, lateribus arcuatus, circiter 1 et $\frac{1}{5}$ in maxima latitudine latior quam longior, dense punctatus; margine antico truncato; angulis anticis posticisque obtusis; lateribus pulvino et canaliculo punctato stricte marginatis; basi subtruncata, ad extremitates marginata. Scutellum subpentagonale, transversissimum, punctulatum. Elytra basi quam prothorax paulo latiora, humeris obtuse angulosa, lateribus arcuata, ampliata, apice separatim breviter rotundata, circiter 1 et $\frac{2}{3}$ longiora quam simul in maxima latitudine latiora, vix perspicue rugosula, punctato-striata, punctis et striis apicem versus attenuatis, his evanescentibus, illis minutissimis et confusis; striis suturalibus integris, ad apicem magis impressis; intervallis plus minusve subconvexis, in disco quam punctis latioribus, confuse tenuissimeque punctulatis. Pedes robusti. Long. 1 mill.

Oblong, environ deux fois et deux tiers plus long que large dans sa plus grande largeur, convexe, brillant, brun de poix avec les antennes et les pattes rougeâtres, couvert d'une pubescence flave-cendrée, fine, dressée, courte, inclinée et plus dense sur les élytres, leur donnant lorsque l'insecte est frais un aspect un peu lanugineux. Antennes un peu épaissies; 1^{er} article épais, un peu plus long que large, 2^{me} un peu épais, un peu plus long que large; 3^{me} subégal au 2^{me}; articles 3^{me} à 9^{me} s'épaississant faiblement et progressivement, 4^{me} à 8^{me} transversaux, 9^{me} subcarré, 10^{me} glandiforme, environ une fois et demie plus long que large, environ deux fois plus large que le 9^{me}. Tête plus de deux fois plus large au niveau des yeux que longue, très finement et presque densément pointillée sur le front, infléchie en arc en avant des naissances des antennes, subtronquée au bord antérieur; bords latéraux parallèles en avant des yeux, fortement sinués vers la base de l'antenne, très convergents en avant entre l'antenne et la base de la tête; yeux très saillants, coupés transversalement à leur bord antérieur. Prothorax un peu

plus rétréci en avant qu'à la base, arrondi sur les côtés, surtout dans la partie basilaire, présentant sa plus grande largeur vers le premier tiers de la longueur à partir de la base, environ une fois et un cinquième plus large dans sa plus grande largeur que long, densément et assez fortement ponctué pour la taille; bord antérieur tronqué; angles antérieurs et postérieurs obtus; côtés étroitement bordés par un bourrelet et un sillon, le dernier ponctué; base subtronquée, bordée aux extrémités. Ecusson subpentagonal, très transversal, pointillé. Elytres à peine sinués à la base, en angle obtus aux épaules, un peu plus large à la base que la base du prothorax, arqués sur les côtés, assez nettement élargis, présentant leur plus grande largeur vers le premier quart de la longueur à partir de la base, séparément et brièvement arrondis au sommet, ponctué-striés; stries et points atténués vers le sommet, les premières effacées avant l'extrémité, les deuxièmes devenant très fins et confus; intervalles presque subrugueux, plus ou moins un peu convexes, plus larges sur le disque que les points, éparsément, irrégulièrement et très finement pointillés; stries suturales entières, plus marqués au sommet; marges latérales arrondis, obliquement infléchies, bordées par une fine strie à ponctuation écartée. Métastrernum finement et peu densément ponctué. Pattes robustes; tibias postérieurs s'élargissant presque à partir de la base, arqués au bord externe. Cavités des hanches antérieures presque fermées.

1 exemplaire.

Loc. SEYCHELLES. Mahé: "From between leaf-bases of a growing endemic palm (*Stevensonia*), near Morne Blanc, 1908."

21. *Cerylon gardineri*, n. sp. (Pl. II, fig. 14.)

Elongate-oblongum, convexum, nitidum, pube flavo-cinerea, tenui, subbrevis, praecipue in elytris dense vestitum, piceum; antennis pedibusque rufis. Antennae subincrassatae; 2° articulo quam 3° paulo brevior; clava glandiformi, fere duplo longior quam latior. Caput transversum, fronte subdense punctulatum, ante antennarum bases angulose inflexum, antice truncatum; oculis valde prominulis. Prothorax antice quam postice angustior, lateribus arcuatus, fere 1 et $\frac{1}{2}$ in maxima latitudine latior quam longior, dense et quam caput validius punctulatus, punctis in disco spatium laeve, strictum relinquentibus; margine antice truncato; angulis anticis posticisque obtusis; lateribus basi marginatis, hac truncata; marginibus lateralibus fere ad medium impressis. Scutellum subpentagonale, transversissimum, parvissime punctulatum. Elytra basi quam prothorax paulo latiora, humeris sub-

dentata, lateribus arcuata, vix ampliata, apice breviter conjunctim rotundata, circiter 1 et $\frac{1}{3}$ longiora quam in maxima latitudine latiora, subaspera, punctatostrata; punctis ad basin sat validis, apicem versus attenuatis et evanescentibus; striis suturalibus sicut aliis impressis; intervallis quam punctis latioribus, tenuissime, confuse et parce punctulatis. Pedes robusti. Metasternum dense punctatum. Abdominis primum segmentum, ad latera, punctis validis, densatis notatum. Long. 0·8–1·5 mill.

Oblong, environ deux fois et demie plus long que large dans sa plus grande largeur, convexe, brillant, brun de poix avec les antennes et pattes rougeâtres, couvert d'une pubescence cendrée, un peu flave, fine, dressée, inclinée et plus dense sur les élytres, donnant à l'insecte lorsqu'il est frais un aspect en peu lanugineux. Antennes un peu épaisses; 1^{er} article épais, moins d'une fois et demie plus long que large, légèrement courbé; 2^{me} un peu épais, subarrêté, 3^{me} environ une fois et demie plus long que large, 4^{me} à 8^{me} subégaux, plutôt transversaux, s'épaississant très faiblement et progressivement, 9^{me} suballongé, 10^{me} oblong, glandiforme, presque deux fois plus long que large, un peu plus de deux fois plus large que le 9^{me}. Tête plus de deux fois plus large au niveau des yeux que longue, presque densément pointillée sur le front, infléchie en avant des naissances des antennes en dessinant presque un angle obtus, subtronquée au bord antérieur; bords latéraux parallèles en avant des yeux, fortement sinués vers la base de l'antenne, très convergents en avant entre l'antenne et la base de la tête; yeux très saillants, coupés transversalement à leur bord antérieur. Prothorax plus rétréci en avant qu'à la base, arrondi sur les côtés, présentant sa plus grande largeur vers le premier quart de la longueur à partir de la base, environ une fois et demie plus large dans sa plus grande largeur que long, présentant sur le disque un espace lisse, longitudinal, très étroit, ponctuation de chaque côté de cet espace serrée, plus forte que celle de la tête, s'accroissant vers les bords latéraux; bord antérieur tronqué; angles antérieurs et postérieurs obtus; côtés bordés par un bourrelet et une gouttière très étroite; marges latérales impressionnées vers le milieu de la longueur; base tronquée, bordée par un étroit sillon. Ecusson subpentagonal, très transversal et très éparsément pointillé. Elytres subsinués à la base en angle obtus, subdentés aux épaules, un peu plus larges à la base que la base du prothorax, arqués sur les côtés, à peine élargis, brièvement arrondis ensemble au sommet, environ une fois et un tiers plus longs que larges ensemble dans leur plus grande largeur, fortement ponctués-striés; stries atténuées et effacées vers le sommet, atténuées vers les bords latéraux; intervalles subrugueux, très finement, éparsé-

ment et irrégulièrement ponctués; stries suturales marquées comme les autres; bords latéraux très fortement infléchis, finement rebordés. Dessous de la tête, prosternum, mésosternum et métasternum densément ponctués; 1^{er} segment de l'abdomen encore plus fortement ponctué, les autres en majeure partie lisses, présentant une ligne ou une bande transversale de points, pubescents surtout sur leur partie apicale.

Les exemplaires mâles ont en général les antennes plus longues et moins épaisses, les premiers articles des tarsi antérieurs plus dilatés et les segments apicaux de l'abdomen plus mobiles.

Cette espèce, représentée par environ 265 exemplaires, est très variable comme taille, longueur des antennes caractérisée par la longueur du 9^{me} article, rapport de la longueur totale à la largeur maxima, largeur du prothorax par rapport à la largeur des élytres, force et densité de la ponctuation, développement de la partie lisse du prothorax, etc., etc.

Loc. SEYCHELLES. Silhouette, Mahé: "Silhouette; from the high mountain forests, the majority of specimens having been found between bases of leaves of growing endemic palms and *Pandanus*; there is a series of thirty-five specimens from leaf-bases of two trees of *Pandanus hornei* above Mare aux Cochons; a second series of seven specimens from a *Pandanus sechellarum* in the same locality; a series of thirteen specimens from a single *Stevensonia* palm also in the same place; several other batches from *Stevensonia* leaf-bases in other places; and a single immature example from leaf-bases of the (in this respect unproductive) palm *Roscheria*. In Mahé the species was found in several parts of the mountain forests, and a few specimens are recorded as from a low elevation, near the coast at Cascade. The Mahé series includes ten examples from leaf-bases of a *Verschaffeltia* palm, and one small and two large sets from *Stevensonia* palms."

25. *Cerylon liliputanum*, n. sp.

Oblongum, paulo magis ter longius quam latius, convexiusculum, nitidum, pilis erectis, tenuissimis, minutissimis, parcissime vestitum, dilute castaneum. Antennae vix incrassatae; 2^o articulo paulo longiore quam latiore, eum 3^o subaequali, 3^o-9^o paulatim parum incrassatis, clava oblonga, glandiformi. Caput transversum, convexiusculum, fronte vix perspicue punctulatum, ante antennarum bases angulatim inflexum, antice truncatum. Prothorax antice quam postice angustior, lateribus antice breviter valde rotundatus,

postice subrectus, retrorsum convergens, modice transversus, dense punctatus; margine antico truncato; angulis anticis rotundatis; lateribus strictissime pulvinato-marginatis; angulis posticis obtusis, basi subtruncata. Scutellum subpentagonale, transversum. Elytra humeris obtuse angulosa, lateribus arcuata, parum ampliata, apice conjunctim breviter rotundata, magis duplo longiora quam simul in maxima latitudine latiora, punctato-striata, striis ad latera attenuatis, apicem versus evanescentibus; intervallis in disco quam punctis paulo latioribus, subplanis; striis suturalibus integris, apicem versus fere magis impressis; lateribus stricte marginatis. Long. 0·8-0·9 mill.

Oblong, un peu plus de trois fois plus long que large dans sa plus grande largeur, faiblement convexe, brillant, présentant sur son tégument des poils dressés, très fins, très courts et très espacés; marron clair, antennes et pattes encore plus claires. Antennes à peine épaissies; 1^{er} article épais, dilaté-arrondi en dedans, un peu plus long que large, 2^{me} moins épais, subégal au 3^{me}, 3^{me} à 9^{me} s'épaississant progressivement, 4^{me} à 9^{me} serrés, transversaux, 10^{me} glandiforme, environ une fois et demie plus long que large et trois fois plus large que le précédent. Tête plus de deux fois plus large au niveau des yeux que longue, faiblement convexe, tronquée en avant, anguleusement infléchie en avant des bases des antennes, à peine visiblement pointillée; bords latéraux sinueux en avant des yeux, ceux-ci médiocrement saillants. Prothorax un peu plus rétréci en avant qu'à la base, arrondi sur les côtés dans la partie antérieure, puis droit, convergent vers l'arrière dans le reste de la longueur, environ une fois et un quart plus large dans sa plus grande largeur que long, densément et assez fortement ponctué pour sa taille; bord antérieur subtronqué; angles antérieurs arrondis, côtés très finement bordés en bourrelet; angles postérieurs obtus; base faiblement arquée en arrière. Elytres tronqués à la base, en angle obtus aux épaules, arqués sur les côtés, un peu élargis, brièvement arrondis ensemble au sommet, assez nettement plus larges dans leur plus grande largeur que le prothorax et plus de deux fois plus longs que larges ensemble dans cette plus grande largeur, striés-ponctués, stries atténuées sur les marges latérales, effacées au sommet, stries suturales entières, médiocrement enfoncées vers le sommet; intervalles presque plans, à peine plus larges sur le disque que les points; marges latérales arrondies, ne masquant pas le bord latéral lorsque l'insecte est vu de dessus, bordées par une strie bien marquée. Tibias postérieurs élargis presque depuis la base. Mésosternum incliné par rapport au plan du métasternum, celui-ci assez densément et assez fortement ponctué.

2 exemplaires.

Loc. SEYCHELLES. Mahé: "Mare aux Cochons district, ca. 1500 feet, i. 1909."

26. *Cerylon curtulum*, n. sp.

Subovatum, postice attenuatum, sat valde convexum, nitidum, glabrum, castaneum, antennis pedibusque dilutioribus. Antennae sat incrassatae; 2° articulo subelongato. 3° clavam parante, clava oblonga, crassa, subglandiformi. Caput transversum, ante antenarum bases vix productum, truneatum, inter oculos transversim subplicatum. Prothorax antice valde, postice vix angustatus, lateribus arcuatus, in maxima latitudine 1 et $\frac{1}{3}$ latior quam longior, in disco parce punctulatus, ad latera laevis; margine antico truncato; angulis anticis obtusis; lateribus pulvino stricto et canaliculo punctato, ambobus strictis, marginatis; angulis posticis subrectis; basi medio subtruncata, ad extremitates retrorsum suboblique truncata, marginata. Scutellum triangulare, minimum. Elytra humeris obtuse angulosa, vix hebetata, lateribus arcuata, ampliata, apice conjunctim breviter rotundata, circiter 1 et $\frac{1}{5}$ longiora quam simul in maxima latitudine latiora, substriato-punctata; punctis sat validis, striis et punctis ad apicem et ad latera evanescentibus; lateribus strictissime marginatis. Long. 0·9-1·1 mill.

Oblong, environ deux fois et demie plus long que large dans sa plus grande largeur, fortement convexe, glabre, brillant, marron peu foncé; antennes et pattes plus claires. Antennes assez épaisses; 1^{er} article très épais, dilaté-arrondi en dedans, environ aussi long que large, 2^{me} médiocrement épaissi, à peine plus long que large, 3^{me} à peine épaissi, subégal au 2^{me}; 4^{me} à 9^{me} progressivement et faiblement épaissis, 4^{me} à 8^{me} plus ou moins transversaux, serrés, 9^{me} très transversal, amorçant la massue; celle-ci oblique, aussi longue que les articles 4^{me} à 9^{me} pris ensemble, environ une fois et demie plus longue que large, terminée par une calotte pubescente. Tête plus de deux fois plus large que longue, tronquée au bord antérieur, convexe sur le front, transversalement subpliée entre les yeux, à peine visiblement pointillée; bords latéraux transversalement et brièvement tronqués en avant des yeux, fortement sinués pour l'insertion des antennes, très fortement convergents en arrière avant les yeux, ceux-ci petits, très saillants, presque portés par un pedoncule. Prothorax assez fortement rétréci en avant, faiblement à la base, arrondi sur les côtés, environ une fois et un tiers plus large dans sa plus grande largeur que long, transversalement plus convexe en avant qu'en arrière, éparsément et à peine visiblement

pointillé vers les côtés; bord antérieur subtronqué; angles antérieurs obtus; côtés rebordés; angles postérieurs aigus, un peu saillants en arrière; base subtronquée au milieu, obliquement réfléchie en arrière de chaque côté, rebordée; marges latérales et basilaires très brièvement et fortement infléchies contre la bordure marginale. Ecusson triangulaire, plus long que large. Elytres aussi larges à la base que le prothorax, en angle obtus aux épaules, ne continuant pas sur les côtés la courbure des côtés du prothorax, arrondis sur les côtés, un peu élargis, brièvement arrondis ensemble au sommet, environ une fois et un cinquième plus longs que larges ensemble dans leur plus grande largeur, marqués de lignes substriées de points assez forts, effacés sur les côtés et vers le sommet; intervalles des lignes assez larges; bords latéraux très étroitement rebordés. Convexité des élytres plutôt forte. Pattes robustes. Mésosternum infléchi par rapport au plan du métasternum, celui-ci fortement, irrégulièrement et éparsément ponctué sur les côtés. Épipleurs relativement très larges.*

87 exemplaires.

Loc. SEYCHELLES. Silhouette, Mahé: "Silhouette, a few specimens from the mountain forests near Mont Pot-à-eau and Mare aux Cochons, including seven from a fallen and rotten trunk of an endemic palm, one from between leaf-bases of a growing *Roscheria* palm, and one from a fallen and rotten trunk of 'Bois Rouge' (*Wormia*). In Mahé the majority were found in the high forest of Mome Blanc, and a few in several other localities."

AXIOCERYLON, nov. gen.

Antennae 9-articulatae; clava unarticulata. Antennae in sulcis prosternalibus receptae; clava in prosterni depressione basilari recepta. Processus prosternalis latus, apice haud inflexus nec

* While making a preliminary sorting of the material previous to sending it to Mons. Grouvelle, I removed the elytra of examples of a number of forms in order to examine the condition of the *meta-thoracic wings*. These were found to be normally developed in all cases except three, namely *Paralyreus scotti* and *Thyroderus sculpticollis* (q. v.), and *Cerylon curtulum*. In the latter, six specimens were examined, and in all of them the wings are minute vestiges of remarkable form. They appear to be only about $\frac{1}{4}$ the length of the elytra, though exact measurement is difficult, and in balsam preparations (two of which were made) they are hardly visible at all owing to their transparency. They are extremely narrow in proportion to their length, the basal part being almost handle- or thread-like, while the distal part is only very little wider.—H. S.

productus, obtuse acuminatus. Abdominis primum segmentum elongatum, metasterno longius; segmentis aliis brevissimis.

Le genre *Axiocerylon* doit se placer près du genre *Glyptolopus*, Er.; il faut lui rapporter le *Cautomus monstruosus*, Grouvelle (1905, Bull. Soc. Ent. France, p. 109), de Sierra Leone. Les deux espèces *cavicolle* et *monstruosum* sont très voisines; la première a les intervalles des carènes des élytres confusément ponctuées, la deuxième est ponctuée en lignes sur ces intervalles. Une troisième espèce encore inédite, provenant de Sierra Leone, est encore plus voisine de la forme des Seychelles; les intervalles des carènes de ses élytres sont également ponctués en lignes, mais cette ponctuation est plus forte et les carènes ne s'accordent pas avec celles de l'*A. cavicolle*.

27. *Axiocerylon cavicolle*, n. sp. (Pl. II, fig. 13.)

Breviter oblongum, convexissimum, nitidum, glabrum, atrum; antennis pedibusque dilute pieeis. Antennae subgraciles; 2^o articulo subincrassato, fere duplo longiore quam latiore; clava oblonga, tribus partibus transversis divisa; 1^a glabra, duabus aliis pubescentibus, ultima apice acuminata. Caput modice transversum, inter antenarum bases angulatim vix carinatum, postice subdense, antice dense punctatum; margine antico arcuato. Prothorax transversus, antice sat valde, postice vix attenuatus, antice margine abrupto laevi, ad extremitates angulatim dilatato, praetextus; disco transversim excavato, lateribus valde abrupteque inflexo; marginibus depressis, latis, singulo duobus tuberculis elevatis instructo; intervallis inter discum, tuberculos et margines laterales in maxima parte profunde excavatis; tuberculo antico quadrilatero magno, cum margine laterali per angulum externum juncto, postico elongato, obliquo-subcarinato, extus juxta extremitatem basin attingente, intus depressione lata ex disco separato; excavatione transversa antice abrupta, postice obliqua; disco, aute excavationem dense, postice subparce, punctato. Elytra tam elongata quam simul lata, apice separatim obtusissime subacuminata, lineato-punctata; in singulo, intervallo 2^o modice, humerali valde carinatis; marginibus lateribus valde inflexis, juxta latera valde punctatis et striete concavopulvinatis. Long. 1.5-1.7 mill.

Oblong, un peu moins d'une fois et demie plus long que large, très convexe, glabre, brillant, noir; antennes et pattes roux de poix clair. Antennes assez grêles; 1^{er} article épais, dilaté-arrondi en dedans, à peine plus long que large; 2^{me} moins épais, environ

deux fois plus long que large; 3^{me} un peu allongé, 4^{me} subcarré, 5^{me} à 8^{me} plus ou moins transversaux, 9^{me} formant une massue oblongue, plus d'une fois et demie plus longue que large, partagée en trois zones transversales : la première occupant environ la moitié de la longueur, glabre, les deux autres pubescentes, la dernière acuminée. Tête infléchie, cachée dessous le pronotum, un peu moins longue que large au niveau des yeux, anguleusement subpliée entre les bases des antennes, très densément ponctuée en avant de ce pli, moins densément en arrière, longitudinalement subpliée sur le front; épistome développé, arrondi en avant; bords latéraux sinueux-échancrés à l'insertion des antennes. Yeux petits, très saillants. Prothorax fortement rétréci en avant, faiblement à la base, coupé transversalement vers le 1^{er} tiers de la longueur, à partir du sommet, par une forte excavation, à profil anguleuse, striée au fond, profondément impressionnée aux extrémités, limitée en avant par une carène un peu arquée vers l'avant, en arrière par une carène arquée vers l'arrière et de chaque côté par un sillon longitudinal très tourmenté. Bord antérieur apparent lorsque l'insecte est vu de dessus, arqué, bordé par une carène : marge antérieure réelle, invisible de dessus, normale au plan de l'insecte, très étroite au milieu, s'élargissant vers les extrémités, alors subconcave, formant en avant et en arrière des angles aigus, bordée en avant et sur les côtés par un faible bourrelet. Marge antérieure de l'excavation transversale presque brusquement infléchie, postérieure assez longuement inclinée au milieu, la première densément ponctuée, la deuxième ponctuée contre le bord supérieur : parties du disque comprises entre les sillons latéraux, l'excavation transversale, le bord antérieur apparent et la base, densément ponctuées. Sillons latéraux plus ou moins profonds, formant de véritables coupures normales au plan de l'insecte, commençant en avant, entre le bord latéral et l'extrémité de la marge infléchie du bord antérieur, suivant le bord de la partie discoidale antérieure, alors assez larges et assez profonds, fortement rétrécis devant l'excavation transversale par un lobe quadrangulaire, très convexe, contigus au bord latéral par un des sommets, puis longeant la partie discoidale postérieure, alors larges et fortement impressionnés, bordés en dehors par une forte saillie earêniforme un peu oblique, partant de la base, atteignant presque le lobe quadrangulaire et séparés de lui et des bords latéraux par des intervalles profonds; bords latéraux terminés en bourrelet, ornés de deux petits tubercules entre le lobe quadrangulaire et la base; celle-ci largement obtuse au milieu, rebordée. Ecusson invisible. Elytres environ aussi longs que larges ensemble, séparément et très largement acuminés-émoussés au sommet, fortement ponctués en lignes, à peine striés; 2^{me} intervalle dorsal et intervalle huméral relevés; le 1^{er} médiocrement,

le 2^{me} plus fortement, caréné, n'atteignant pas le sommet. Marges latérales fortement infléchies, marquées de deux lignes de points, la 2^{me} plus forte bordant le rebord latéral. Dessous à peine brillant, très finement chagriné, couvert d'une ponctuation grise, peu profonde, irrégulière, serrée sur le prosternum et les côtés du mésosternum, très espacée sur le milieu du premier segment de l'abdomen, effacée sur les autres segments.

16 exemplaires.

Loc. SEYCHELLES. Silhouette, Mahé : " Four specimens were obtained in Silhouette, three from the much-decayed fallen trunk of an endemic palm, and one between leaf-bases of a growing *Roscheria* palm. In Mahé examples were taken at high elevations in the forests of Morne Blanc, Morne Seychellois, and Cascade Estate."

THYRODERUS, Sharp, 1885, Journ. Linn. Soc. Lond., Zool., XIX, p. 82.

28. *Thyroderus sculpticollis*, n. sp. (Pl. II, fig. 12.)

Oblongo-subparallélus, convexus, disco elytrorum subdepressus, nitidus, glaber, castaneus, antennis pedibusque dilutior. Antennae breves; clava subglobosa, glandiformi. Caput fronte convexiusculum, crebre punctulatum, antice truncatum. Prothorax transversus, antice modice, postice parum angustatus, paulo ante medium transversim et utrinque plus minusve in longitudinem profunde striato-impressus; lobo ante impressionem transversam convexo, antice quam postice latiore, tenuiter denseque punctulato; lobo postico latiore, in longitudinem modice trisuleato, tenuiter punctulato; impressionibus lateralibus juxta basin lobi antici latioribus; marginibus lateralibus pulvinatis, ante sulcum transversum subsinuatis. Elytra subparallela, ad apicem sinuata et breviter conjunctim rotundata, circiter sesquolongiora quam latiora; singulo in longitudinem quadri-carinato; 1^a carina suturali vix elevata, 2^a et 3^a dorsalibus et 4^a laterali elevatis, integris, intervallis valde bilineato-punctatis. Long. 0.7 mill.

Oblong, subparallèle, environ deux fois plus long que large dans sa plus grande largeur, convexe, déprimé sur le disque des élytres, glabre, brillant, marron; antennes et pattes plus claires. Antennes courtes, épaisses; 1^{er} article arrondi-dilaté en dedans, environ aussi long que large, 2^{me} presque une fois et demie plus long que large, 3^{me} à 7^{me} serrés, transversaux, progressivement atténués, 8^{me} formant une massue subglobuleuse, glandiforme. Tête trans-

versale, tronquée en avant, un peu convexe sur le front, très densément pointillée. Prothorax modérément rétréci en avant, faiblement à la base, environ une fois et demie plus large dans sa plus grande largeur que long, coupé transversalement, un peu avant le milieu, par une impression sudeiforme profonde, limitée de chaque côté à un sillon longitudinal, ondulé, séparé du bord latéral par un bourrelet plus ou moins étroit; bord antérieur arqué dans le milieu, sinué de chaque côté devant le sillon longitudinal; angles antérieurs obtus, émoussés; côtés biarqués, sinués devant l'impression transversale; angles postérieurs faiblement obtus; base anguleuse dans le milieu, subsinuée de chaque côté. Lobe (antérieur) compris entre le bord antérieur et les sillons longitudinaux et le sillon transversal, convexe, rétréci vers la base, finement et très densément pointillé; lobe (postérieur) compris entre la base, les sillons latéraux et le sillon transversal, convexe, plus large en avant que le lobe antérieur, rétréci vers la base, finement et densément pointillé, partagé en avant en quatre lobes convexes par trois sillons longitudinaux, dont l'intermédiaire est mieux marqué; bourrelets marginaux dilatés en dedans un peu en avant du sillon transversal et moins fortement dans la partie basilaire; marge basilaire étroitement explanée, densément pointillée. Ecusson caché. Elytres parallèles, à la base de la largeur du prothorax, fortement sinués sur les côtés avant le sommet et enfin brièvement arrondis ensemble à l'extrémité; chacun avec quatre carènes longitudinales; la première suturale peu marquée, la 2^{me} et la 3^{me} dorsales accentuées, entières, la 4^{me} latérale et humérale, également entière. Intervalles entre ces carènes avec deux lignes de points enfoncés. Métaesternum et sommet du premier segment de l'abdomen coupés par une impression longitudinale, peu marquée.*

2 exemplaires.

Loc. SEYCHELLES. Silhouette, Mahé: "Both specimens from high elevations, in the forests of Mont Pot-à-eau (Silhouette) and Morne Blanc (Mahé), respectively."

MYCHOCERUS, Erichson, 1845, Naturg. Ins. Deutschl., III, p. 292, note 1.

29. *Mychocerus alluaudi*, Grouvelle.

Mychocerus alluaudi Grouvelle, 1894, Ann. Soc. Ent. France. LXIII. p. 15

* An elytron of *Thyroderus sculpticollis* became detached accidentally, revealing the fact that the specimen has no apparent trace of metathoracic wings [cf. *Paralyreus scotti* and *Cerylon cartulum*, pp. 24, 41].—H. S.

Oblongus, convexus, nitidus, glaber, castaneus; antennis pedibus dilutioribus. Antennae sat incrassatae, 8-articulatae; 2° articulo subelongato, quam 3° paulo longiore, 6° et 7° quam praecedentibus paulo angustioribus; clava suboblunga, intus magis dilatata. Caput transversum, antice truncatum, fronte convexiusculum. Prothorax antice valde angustatus, lateribus arcuatus, juxta basin antrorsum convergens, basi fere duplo latior quam longior; vix perspicue punctulatus; margine antico subtruncato; angulis anticis obtusis, vix indicatis; lateribus strictissime marginatis; angulis posticis acutis; basi medio arcuatim producta, utrinque transversim subtruncata, extra extremitates tenuissime punctato-marginata. Scutellum transversum, subpentagonale. Elytra humeris angulosa, lateribus arcuata, vix ampliata, apice conjunctim breviter rotundata, circiter 1 et $\frac{1}{2}$ longiora quam simul in maxima latitudine latiora, punctato-lineata, ex parte vix striata; punctis apicem versus et ad latera evanescentibus; intervallis latis, planis. Long. 0·9-1·2 mill.

Oblong, environ deux fois plus long que large dans sa plus grande largeur, convexe, glabre, brillant, marron peu foncé; antennes et pattes plus claires. Antennes de 8 articles, assez épaisses; 1^{er} article épais, environ une fois et demie plus long que large, recourbé dans la partie antérieure, 2^{me} moins épais, subcarré, 3^{me} à 5^{me} plus ou moins transversaux et subtransversaux, progressivement et très faiblement rétrécis, 6^{me} et 7^{me} transversaux, plus étroits que les précédents, 8^{me} oblong, un peu moins d'une fois et demie plus long que large, à peine moins long que les articles 3^{me} à 7^{me} réunis, un peu plus dilaté en dedans qu'en dehors, terminé par une calotte pubescente. Tête moins de deux fois plus large que longue, saillante anguleusement en avant des naissances des antennes, infléchie, tronquée au bord antérieur, modérément convexe sur le front, à peine visiblement pointillée; yeux modérément saillants. Prothorax fortement rétréci en avant, faiblement arqué sur les côtés, ceux-ci convergents en avant dès la base, presque deux fois plus large à la base que long, à peine visiblement pointillé de chaque côté du disque, principalement vers la région basilaire; bord antérieur subtronqué; angles antérieurs obtus, à peine marqués; côtés bordés par un très fin bourrelet et par une très étroite canelure ponctuée; angles postérieurs aigus; base arrondie en arrière dans le milieu, tronquée transversalement de chaque côté, bordée sauf au milieu et aux extrémités par une ligne de très petits points. Ecusson subpentagonal, environ deux fois plus large que long. Elytres en angle un peu obtus aux épaules, continuant la courbure des côtés du prothorax, arqués sur les côtés, à peine élargis, brièvement arrondis ensemble au sommet, environ une fois et demie plus longs que larges

ensemble dans leur plus grande largeur, ponctués-substriés; points assez forts vers la base, atténués puis effacés vers le sommet et sur les marges latérales; celles-ci très étroitement rebordées; intervalles larges, plans, stries suturales effacées au sommet. Convexité longitudinale des élytres continuant la convexité du prothorax. Mésosternum se développant presque dans le plan du métasternum. Strie marginale des hanches intermédiaires arquée, rejoignant l'épisternum un peu au delà du milieu de sa longueur, bordée en dehors par une ligne de points; métasternum ponctué en dedans de la strie marginale. Saillie du premier segment de l'abdomen entre les hanches postérieures sinuée; strie marginale arquée en dedans, rejoignant presque le bord latéral du segment, mais n'atteignant pas son sommet.

48 exemplaires.

Loc. SEYCHELLES. Silhouette, Mahé, Praslin, La Digue, Félicité: "Not confined to the mountain forests, but found also in cultivated places and at low elevations. In Silhouette a number were obtained near the coast at Pointe Etienne, under the bark of felled trees, with *Xuthia sicana*, *Lascolonus scotti*, and *Cerylon longius*; others were taken in the high mountain forests at 1000 feet and more, including one from a rotting trunk of an endemic palm. In Mahé examples were found at considerable elevations in Cascade Estate and Morne Blanc district. Two were also obtained in the cultivated islet, Long Island, from a felled coconut-palm trunk. Praslin: one specimen from Côtes d'Or Estate. Félicité: two specimens. Originally discovered by Alluand, 1892, in Mahé and La Digue."

TABLEAU DES *CERYLINI* DES SEYCHELLES.

1. Des fossettes antennaires sur le prosternum	2.
— Pas de fossettes antennaires sur le prosternum	4.
2. Fossettes antennaires contre le bord antérieur du prosternum. Surface du prothorax sans impressions ou excavations (<i>Myhocerus</i>)	<i>alluandi</i> , Group.
— Fossettes antennaires atteignant le bord postérieur du prosternum. Surface du prothorax irrégulière	3.
3. Sillons antennaires terminés par une fossette contre le bord postérieur du prosternum (<i>Axiocerylon</i>)	<i>caricolle</i> , n. sp.
— Fossettes antennaires s'étendant entre les bords antérieurs et postérieurs du prosternum (<i>Thyroderus</i>).	<i>sculpticollis</i> , n. sp.
4. Insecte glabre	5.
— Insecte pubescent	7.

5. Premier segment de l'abdomen plus long que le métasternum. Cavités cotyloïdes ouvertes (*Cerylon*) *curtulum*, n. sp.
 — Premier segment de l'abdomen au plus égal au métasternum; cavités cotyloïdes ouvertes 6.
6. Stries des élytres également marquées à la base, plus fortement ponctuées *longius*, n. sp.
 — Stries humérales plus fortement marquées à la base, toutes plus finement ponctuées *nitidum*, Grouv.
7. Elytres moins de deux fois plus longs que larges ensemble. Pubescence plutôt longue, assez dense, sublanugineuse *gardineri*, n. sp.
 — Elytres au moins deux fois plus longs que larges ensemble. Pubescence très fine 8.
8. Ponctuation des élytres confuse vers le sommet. Prothorax nettement plus étroit en avant qu'à la base *tuntillum*, n. sp.
 — Ponctuation des élytres régulière. Prothorax à peu près aussi large en avant qu'à la base 9.
9. Métasternum densément ponctué. Ponctuation des élytres plus fine *liliputanum*, n. sp.
 — Métasternum peu densément ponctué. Ponctuation des élytres plus forte *perparvulum*, n. sp.

NOTIOPHYGIDAE.

Cinq espèces représentent cette famille dans les collections rapportés par la Percy Sladen Trust Expedition; toutes appartiennent au genre *Aphanocephalus*, Wollaston, genre représenté dans les parties tropicales et subtropicales du monde entier. Pour le moment les *Aphanocephalus* semblent beaucoup plus nombreux dans les régions de l'ancien continent, mais les belles découvertes de la Percy Sladen Trust Expedition montrent qu'on doit s'attendre à voir le nombre des *Aphanocephalus* augmenter dans des proportions considérables. La famille des Notiophygidae (*Notiophygus* 1834, *Discoloma* 1845) comprend un ensemble d'espèces remarquables par les pores distribués sur la tête et les côtés du prothorax et des élytres. Le genre *Disco-genia*, Kolbe (Deutsch. Ost-Afrika, IV, Käf. 1898, p. 112) ne semble pas à sa place parmi les Notiophygidae; à mon avis il doit être rapproché des *Trichopteryx*.

APHANOCEPHALUS, Wollaston, 1873, Ent. Monthly Mag., XI, p. 278; Matthews, 1899, Monog. Coryloph., p. 197,

pl. 7, fig. c: Grouvelle, 1912, Notes Leyden Mus., XXXIV, p. 197.

30. *Aphanocephalus insularis*, n. sp.

Breviter oblongus, convexus, nitidus, pilis flavo-cinereis, tenuibus, dense vestitus, piccus, prothoracis elytrorumque marginibus stricte rufus. Antennae subincrassatae. Caput transversum, antice late arcuatum, inter antennarum bases tenuiter striatum, fronte tenuiter punctulatum, epistomo sublaevi. Prothorax antice valde, postice vix angustatus, basi fere ter latior quam longior, subparce tenuiter punctulatus; punctis ad latera paulo validioribus; margine antico truncato; angulis anticis rotundatis, tenuiter marginatis; lateribus in maxima parte parum, juxta basin valde rotundatis, extra basin sat late subconcavo-explanatis; angulis posticis subrectis; basi ante scutellum truncata, utinque longe sinuata. Elytra oblonga, paulo longiora quam simul latiora, punctis parum impressis, irregulariter dispersis, notata; intervallis praecipue juxta suturam, dense et saepe vix perspicue punctulatis; angulis humeralibus obtusis, vix hebetatis; lateribus tenuiter pulvinato-marginatis et sat late concavo-explanatis. Long. 1.2-1.5 mill.

Oblong, environ une fois et demie plus long que large, convexe, brillant, couvert d'une pubescence flave-cendrée, serrée, dressée, brun de poix, marges latérales du prothorax et des élytres très étroitement rougeâtres lorsque la coloration de l'insecte est complète, plus ou moins largement dans le cas contraire; antennes et pattes brun clair. Antennes un peu épaisses; 1^{er} article environ deux fois plus long que large, 2^{me} subtransversal, 3^{me} environ une fois et demie plus long que large, 4^{me} et 5^{me} subcarrés, 5^{me} à 8^{me} un peu moins épais que les précédents, subtransversaux; massue suboblongue, nettement plus longue que large. Tête cachée par le prothorax lorsque l'insecte est vu de dessus à l'état normal, saillante en avant des naissances des antennes en lobe subtronqué au sommet, environ deux fois plus large que long, à peine visiblement pointillé, transversalement convexe; strie interantennaire fine; front densément et très finement pointillé. Prothorax fortement rétréci en avant, à peine à la base, presque trois fois plus large dans sa plus grande largeur que long, subéparsément et finement pointillé de points un peu plus forts vers les marges latérales; bord antérieur tronqué; angles antérieurs arrondis, finement rebordés; côtés faiblement arrondis sur la majeure partie de leur longueur, fortement contre la base, bordés par un fin bourrelet et par une explanation subconcave assez large, n'atteignant pas la base; angles postérieurs driots; base, tronquée devant l'écusson,

longuement sinuée de chaque côté. Ecusson triangulaire, moins large à la base que long, à peine pointillé. Elytres oblongs, un peu plus plongs que larges dans leur plus grande largeur, ponctués de points peu enfoncés, irrégulièrement dispersés, séparés par des intervalles à peine visiblement pointillés, sauf contre la suture; base très finement rebordée; angles huméraux obtus, un peu émoussés; bords latéraux, bordés par un bourrelet et par une explana-tion concave, assez large, séparée du disque par des points irrégulièrement espacés. Métasternum presque lisse sur le disque, sub-éparsément ponctué sur les côtés; 1^{er} segment de l'abdomen éparsément ponctué sur le disque, plus densément et plus fortement sur les côtés.

93 exemplaires.

Loc. SEYCHELLES. Silhouette, Mahé, Praslin: "From the endemic mountain forests. Silhouette, near Mont Pot-à-eau and above Mare aux Cochons, including four speci-mens from leaf-bases of a growing *Stenersonia* palm. Mahé; near Morne Blanc, above Cascade Estate, etc., including two specimens from leaf-bases of a growing *Stenersonia* in the stunted forests on the summit of Mount Sebert. Praslin; a considerable series from the Coco-de-mer forest in the Vallée de Mai, Côtes d'Or Estate, xi. 1908." Cette espèce a été aussi récoltée à l'île Maurice par M. Carié.

31. *Aphanocephalus binotatus*, n. sp. (Pl. I, fig. 4.)

Breviter oblongus, convexus, nitidus, tenuissime, dense, flavo-cinereo-pubescent, ater; prothoracis marginibus anticis laterali-busque, in singulo elytro plaga oblonga, transversa, paulo ante medium posita, elytrorum marginibus reflexis, antennis pedibusque fulvis. Antennae vix incrassatae. Caput transversum, antice truncatum, inter antennarum bases striatum; epistomo transversum sat convexo; labro sat producto. Prothorax antice valde, postice modicissime angustatus, lateribus praecipue ad basin rotundatus, in maxima latitudine circiter ter latior quam longior, dense tenuiterque punctulatus, margine antico truncato, extra medium tenuiter marginato; angulis anticis rotundatis, tenuiter marginatis; lateri-bus pulvino tenui et margine reflexo, praecipue in medio dilatato, basin laud attingente, marginatis; angulis posticis parum obtusis; basi ante scutellum truncata, utrinque praecipue ad extremitatem sinuata. Scutellum subtriangulare, transversum, tenuissime punc-tulatum, in longitudinem subelevatum. Elytra oblonga, apice con-junctim breviter rotundata, 1 et $\frac{1}{4}$ longiora quam simul in maxima

latitudine latiora, crebre tenuiterque punctulata, punctis plus minusve sparsis vel densatis intermixtis; lateribus pulvino substricto et canaliculo concavo marginatis, pulvino sexies dilatato et punctato. Long. 2 mill.

Oblong, environ une fois et deux tiers plus long que large dans sa plus grande largeur, convexe, brillant, couvert d'une pubescence flave-cendrée fine, courte et serrée; noir, marges antérieures et latérales du prothorax largement, antennes, pattes, marges réfléchies des élytres et sur chacun d'eux une tache oblongue, transversale, placée avant le milieu, roux. Antennes peu épaissies; 1^{er} article environ une fois et demie plus long que large, 2^{me} subcarré, 3^{me} environ trois fois plus long que large, 4^{me} un peu allongé, 5^{me} à 8^{me} progressivement et faiblement plus épais, 5^{me} subcarré, 6^{me} à 8^{me} subtransversaux, massue piriforme, presque deux fois aussi longue que large. Tête presque cachée, lorsque l'insecte est vu de dessus, saillante en avant des naissances des antennes en forme de lobe tronqué en avant, transversalement convexe, environ deux fois plus large que long, séparé du front par une fine strie, à peine pointillé; front plus densément pointillé; labre médiocrement saillant. Prothorax très rétréci en avant, très faiblement à la base, arqué sur les côtés, fortement arrondi dans la partie basilaire, environ trois fois plus large dans sa plus grande largeur que long, couvert d'une ponctuation très fine et serrée; bord antérieur subtronqué lorsque l'insecte est vu de dessus, très finement rebordé sauf au milieu; angles antérieurs arrondis, finement rebordés; côtés bordés par un fin bourrelet et par une marge explanée, large, surtout au milieu, subconcave, n'atteignant pas la base; angles postérieurs un peu obtus; base tronquée devant l'écusson, largement sinuée de chaque côté surtout vers l'extrémité. Ecusson triangulaire, moins de deux fois plus large à la base que long, très finement pointillé, longitudinalement et faiblement plié. Elytres oblongs, arrondis aux épaules, alors très nettement plus larges que le prothorax dans sa plus grande largeur, arrondis sur les côtés, assez brièvement arrondis ensemble au sommet, environ une fois et un quart plus longs que larges dans leur plus grande largeur, couverts d'une ponctuation serrée, très fine, entremêlée de points plus ou moins forts et plus ou moins espacés ou serrés, effacés vers le sommet. Marges latérales bordés par un bourrelet relativement épais et par une marge concave, médiocrement étroite; bourrelet présentant en dedans six renflements ponctués, peu allongés. Métasternum plus densément mais moins fortement ponctué au milieu que sur les côtés. 1^{er} segment de l'abdomen densément ponctué comme le milieu du métasternum.

2 exemplaires.

Loc. SEYCHELLES. Mahé: "Cascade Estate, 800-1000 feet."

32. **Aphanocephalus quadriplagiatus**, n. sp. (Pl. II, fig. 10.)

Oblongus, convexus, nitidus, pilis cinereis, brevibus, inclinatis subdense vestitus, ater; antennarum basi tarsisque fulvo-testaceis; pedibus colore paulo nubilis; singulo elytro duabus maculis flammeo-testacis, latis ornato. Antennae parum incrassatae. Caput transversum, antice truncatum, inter antennarum bases vix perspicue striatum; epistomo transversim convexo; labro minimo. Prothorax antice valde angustatus, lateribus parum arcuatus, circiter basi ter latior quam longior, dense tenuiterque punctulatus, punctis apicem versus attenuatis; margine antico truncato, tenuissime marginato; angulis anticis rotundatis, marginatis; lateribus pulvino tenuissimo et margine concavo, stricto, juxta basin attenuato marginatis, angulis posticis acutis; basi ante scutellum sinuata et utrinque praecipue ad extremitatem sinuata. Scutellum subtriangulare, tam longum quam basi latum. Elytra oblonga, apice conjunctim rotundata, 1 et $\frac{2}{3}$ longiora quam simul in maxima latitudine latiora, tenuiter et plus minusve dense punctulata, punctis majoribus irregulariter intermixtis; lateribus pulvino tenuissimo et canaliculo concavo, stricto marginatis, pulvino quater dilatato et punctato. Long. 1.4-1.6 mill.

Oblong, environ deux fois plus long que large dans sa plus grande largeur, convexe, brillant, couvert d'une pubescence cendrée, courte, inclinée, assez dense, noir; base des antennes roux de poix clair, fémurs et tibias plus ou moins plus foncés; sur chaque élytre deux larges taches roux orangé, la postérieure atteignant presque la suture et le bord latéral. Antennes peu épaissies; 1^{er} article environ une fois et demie plus long que large, 2^{me} subcarré, 3^{me} environ trois fois plus long que large, 4^{me} subcarré, 5^{me} à 8^{me} s'épaississant progressivement et faiblement, transversaux, massue piriforme, environ une fois et demie plus longue que large. Tête presque complètement cachée lorsque l'insecte est vu de dessus, saillante en avant des naissances des antennes, en forme de lobe tronqué en avant, transversalement convexe, plus de deux fois plus large que long, séparé du front par une strie peu visible, à peine visiblement pointillé; front un peu plus fortement pointillé; labre petit. Prothorax fortement rétréci en avant, arrondi aux angles antérieurs, faiblement arqué sur les côtés, environ trois fois plus large à la base que long, couvert d'une ponctuation fine et serrée sur la région

basilaire, plus ou moins effacée sur le reste de la surface; bord antérieur subtronqué lorsque l'insecte est vu de dessus, très finement rebordé; côtés bordés par un très fin bourrelet et par une étroite marge concave, atténuée à la base; angles postérieurs aigus; base tronquée devant l'écusson, largement sinuée de chaque côté surtout vers l'extrémité. Ecusson triangulaire, aussi long que large à la base, très finement pointillé. Elytres oblongs, à peine plus larges à la base que la base du prothorax, arqués sur les côtés, très faiblement élargis, arrondis ensemble au sommet, environ une fois et deux cinquièmes aussi longs que larges ensemble dans leur plus grande largeur, couverts d'une ponctuation fine et serrée sur la région suturale-discoïdale, plus ou moins effacée sur le reste de la surface, entremêlée de points plus forts, irrégulièrement dispersés. Bords latéraux bordés par un bourrelet très fin et par une marge concave, étroite, effacée au sommet, limitée en dedans par une ligne de points; bourrelet présentant en dedans quatre renflements marqués d'un point. Métasternum irrégulièrement et peu densément ponctué; 1^{er} segment de l'abdomen ponctué à peu près de même.

Environ 40 exemplaires.

Loc. SEYCHELLES. Mahé: "From near Morne Blanc, and from Cascade Estate, 800-1000 feet."

33. *Aphanocephalus subdepressus*, n. sp. (Pl. I, fig. 5.)

Breviter oblongus, modice convexus, elytrorum disco subdepressus, nitidus, pilis flavo-cinereis, tenuissimis, inclinatis dense vestitus, brunneus; antennis, prothoracis elytrorumque marginibus reflexis, dilutioribus, pedibus dilute subpiceo-testaceis. Antennae sat incrassatae. Caput transversum, antice sinuatum, inter antennarum bases transversim subimpressum; epistomo vix perspicue punctato. Prothorax antice valde angustatus, postice breviter parallelus, lateribus arcuatus, circiter basi 2 et $\frac{1}{2}$ latior quam longior, dense tenuiterque punctulatus; margine antico subemarginato; angulis anticis late obtusis, hebetatis; marginibus lateralibus late explanato-concavis, juxta apicem breviter reflexis; angulis posticis subrectis; basi medio retrorsum producta, truncata, utrinque late sinuata. Scutellum rufo-brunneum, triangulare, tam elongatum quam basi latum. Elytra oblonga, lateribus arcuata, sat ampliata, apice vix conjunctim rotundata, circiter 1 et $\frac{1}{5}$ longiora quam simul in maxima latitudine latiora, tenuiter et irregularissime punctulata, punctis majoribus, irregularibus, praecipue ad latera validioribus, intermixtis et irregulariter dispersis; lateribus pulvino et

marginé concavo sat lato marginatis; pulvino apicem versus attenuato, pluribus punctis notato et juxta haec puncta vix incrassato. Long. 1.5-1.7 mill.

Oblong, environ une fois et deux tiers plus long que large dans sa plus grande largeur, modérément convexe, subdéprimé sur le disque des élytres, brillant, couvert d'une pubescence flave-cendrée, courte, inclinée et serrée, brun; antennes, marges réfléchies du prothorax et des élytres plus claires, pattes testacé-claires, très légèrement teintées de brun. Antennes assez épaisses; 1^{er} article environ une fois et demie plus long que large, 2^{me} subcarré, 3^{me} deux fois plus long que large, 4^{me} à 8^{me} progressivement et à peine visiblement épaissis, 4^{me} et 5^{me} subcarrés, 6^{me} à 8^{me} plus ou moins transversaux; massue piriforme, moins d'une fois et demie plus longue que large. Tête presque cachée par le prothorax lorsque l'insecte est vu de dessus, saillante en avant des bases des antennes en lobe sinué au bord antérieur, transversalement convexe, plus de deux fois plus large que long, à peine visiblement pointillé: front caché sous le prothorax, séparé de l'épistome par une impression peu accentuée; labre petit. Prothorax fortement rétréci en avant, brièvement parallèle à la base, arrondi sur les côtés, environ deux fois et demie plus large à la base que long, densément et finement pointillé de points un peu plus forts de chaque côté vers la base; bord antérieur subsinué; angles antérieurs très largement obtus, émoussés; côtés bordés par un très fin bourrelet et par une marge concave assez large, atténuée un peu avant la base, brièvement réfléchi contre le bord antérieur, marquée d'un point enfoncé contre cet angle et d'un autre point contre le bourrelet latéral vers le premier conquinème de la longueur à partir de la base; angles postérieurs presque droits; base saillante en arrière au milieu, tronquée devant l'écusson, largement sinuée de chaque côté. Ecusson rougeâtre, triangulaire, aussi long que large à la base, presque lisse. Elytres oblongs, arrondis sur les côtés, un peu élargis, arrondis presque ensemble au sommet, environ une fois et un cinquième plus longs que larges ensemble dans leur plus grande largeur, couverts d'une ponctuation très fine, plus ou moins visible, irrégulièrement serrée, entremêlée de points très irrégulièrement dispersés, en général plus forts et plus serrés vers les côtés. Base très finement rebordée vers les extrémités, en angle obtus, un peu émoussé aux extrémités. Côtés bordés par un bourrelet assez marqué à la base, atténué vers le sommet et par une marge concave assez large, atténuée également vers le sommet, séparée de la convexité des élytres par une strie ponctuée peu régulière; bourrelet présentant quelques points, ceux-ci n'entraînant pas un épaissement sensible de son bord. Métasternum presque

lisse au milieu, ponctué sur les côtés; 1^{er} segment de l'abdomen moins fortement ponctué au milieu que sur les côtés.

9 exemplaires.

Loc. SEYCHELLES. Praslin: "The specimens were all taken from between the leaf-bases of a single growing Coco-de-mer palm (*Lodoicea sechellarum*) in the Vallée de Mai, Côtes d'Or Estate, xi. 1908."

34. *Aphanocephalus acuminatus*, n. sp.

Ovatus, apice attenuatus, convexus, nitidus, pilis cinereis, sublanuginosis subparce vestitus; piceus, antennis et prothoracis marginibus lateralibus stricte ad angulos anticos fusco-testaceis; pedibus dilutioribus. Antennae sat incrassatae. Caput fere tam elongatum quam ad oculos latum, antice subsinuatum, inter antennarum bases tenuiter striatum, fronte subasperum; epistomo sublaevi; labro magno. Prothorax antice valde angustatus, lateribus arcuatus, juxta basin antrorsum valde convergens, circiter basi ter latior quam longior, dense tenuissimeque punctulatus, punctis juxta basin paulo validioribus; margine antico subsinuato; angulis anticis rotundatis; lateribus pulvino tenui et margine concavo, modice lato, ante basin evanescente marginatis; angulis posticis subrectis; basi medio arcuata, utrinque late sinuata, juxta extremitates leviter impressa. Scutellum triangulare, basi latius quam longius, tenuissime punctulatum. Elytra oblonga, lateribus arcuata, vix ampliata, apice conjunctim rotundata, fere tam longiora quam simul in maxima latitudine latiora, plus minusve dense punctulata, punctis plus minusve majoribus, irregulariter dispersis, intermixtis; lateribus pulvino stricto et canaliculo substricto, ambobus ad apicem attenuatis, marginatis. Long. 1.3-1.7 mill.

Ovale, atténué en avant, un peu moins d'une fois et demie plus long que large dans sa plus grande largeur, brillant, couvert d'une pubescence cendrée, sublanugineuse, peu serrée, brun de poix avec les antennes et une étroite marge vers les angles antérieurs du prothorax testacées, enfumées; pattes plus claires. Antennes assez épaisses; 1^{er} article environ deux fois plus long que large, 2^{me} subcarré, 3^{me} moins d'une fois et demie plus long que large, 4^{me} 6^{me} plus ou moins subcarrés 7^{me} et 8^{me} transversaux, massue subpiriforme, environ une fois et un tiers plus longue que large. Tête un peu moins longue que large au niveau des yeux, en partie visible lorsque l'insecte est vu de dessus, saillante en avant des bases des antennes en lobe subsinué au bord antérieur, subdéprimé à la base, progressivement convexe vers l'avant, plus de deux fois plus large que long,

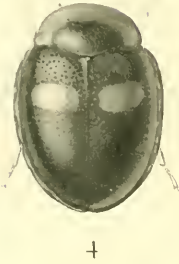
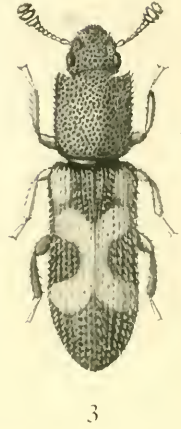
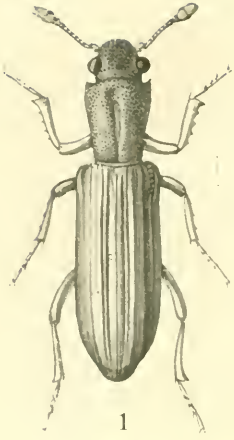
presque lisse ; intervalle entre les bases des antennes finement strié, impressionné au milieu ; front très finement pointillé, subrugueux ; labre grand. Prothorax très fortement rétréci en avant, arqué sur les côtés, convergent vers l'avant contre les angles postérieurs, environ trois fois plus large à la base que long, densément et très finement ponctué de points plus forts sur la région basilaire ; bord antérieur subsinué ; angles antérieurs arrondis ; côtés bordés par un fin bourrelet et par une marge concave, effacée avant la base ; angles postérieurs aigus, un peu émoussés ; base arquée en arrière dans le milieu, largement sinuée de chaque côté, impressionnée de chaque côté vers l'extrémité. Écusson triangulaire, moins long que large à la base, très finement pointillé. Élytres oblongs, arqués sur les côtés, un peu plus larges dans leur plus grande largeur que le prothorax à la base, arrondis ensemble au sommet, environ aussi longs que larges dans leur plus grande largeur, couverts d'une ponctuation fine, plus ou moins dense, entremêlée de points plus forts, devenant encore plus forts vers les marges latérales, irrégulièrement espacés ; angles huméraux obtus, émoussés ; côtés bordés par un bourrelet étroit et par une marge concave presque étroite, tous deux atténués vers le sommet ; marge concave limitée en dedans par une ligne de gros points irrégulièrement espacés ; bourrelet présentant plusieurs points enfoncés ne l'épaississant pas sensiblement. Métasternum et 1^{er} segment de l'abdomen presque lisses sur le milieu, assez fortement et peu densément ponctué sur les côtés.

4 exemplaires.

Loc. SEYCHELLES. Silhouette, Mahé : "From the high mountain forests."

TABLEAU DES *APHANOCEPHALUS* DES SEYCHELLES.

1. Prothorax rétréci à la base ; une tache roux-testacée sur la moitié basilaire de chaque élytre ; pubescence très courte, très fine, serrée *binotatus*, n. sp.
- Prothorax non rétréci à la base 2.
2. Noir avec deux taches rouges sur chaque élytre ; pubescence fine, sublanugineuse ; forme ovale, au moins deux fois aussi longue que large *quadriplagiatus*, n. sp.
- Brun de poix, sans taches rouges 3.
3. Prothorax nettement tronqué au bord antérieur ; pubescence fine, courte et serrée ; forme ovale, environ une fois et demie plus longue que large ; élytres plus longues que larges *subdepressus*, n. sp.



H. Mac. Knorr: 3c.

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COLEOPTERA FROM THE SEYCHELLES AND
ALDABRA ISLANDS.

EXPLANATION OF PLATE I.

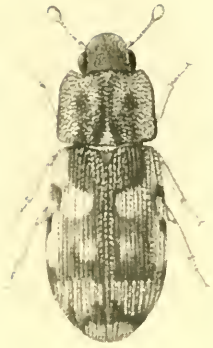
1. *Bothrioides fryeri*, sp. nov.
2. *Tyrtæus singularis*, sp. nov.
3. *Lascotoæus scotti*, sp. nov.
4. *Aphanocephalus binotatus*, sp. nov.
5. *Aphanocephalus subdepressus*, sp. nov.
6. *Ditoma cavicollis*, sp. nov.
7. *Sarothriæ eximius*, gen. et sp. nov.
8. *Colobicones singularis*, gen. et sp. nov.

EXPLANATION OF PLATE II.

9. *Cicones scotti*, sp. nov.
10. *Aphanocephalus quadriplagiatus*, sp. nov.
11. *Diplotoma capito*, sp. nov.
12. *Thyroderus sculpticollis*, sp. nov.
13. *Axiocerylon cavicolle*, gen. et sp. nov.
14. *Cerylon gardineri*, sp. nov.
15. *Paralyreus scotti*, gen. et sp. nov.
16. *Cicones compactus*, sp. nov.

[*Note*.—In figures 4, 11, 12, 16, certain of the appendages are represented by dotted lines. The specimens are not defective, but the appendages are bent beneath them and invisible from above; and the insects being very hard to relax, and in three of the cases unique, did not admit of the manipulation necessary to spread the appendages out.

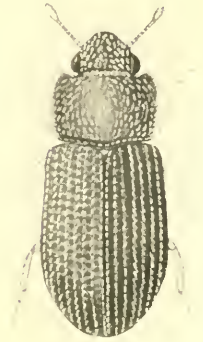
It is almost impossible to represent adequately the remarkable depth of the cavities on the thorax in figs. 12 and 13.—H. S.]



9



10



11



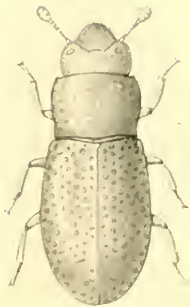
12



13



14



15



16

Horace Knight, del

Andre. Sleigh & Angl. Ltd

- Prothorax arrondi au bord antérieur; élytres environ aussi longs que larges 4.
4. Angles huméraux des élytres arrondis; forme oblongue, environ une fois et demie plus longue que large, bien arrondie en avant; pubescence assez longue, serrée; disque des élytres éparsément ponctué; écusson grand
insularis, n. sp.
- Angles huméraux des élytres obtus, à peine émoussés; forme oblongue, un peu moins d'une fois et demie aussi longue que large, subacuminée en avant; pubescence plutôt longue, sublanugineuse; écusson petit
acuminatus, n. sp.

Ces cinq espèces ont les angles antérieurs du prothorax aigus, la ponctuation des élytres plus ou moins espacée, le tégument sans reflet métallique, pubescent; elles rentrent dans le groupe 9 du tableau publié dans les Notes from the Leyden Museum, XXXIV, 1912, p. 221. *A. subdepressus* a les angles postérieurs du prothorax un peu saillants en arrière; *A. insularis* et *acuminatus* ne présentent pas ce caractère.

EXPLANATION OF PLATES I, II.

[See *Explanation facing the PLATES.*]

II. *New species of Staphylinidae from Singapore.* Part I.
By MALCOLM CAMERON, M.B., R.N., F.E.S.

[Read December 5th, 1917.]

THIS paper contains descriptions of Staphylinidae collected by myself in the Island of Singapore, between September 22nd, 1915, and December 20th, 1916. During this period practically every part was visited, but owing to the very limited time at my disposal it cannot be expected that a complete collection has been made; indeed, there are several species recorded which were not met with by me. I may say, however, that I devoted myself entirely to the collection of Staphylinidae, and 257 species were taken, of which no fewer than 146 appear to be undescribed.

It is hoped that the paper will be concluded by synoptic tables of all the species known in the island, which from its position forms a link with India on the one hand and the Malay Archipelago on the other. The ever-increasing number of descriptions and the almost entire absence of local "Faunas" dealing with this group is of course due to the want of material, and this paper should help as a small contribution to such local knowledge. The types of the species described are all contained in my own collection. The groups here dealt with are the *Lispini*, *Oxyteli*, *Osorii*, *Stenini*, *Pinophili*, *Paederini*, *Xantholinini*, *Staphylinini*, and *Quediini*.

LISPINI.

I. *Ancaeus singularis*, n. sp.

Linear, parallel, pitchy-brown, shining; head on either side of front with a rounded impression; antennae and legs testaceous, the former with 5-jointed club. Length 1.5-1.75 mm.

Somewhat resembling in facies the genus *Lispinus*. Smaller, narrower and less shining than *A. exiguus*, Er., and of different appearance due to the much longer head and thorax and less depressed form. Head as long as broad; eyes somewhat prominent; temples rather long, parallel, longer than the diameter of the eyes viewed from above; front truncate, with a rounded impression on each side; impunctate, but with a fine longitudinal strigose ground-sculpture.

TRANS. ENT. SOC. LOND. 1918.—PARTS I. II, (DEC.)

Antennae formed as in *A. exiguus*, the 1st joint stout, the 3rd shorter than the 2nd, scarcely longer than broad, 4th, 5th and 6th small and transverse, 7th to 10th considerably broader forming with the last a distinct club. Thorax as wide as the head (including the eyes), a little broader (at the anterior margin) than long, the sides converging gradually backwards to a little before the posterior angles, where they are slightly constricted; posterior angles bluntly rectangular with distinct rounded impression adjacent; disc with a fine median sulcus not nearly extending to the anterior or posterior borders, and an obscure rounded impression on either side; anterior margin with a minute fovea on either side nearer to the middle line than to the anterior angles; sculpture as on the head, no visible puncturation. Elytra as wide as the thorax at the anterior angles, longer than broad, parallel, sutural stria distinct; disc with an obscure fovea on either side; sculpture as on fore-parts, with the addition of a few exceedingly fine, scarcely visible punctures. Abdomen cylindrical, last segment testaceous, finely coriaceous, each segment with a puncture on either side bearing an erect seta, lateral setae feeble.

Hab. Bukit Panjang and Bukit Timah, under bark.

2. *Lispinus setosus*, n. sp.

Rufous, shining, head and abdomen pitchy; thorax transverse, scarcely constricted at the base. Length 2.9 mm.

A rather brightly-coloured, shining species. Allied to *L. impressicollis*, Kr., and *specularis*, Bernh., but larger, and more robust and shining, than the former, with the thorax scarcely constricted before the base, both the median and lateral impressions less marked and the setae everywhere more numerous and stronger; separable from *specularis* by its still larger and stouter build, less constricted thorax, less marked lateral impressions, stouter antennae, more finely and sparingly punctured elytra, and the more numerous and stronger setae. Head pitchy-red, front rufescent, distinctly impressed on either side, finely and sparingly punctured, sides with long, erect, yellowish setae; ground-sculpture scarcely visible. Antennae reddish-testaceous, the 2nd, 3rd and 4th joints subequal, short, 5th as long as broad, 6th to 10th transverse gradually increasing in width, 11th short-oval, acuminate. Thorax distinctly transverse, widest just before the middle, the sides rounded and converging anteriorly, contracted posteriorly in nearly a straight line, with scarcely a trace of sinuation; posterior angles with a small oval superficial impression, situated in front of which are two (as compared with the general puncturation) large punctures; disc with an

exceedingly fine groove in middle line posteriorly, feebly impressed on either side; puncturation not so fine as on the head, sparing and unequal, leaving a smooth impunctate median line; sides with long yellowish setae; ground-sculpture longitudinal, strigose, scarcely visible. Legs reddish-testaceous. Scutellum coriaceous, with three or four minute punctures. Elytra about one-third longer than, and as wide as, the thorax, scarcely transverse, on either side of the suture with a fine stria; puncturation fine and sparing as on the thorax, and, moreover, with a row of four larger (especially the posterior pair) setiferous punctures parallel to the stria, and three others on the middle of the disc; sides setiferous; ground-sculpture fine, coriaceous. Abdomen pitchy, the whole of the last and the posterior margins of the rest of the segments ferruginous; without punctures, except for the setiferous ones; ground-sculpture distinct, coriaceous.

Hab. Woodlands, under bark.

3. *Lispinus minutus*, n. sp.

Pitchy-brown, head black; shining, coriaceous, impunctate. Antennae and legs testaceous. Length 1.7 mm.

Head (including the eyes) a little broader than long, anterior margin of the front very feebly emarginate, distinctly impressed on either side; eyes rather large and prominent; sculpture coriaceous, without trace of punctures, glabrous. Antennae moderate, the first three joints subequal in length, decreasing in breadth, 4th moniliform, 5th and 6th scarcely broader than long, 7th to 10th transverse, gradually increasing in breadth, 11th short, oval. Thorax a little transverse, a little narrower than the head (with eyes), broadest at the anterior angles, sides almost parallel to the posterior third, moderately constricted from thence to the rectangular posterior angles; disc with a very narrow smooth median line throughout, anterior margin on either side with a setiferous fovea, posterior angles scarcely impressed; ground-sculpture coriaceous, a few scarcely visible punctures traceable. Elytra longer than broad, nearly half as long again as the thorax, obsoletely impressed on either side of the sutural stria, and each with two minute foveae; sculpture as on the thorax. Abdomen pitchy, last segment entirely, the posterior margins of the others, narrowly, reddish-testaceous; sculpture coriaceous, no punctures other than the usual setiferous ones.

Hab. Mandai, under bark, a single specimen.

ONYTELL.

4. *Trogophloeus* (s. str.) *orientalis*, n. sp.

Black nearly opaque, head and thorax densely punctured and grey-pubescent; elytra distinctly longer than the thorax; first two joints of the antennae and the legs testaceous. Length 2 mm.

In the dull, scarcely shining and pubescent surface this species much resembles *T. elongatulus*, Er., but differs from it in the following respects: the antennae are more elongate, the 5th and 6th joints being longer than broad; the eyes are much larger and the temples very small; the thorax is slightly longer, with the sides distinctly less rounded towards the base, and the elytra are much longer. Head transverse, impressed on each side in front within the antennal tubercles; eyes very large, temples very small, densely punctured and grey-pubescent. Antennae with the 2nd and 3rd joints subequal, 4th to 7th all a little longer than broad, gradually decreasing in length, 8th to 10th slightly transverse, gradually increasing in breadth, 11th moderately elongate, oval; the first two joints clear testaceous, the rest infuscate. Thorax a little broader than the head, broadest at the junction of the first and second fourths, gently rounded and narrowed anteriorly, narrowed posteriorly to the base in an almost straight line; disc with four obsolete impressions, the posterior pair being the more distinct; sculpture and pubescence as on the head. Elytra broader and about one-fourth longer than the thorax, much more finely and densely punctured than in *T. elongatulus*. Abdomen a little widened posteriorly, densely shagreened and grey-pubescent.

Hab. Keppel Harbour, in débris. One specimen.

It is possible that this species is synonymous with *T. siamensis*, Fauv., but not being certain from the description I have thought it advisable to treat it as new.

5. *Trogophloeus* (s. str.) *silvestris*, n. sp.

Black, moderately shining; fore-parts densely, finely punctured; thorax transversely impressed before the base and with four other impressions on the disc; antennae slender, the first three joints, legs and mouth-parts testaceous. Length 2 mm.

Facies of *T. indicus*, Kr., but much smaller and with prominent temples. Head large, transverse, subtriangular; temples smaller than the diameter of the eyes, rather prominent; front with a short impression within the antennal tuberosity on either side; vertex with a small fovea on either side of middle line; densely, finely

punctured. Antennae slender, all the joints distinctly longer than broad, except the 10th which is but slightly elongate. Thorax broader than the head, transverse, widest at the junction of the anterior and second fourths, from thence strongly contracted posteriorly in an almost straight line; disc with distinct transverse impression before the base and in front of this the surface is so impressed as to form an M-shaped elevation; on either side also are two short, oblique impressions; puncturation similar to that of the head. Elytra about one-third longer than the thorax, scarcely transverse; disc on either side of the suture for the anterior two-thirds with a longitudinal impression; puncturation similar to that of the thorax. Abdomen not widened behind, exceedingly finely and moderately closely punctured and pubescent.

Hab. Bukit Timah, Mandai and Sembawang, in débris, on the banks of the jungle streams. Appears to be a common insect.

6. *Trogophloeus (Taenosoma) halophiloides*, n. sp.

Nearly opaque, black; head and thorax densely shagreened, impunctate; first six joints of the antennae and legs pitchy-testaceous. Length 1.3 mm.

Very similar to the Palaearctic *T. halophilus*, Kies., from which it differs in the following respects: the shagreening and pubescence of the head and thorax are coarser, the antennae much stouter, the sides of the thorax more evenly rounded, the elytra much shorter, slightly widened behind and a little more strongly punctured. Head slightly narrower than the thorax, constricted behind, the temples shorter than the diameter of the eyes, which are rather large; the front longitudinally impressed on either side; the vertex with a small, smooth, shining plaque, the rest of the surface densely shagreened, without visible puncturation; pubescence rather coarse, griseous. Antennae with the 2nd joint shorter than the 1st, the 3rd about half as long as the 2nd, the 4th to the 7th square, the 8th to 10th transverse, the 9th to 11th larger than the preceding.

Thorax transverse, widest at the junction of the anterior and middle thirds, the side evenly rounded and converging both anteriorly and posteriorly, but more strongly so posteriorly; the disc with four obsolete impressions; sculpture and pubescence as on the head. Elytra a little longer than the thorax, transverse, slightly widened behind; with puncturation and pubescence much as in *T. halophilus*. Abdomen slightly widened behind, very finely

and pretty closely punctured, as in *T. halophilus*, and with similar pubescence.

Hab. Pasir Panjang, on the beach, in débris.

7. *Trogophloeus (Taenosoma) lucens*, n. sp.

Black, shining, thorax and elytra chestnut brown; antennae, mouth parts, and legs testaceous. Length 2.2 mm.

A shining insect, without trace of thoracic impressions. Head transverse, black, distinctly constricted behind the temples, which are a little prominent, their length much less than the diameter of the eyes, the latter large; the front on each side with a broad shallow impression; puncturation fine and scanty, a rather broad area in the middle line quite impunctate; no visible ground-sculpture; pubescence scanty, rather long and moderately coarse. Antennae longer than the head and thorax, the 1st joint elongate, the 2nd much shorter than the 1st, the 3rd a little shorter and more slender than the 2nd, the 4th scarcely longer than broad, the 5th stouter than the 4th and 6th either a little longer than broad or square, the 6th as long as broad, the 7th scarcely, the 8th to 10th gradually more transverse, the 11th oval. Thorax brown, but little broader than the head, almost semi-circular, widest at the junction of the first and second fourths, from thence narrowed and rounded in front and behind in an even curve, the sides passing insensibly into the base, the anterior angles rectangular; disc without impressions, but with a smooth impunctate line in the middle, the rest of the surface moderately finely and not very closely punctured, the punctures larger towards the sides, in which position several are umbilicate; no visible ground-sculpture; pubescence as on the head. Elytra brown, one-half as long again as the thorax, a little broader than long, with moderately fine and not very close puncturation, pubescence rather coarse, erect and moderately close; no visible ground-sculpture. Abdomen slightly widened behind, black, the posterior margins of the segments and the extreme apex more or less brown; puncturation very scanty, scarcely visible; ground-sculpture coriaceous, distinct; pubescence rather long, sparing and coarse.

Hab. Pasir Panjang, in a rotting pine-apple on a sandy beach.

8. *Trogophloeus (Taenosoma) littoralis*, n. sp.

Castaneous, shining, elytra reddish-testaceous; thorax with four impressions on the disc and the sides broadly impressed; mouth-

parts, legs, and first three joints of the antennae reddish-testaceous, the rest of the antennae fuscous. Length 1.75 mm.

A shining, reddish species, with lighter elytra, very similar in build to *T. nitidus*, Baudi, but with broader head, smaller eyes, and shorter elytra. Head large, ferruginous, constricted behind, scarcely narrower than the thorax; the front on either side with a well-marked longitudinal impression; the temples slightly prominent, their length equal to the diameter of the eyes; moderately finely and not very closely punctured, and without visible ground-sculpture; pubescence fine and sparing. Antennae longer than the head and thorax, the 2nd joint about half as long as the 1st, the 3rd much shorter than the 2nd, the 4th scarcely longer than broad, the 5th square, larger than the 4th and 6th, the 6th moniliform, the 7th and 8th slightly, the 9th and 10th more strongly, transverse, the 11th conical. Thorax about one-half as broad again as long, broadest at the junction of the first and middle thirds, from thence gradually narrowed and rounded to the anterior angles, more strongly contracted and much less rounded to the posterior angles; the disc with four distinct impressions, the sides rather broadly and superficially impressed; puncturation rather fine and not very close; pubescence fine and scanty; no visible ground-sculpture. Elytra reddish-testaceous, shining, one-fourth longer than the thorax, transverse; puncturation coarser than that of the thorax, rather superficial and moderately close; pubescence fine and moderately close. Abdomen very sparingly, scarcely perceptibly punctured, finely coriaceous, finely and sparingly pubescent.

Hab. Pasir Panjang, in rotting fruit on a sandy beach.

9. *Trogophloeus* (*Taenosoma*) *rufotestaceus*, n. sp.

Reddish-testaceous, moderately shining, antennae, mouth-parts and legs testaceous, the last three joints of the antennae forming a club. Length 1.4 mm.

A minute species, with large head, the abdomen more shining than the fore-parts, and with the fourth visible segment somewhat pithy. Head large, subtriangular, constricted behind, a little wider than the thorax; temples rounded, longer than the diameter of the eyes, which are small; the front narrowly black between the antennal tuberosities, slightly impressed on either side; sculpture finely coriaceous, without trace of puncturation; pubescence very fine, yellow, very sparing. Antennae about as long as the head and thorax, the 3rd joint shorter than the 2nd, the 4th small, moniliform, the 5th to the 8th transverse gradually increasing in width,

the 9th considerably broader than the 8th, the 10th as broad as the 9th, 11th conical. Thorax transverse, formed as in *T. halophilus*, Kies., but shorter, widest at the junction of the first and middle thirds, slightly rounded and narrowed anteriorly, more strongly contracted backwards to the rounded posterior angles; disc longitudinally impressed on either side of the middle line; sculpture and pubescence similar to that of the head. Scutellum shining, impunctate. Elytra about one-fourth longer than the thorax, a little infusate posteriorly; sculpture finely granular and coriaceous, no distinct puncturation visible; pubescence yellow, fine and sparing, but much more distinct than on the fore-parts. Abdomen very finely coriaceous, impunctate, more shining than the fore-parts, very finely and very sparingly pubescent.

Hab. Sembawang, on the bank of a stream.

10. *Aploderus testaceus*, n. sp.

Rufo-testaceous, shining: last six joints of the antennae and disc of the elytra infusate. Length 3.5-4 mm.

Head transversely suborbicular, front depressed between the antennal tuberosities, anterior margin elevated and produced; eyes large, their diameter much greater than the length of the temples; orbit with a juxta-ocular furrow; puncturation fine and sparing. Antennae with the 1st joint elongate, clavate, the 2nd and 3rd joints subequal, 4th slightly, the following more strongly transverse, gradually increasing in breadth, the last joint conical. Thorax transverse, a little broader than the head, widest just behind the anterior angles, narrowed posteriorly in a nearly straight line, posterior angles completely rounded; disc with a very fine median impressed line (sometimes obsolete), sides broadly and feebly impressed, puncturation exceedingly fine and sparing. Elytra a little longer than the thorax, transverse, the puncturation closer and more distinct than that of the thorax. Abdomen, except for a few setiferous punctures, laevigate; ground-sculpture very fine, coriaceous, scarcely visible.

♂. Seventh ventral segment bluntly, triangularly produced in the middle, and rather deeply emarginate on either side; the sixth feebly impressed in the middle in front of the posterior margin, the impression rather thickly punctured and clothed with stiff whitish pubescence.

Hab. Mount Faber district, in dung. Appears to be scarce.

11. *Oxytelus (Anotylus) granadillae*, n. sp.

Pitch-brown, shining, thorax and abdomen pitchy-testaceous; first four joints of antennae and legs testaceous, the rest of the former a little infusate. Length 2.25–2.75 mm.

Build of *O. kraatzi* (*pulcher*, Kr.), but a little smaller than that species, darker in colour, with the head entirely shining, ground-sculpture coarser and limited to the frons and the part lying behind the curved posterior line, puncturation of the thorax coarser and more sparing, and the elytra less distinctly punctured; thorax also less transverse. Head pitch-brown, in ♂ a little broader than the thorax, transversely quadrate, clypeus depressed, semi-circular, impunctate and without ground-sculpture; vertex with a short, rather broad stria opening behind into a curved transverse line limiting the region of the neck; eyes rather small, their diameter shorter than that of the temples which are broadly rounded posteriorly; very finely and sparingly punctured, finely wrinkled between the antennal tubercles and about the neck, otherwise without ground-sculpture. Vertex on either side with a fovea from which an impressed line passes towards the posterior margin of the eye. Mandibles reddish-testaceous, palpi testaceous. Antennae rather long, of the same structure as in *O. kraatzi*, 1st joint elongate, gradually thickened towards the apex, 2nd longer and stouter than the 3rd, 4th moniliform, 5th small and transverse, 6th to 8th slightly, 9th and 10th scarcely transverse, 11th oval. In the ♀ the head is much smaller and *not* broader than the thorax, and the temples are smaller. Thorax reddish-testaceous, shining, strongly transverse, widest at the anterior angles, which are nearly acute, narrowed in a straight line to just in front of the posterior angles, where there is a feeble sinuation; disc with three furrows, the central broadest in front and extending the whole length, the lateral furrows curved and shorter; sides strongly impressed; puncturation rather coarse, sparing, and rugose. Elytra transverse, shining, punctate-strigose. Abdomen shining, very finely and sparingly punctured and pubescent.

♂. Seventh ventral segment slightly emarginate on either side of the middle line posteriorly.

Hab. Keppel Harbour, in rotting Passion fruit.

12. *Oxytelus (Anotylus) frugicola*, n. sp.

Reddish-testaceous, shining, abdomen pitchy; clytra simply punctured, not at all strigose; antennae and legs testaceous. Length 1.4 mm.

Head in ♂ short, transversely quadrate, broader than the thorax, front transversely impressed, smooth and polished; vertex with a fine stria and with very few fine punctures, on either side with two small rounded impressions placed transversely; temples and region behind the antennal tubercles obliquely strigose-rugose; eyes about the length of the temples, the posterior angles of which are rounded. Antennae rather long, 2nd and 3rd joints of equal length, 4th as long as broad, 5th to 10th transverse, gradually increasing in breadth, eleventh conical. Thorax transverse, widest a little behind the anterior angles and from thence narrowed in a straight line posteriorly, slightly rounded and narrowed in front, the straight portion of the sides very obscurely crenulate; disc with three sulci, the central straight and narrow, the others lightly curved and wider; sides distinctly impressed; comparatively coarsely (for the size of the insect), but not very closely, punctured; lateral impressions rugose. Elytra longer than the thorax, transverse, testaceous, shining, moderately finely and somewhat closely punctured, not at all rugose or strigose. Abdomen dirty testaceous, shining, infusate on fifth and sixth segments, exceedingly finely and sparingly punctured and pubescent.

♂. There appears to be no special modification of the terminal segments.

Hab. Mandai, a single specimen found in the rotting fruit of a wild nutmeg.

13. *Oxytelus (Anotylus) obscurus*, n. sp.

Black, fore-parts entirely opaque, first three joints of antennae and legs testaceous; anterior tibiae simple. Length 1.5 mm.

Smaller and more opaque than *O. pygmaeus*, Kr., the thorax much narrower and the ridges not at all shining. Head transversely quadrate, narrower than the thorax; front impressed between the antennal tubercles and coarsely strigose, the striate area bounded by a fine shining line from the rest of the surface, which is completely opaque and densely, finely rugose-strigose; base with transverse impressed line bounding the neck; vertex without fovea or stria. Antennae longer than the head and thorax, 3rd joint moniliform, 4th small, transverse, 5th as long as broad, 6th to 10th gradually more transverse, 11th elongate, pointed. Thorax formed as in *O. pygmaeus*, but considerably narrower; median sulcus narrow, evanescent in front and behind, the lateral sulci double the width of it and straight; sides rather broadly impressed; the whole surface entirely opaque, with sculpture as on the head. Elytra

longer and broader than the thorax, transverse, densely strigose-rugose, impunctate, dull. Abdomen a little shining, exceedingly finely and sparingly punctured and pubescent, with fine coriaceous ground-sculpture.

♂. Seventh ventral segment slightly produced and rounded in the middle line.

Hab. Mount Faber, in carrion.

OSORII.

14. *Holotrochus nitidus*, n. sp.

Black, shining, glabrous, sparingly but distinctly punctured; antennae, legs and last segment of abdomen reddish-testaceous. Length 3-3.5 mm.

Head convex, anterior margin rounded, front with a minute fovea on either side; eyes moderately large, not prominent, temples parallel; puncturation scattered, rather coarse. Antennae with 1st joint elongate, stout, 2nd and 3rd subequal, 4th a little longer than broad, 5th and 6th moniliform, 7th to 10th transverse, gradually increasing in width. 11th conical. Thorax transverse, wider than the head, broadest just behind the anterior angles and from there very slightly rounded and narrowed to the obtuse posterior angles, adjacent to which is a rounded impression; puncturation as on head. Scutellum bipunctate. Elytra a little longer than thorax, square, puncturation less distinct than on the fore-parts. Abdomen very finely and sparingly punctured, ground-sculpture finely coriaceous, scarcely visible. Anterior tibiae sinuate internally.

Hab. Mandai, in rotten wood.

STENINI.

15. *Stenus (Tesus) fortepunctatus*, n. sp.

Black, very shining, glabrous, very coarsely punctured; first four joints of the antennae, palpi, and legs testaceous, the knees narrowly infusate. Length 3.75 mm.

Very similar in build to *S. bispinus*, Motsch., but much smaller, with shorter abdomen, the terminal segments of which are more strongly punctured, the head more concave, the antennae much shorter, the fourth tarsal joints less strongly bilobed, and the thorax a little shorter. Head large, not as broad as the elytra, completely concave, without trace of central elevation, very coarsely and closely punctured. Antennae rather short, the 1st and 2nd joints

of about equal length, the 3rd much longer, the 4th to the 8th all longer than broad, gradually decreasing in length, 9th and 10th as long as broad, the 11th conical: the last seven joints infusate. Thorax widest at the middle, and from there gradually and equally narrowed to the anterior and posterior angles; disc without trace of impressions, coarsely punctured like the head. Elytra square, convex, at the suture scarcely as long as the thorax, the sides rounded, the posterior margins together distinctly emarginate; puncturation even coarser than that of the fore-parts. Abdomen cylindrical, gradually pointed behind, bases of the segments strongly constricted; the first four visible segments as strongly punctured as the head, the following segments gradually less distinctly punctured; anal spines short, incurved. Last joint of the tarsi distinctly shorter than the first.

♂. Seventh ventral segment with acute triangular excision in the posterior margin, sixth with a rather broad, thickly punctured and pubescent impression occupying the whole length of the segment.

Hab. Mandai, in débris.

16. *Stenus (Hypostenus) castaneus*, n. sp.

Shining, head black; thorax and elytra dark brown; abdomen with the first four and half the fifth segments chestnut-brown, the rest black; first two joints of the antennae, and the legs, testaceous, the knees and base of the tibiae infusate. Length 4 mm.

A slender species, very distinct by its colour and having somewhat the facies of a small *S. bispinus*. Head black, glabrous, except for some whitish pubescence on the front, rather deeply and longitudinally impressed on either side of the vertex, which is elevated into a rather broad, impunctate ridge, the latter with an elongate impression posteriorly; from the base of the antennal tubercle on either side an impunctate ridge extends backwards and outwards towards the eye; sculpture consisting of a few rather large, scattered punctures. Antennae long and slender, all the joints considerably longer than broad, the 3rd, 4th and 5th subequal, 6th, 7th and 8th gradually shorter, 9th, 10th and 11th long, oval. Palpi testaceous. Thorax dark pitchy-brown, widest at the middle; viewed from above, narrowed anteriorly in a nearly straight line, posteriorly narrowed and sinuate behind the middle, feebly impressed postero-laterally; anterior and posterior borders distinctly margined; disc without impression, uniformly and rather coarsely punctured. Elytra dark pitchy-brown, glabrous, broader than the head, as broad as long, ample, convex, a little longer at the suture than the thorax, emargin-

ate posteriorly, more coarsely punctured than the thorax. Abdomen cylindrical, the first four visible, and the basal half of the fifth, segments castaneous, the rest black; the first and fifth segments very narrowly bordered, the first four strongly constricted at their bases; the first rather strongly punctured, the second to the fourth much less strongly and less closely punctured, terminal segments almost impunctate, the ninth broadly emarginate, its posterior angles dentiform; anal styles slender, long, incurved, testaceous.

5. Seventh ventral segment with an acute triangular excision, the apex of which is rounded and the sides feebly margined; the sixth impressed in the middle line at the base, the impression thickly punctured and pubescent.

Hab. Mandai, on bank of a jungle stream and also in damp wood.

PINOPHILI.

17. *Pinophilus notabilis*, n. sp.

Rufous, shining, head very finely and sparingly punctured; thorax as long as broad, distinctly punctured; elytra one-third shorter than the thorax, coarsely and rugosely punctured. Length 7.8 mm.

Of peculiar build, and from the description would appear to be closely related to *P. brachypterus*, Kr., from which it apparently differs in coloration and in both mandibles being furnished near the base with a rather long sharp tooth. Head transverse, narrower than the thorax, shining red, temples with a minute tooth, setiferous; front with three setiferous, punctures placed transversely, one smaller, median, and one larger on either side; vertex with four large setiferous punctures placed quadrately, another pair obliquely placed on either side near the base of the antennal tuberosities, and with four or five others at the margin of the eye; besides these, there are some fine, scattered irregularly distributed punctures; ground-sculpture fine, strigose, not very distinct. Mouth-parts testaceous, mandibles ferruginous, falciform, each with a sharp tooth at the base. Antennae pilose, the first two joints stouter than those following, the 2nd a little shorter than the 1st, all the rest very slender and narrowed at the base, 3rd slightly shorter than the 4th, 4th to 6th scarcely differing in length, slender and club-shaped, 7th to 10th gradually but slightly decreasing in length, 11th elongate, as long as the 10th. Thorax as long as wide, broader than the head, sides parallel, setiferous, anterior and posterior angles briefly rounded, disc with trace of impunctate median line, otherwise uniformly

covered with moderately close, not very fine, digital* punctures; ground-sculpture as on the head. Scutellum coarsely punctured. Elytra narrower and one-third shorter than the thorax, coarsely and rugosely punctured; pubescence long and scanty, yellow. Abdomen pitchy-red, posterior margins of the segments narrowly brighter; sides setiferous; puncturation rather fine, not very close, the terminal segments almost as closely punctured as the anterior ones; pubescence rather long, yellow; ground-sculpture imbricate on the first two segments; anterior femora much thickened.

Hab. Bukit Timah, in a rotten log. A single ♀.

18. *Palaminus parvus*, n. sp.

Shining, testaceous, puncturation large and superficial, abdomen reddish-brown, thorax transverse, elytra longer than broad; antennae, legs and palpi pale yellow. Length 2.75 mm.

Head transverse, puncturation rather large, superficial, almost umbilicate. Antennae slender, first two joints of equal length, stouter than the succeeding, 3rd a little longer than 4th, 4th and 5th of equal length, longer than broad, 6th to 9th subequal, oval, 10th stouter and longer than 9th, 11th obconical, broader than 10th. Thorax broadest just behind anterior angles, about one-third broader than long, gently rounded in front, narrowed in an almost straight line to the rounded posterior angles, puncturation rather large, sparing and superficial. Elytra more than one-third longer than the thorax, distinctly longer than broad, much more closely punctured than the fore-parts. Abdomen with first four segments imbricate, 5th sparingly asperate, 6th laevigate, apex with a pair of styliform processes. The whole insect clothed with long, coarse, yellow hairs.

Hab. Bukit Panjang, in débris.

This species is somewhat similar in general appearance and sculpture to *P. insularis*, Cam., from Jamaica, but the thorax is less transverse and the elytra are shorter.

PAEDERINI.

19. *Astenus orientalis*, n. sp.

Reddish-testaceous, rather shining, antennae and legs pale testaceous. Length 4 mm.

* By this term I mean an impression such as would be made by pressure of the tip of the finger on a soft surface, such as putty or clay.

So closely allied to *A. kraatzii*, Bernh., that an enumeration of the points of difference should suffice. It is a little more elongate and the antennae are slightly longer than in *A. kraatzii*, the elytra are unicolorous, parallel, more depressed on the disc and more finely punctured, the abdomen is likewise unicolorous and more finely punctured. The thorax has 4 and the elytra 7 or 8 strong setae on either side as in *A. kraatzii*, and the anal styles are similarly formed.

Hab. Bukit Panjang, in débris. A single ♀.

20. *Stilicopsis obliqua*, n. sp.

Rufous, elytra testaceous, with an oblique pitchy-brown macula extending from the lateral margins to near the apex of the suture; abdomen pitchy-testaceous, the fourth (visible) segment black; antennae, legs and palpi pale testaceous. Length 4.5 mm.

Var. 1. Elytral markings almost obsolete, abdomen concolorous.

Var. 2. Uniformly reddish-testaceous.

Larger and much more robust than *S. trinotata*, Kr. Differs from *S. umbilicata*, Fauv., by the longer and more slender antennae, longer and narrower thorax, shorter and broader elytra, and the abdomen more widened behind. Head large, suborbiculate, temples continuously rounded with the base, eyes prominent, sculpture close, umbilicate. Antennae elongate, the 2nd joint shorter than the 3rd, 4th to 7th joints all considerably longer than broad, 10th almost square, 11th conical. Thorax a little longer than broad, narrower than the head and the elytra, puncturation as on the head; sides with four or five long black setae. Elytra in fully-coloured specimens with a pitchy indeterminate macula extending from the middle of the sides and becoming more or less evanescent towards the apex of the suture; about as long as broad, convex, ample, rather coarsely and closely punctured and pubescent; sides with three or four long black setae. Abdomen slightly contracted at the base, reddish, fourth visible segment pitchy-black, apex testaceous, puncturation moderately fine and close, pubescence yellow, lateral setae black.

♂. Seventh ventral segment with a deep obtusely pointed excision, the sixth with a small obtuse excision.

Hab. Bukit Timah, in débris.

21. *Stilicopsis persimilis*, n. sp.

Rufo-testaceous, elytra testaceous, with obscure ill-defined pitchy macula at the middle of the lateral borders; antennae, palpi and legs pale testaceous. Length 4 mm.

Closely resembling the preceding, *S. obliqua*, from which it is distinguished by its smaller size, less robust build, and more shining appearance; the base of the thorax broader, the sides not so strongly contracted, the disc slightly impressed throughout in the middle line; the elytra a little less deeply punctured; the male-characters also different.

♂. Seventh ventral segment with a deep, acute, triangular excision, and the sixth segment with a minute notch, at the middle of the posterior margin; metasternum in the middle in front of the posterior coxae with a large, thickly punctured and pubescent impression extending nearly to the middle coxae.

Hab. Bukit Timah, in débris. A single ♂.

22. *Thinocharis nigricans*, n. sp.

Moderately shining, densely and finely punctured; pitchy-black, head square, thorax pitchy-brown; antennae, palpi and legs testaceous. Length 2.25 mm.

Smaller and narrower than *T. carinicornis*, Kr., and differently coloured. Head as broad as long, quadrate, eyes small; temples long, scarcely dilated, gradually passing into the rounded posterior angles; base scarcely emarginate; puncturation very close and fine, much closer and finer than in *T. carinicornis*, Kr. Antennae with the first two joints much thicker than the following, the 3rd to the 6th longer than broad, subequal, 7th a little shorter than the 6th, 8th to 10th short, scarcely longer than broad, 11th oblong-ovate. Thorax pitchy-brown, narrower than in *T. carinicornis*, Kr., slightly longer than broad, scarcely as wide as the head; anterior angles more rounded than in *T. carinicornis*, Kr.; disc with a narrow elevated line posteriorly, which is finely grooved, obsolete impressed on either side; puncturation and pubescence similar to that of the head. Elytra black, a little longer than the thorax, parallel, longer than broad, densely and finely punctured and pubescent. Abdomen black, apex of last segment brown, closely and finely punctured and pubescent, but much less so than the fore-parts.

Hab. Bukit Timah, in débris.

23. *Medon* (s. str.) *rubicundus*, n. sp.

Shining, rufous, elytra testaceous, with the base and a variable extent of the disc pitchy; abdomen pitchy-red, the sixth and seventh segments broadly reddish-testaceous posteriorly; antennae, palpi, and legs reddish-testaceous. Length 4 mm.

This species is possibly identical with *M. discipennis*, Fauv., but would appear to differ in the finer puncturation of the thorax, which is finer than that on the head. Rather robust. Head large, transverse, quadrate, eyes moderate, the temples longer than their diameter, parallel, posterior angles rectangular; vertex impunctate, the front with a few fine scattered umbilicate punctures, the sides and temples more closely and less finely punctured, the punctures umbilicate and mixed with a few finer simple punctures; setae black. Antennae scarcely as long as the head and thorax, the 2nd and 4th joints shorter than the 3rd, 5th to 9th slightly transverse, 10th about as long as broad, 11th conical. Thorax a little narrower than the head (especially in ♂), slightly transverse, widest at the anterior angles, narrowed almost in a straight line posteriorly; puncturation finer than on the head, superficial and scattered, scarcely umbilicate; sides with seven or eight long black setae. Elytra parallel, a little longer than the thorax, about as long as broad, testaceous, less shining than the fore-parts, with an indeterminate triangular pitchy marking occupying the base and extending more or less along the suture; puncturation close, fine and somewhat asperate; pubescence yellowish, setae black. Abdomen pretty finely and closely punctured, with rather fine and long pubescence.

♂. Seventh ventral segment with a narrow, deep, triangular excision in the middle of the posterior margin; sixth segment broadly and feebly emarginate.

Hab. Woodlands, in rotten logs.

24. *Hypomedon fasciatus*, n. sp.

Rufous, shining, elytra testaceous with broad transverse black fascia; antennae, parts of mouth, and legs reddish-testaceous. Length 3 mm.

From the description this insect would appear to be closely allied to *H. laticinctus*, Fauv., but smaller and more brightly coloured. Head large, transversely quadrate, eyes small, temples parallel, posterior angles slightly rounded, vertex and front nearly impunctate, sides and temples pretty closely and moderately strongly punctured. Antennae rather short, 2nd joint shorter than 3rd, 3rd to 5th longer than broad, decreasing in length, 6th and 7th as long as broad, 8th to 10th transverse, 11th elongate, oval. Thorax a little narrower than the head, the median line obsolete, base with a small feeble impression on either side, very finely and not closely punctured. Elytra slightly broader than the thorax, a little longer than broad, testaceous with a broad, well-defined, black band situated nearer

the posterior than the anterior border; puncturation not so fine as on the thorax, but about as close. Abdomen reddish-testaceous, pretty closely and finely punctured, less distinctly so posteriorly.

♂. Seventh ventral segment with a deep narrow triangular excision in the posterior margin.

Hab. Woodlands, under bark of decaying logs.

25. **Hypomedon lucens**, n. sp.

Reddish-testaceous, shining, abdomen pitchy-red. Antennae and legs testaceous. Length 3 mm.

A subparallel-sided insect, the fore-parts clear shining reddish-testaceous. Head large, transversely quadrate, temples parallel, posterior angles bluntly rectangular; vertex impunctate, the rest of the surface covered with large scattered umbilicate punctures; sides and front setiferous; no trace of ground-sculpture. Antennae shorter than the head and thorax, 2nd joint shorter than the 3rd, about as long as the 4th, 4th, 5th and 6th a little longer than broad gradually decreasing in length, 7th as long as broad, 8th, 9th and 10th gradually increasing in breadth, 11th elongate, oval. Thorax scarcely narrower than the head, transverse, disc with smooth impunctate line throughout its length, the rest of the surface covered with large scattered umbilicate punctures. Elytra a little longer than, and as wide as, the thorax, scarcely longer than broad, of a yellowish red colour, with rather fine, somewhat asperate and not very close puncturation, sparingly pubescent. Abdomen pitchy-red, very finely and not very closely punctured, pubescence yellowish, rather long.

Hab. Bukit Panjang, in débris. A single ♀.

26. **Hypomedon granulatus**, n. sp.

Reddish-testaceous, shining, elytra broadly blackish at postero-external angles; antennae, mouth-parts, and legs reddish-testaceous. Length scarcely 2 mm.

Smaller and more shining than *H. debilicornis*, Woll., and differently coloured, with a narrower head and thorax than in that species. Head square, temples parallel, the posterior angles rather broadly rounded, the base emarginate; sculpture consisting of small granules, pretty dense on the front and temples, but becoming more scattered posteriorly. Antennae short, the 3rd joint shorter than the 2nd, 4th scarcely longer than broad, 5th to 10th transverse, gradually increasing in breadth, 11th short, oval. Thorax scarcely narrower than the head, as long as broad, widest at the anterior angles, which

are broadly rounded, narrowed in a straight line to the posterior angles; disc with a narrow smooth elevated line, more distinct posteriorly and becoming evanescent about the anterior third; sculpture similar to that of the head; anterior angles with a single seta. Elytra very slightly broader than long, a little longer and distinctly broader than the thorax, of a testaceous colour, with the posterior half of the sides, the postero-external angles, and the posterior margins blackish; sculpture of the same character as that of the head, but less distinct and not so close as on the thorax. Abdomen very finely, sparingly and obsolete punctured, especially towards the apex; pubescence sparing, yellowish.

Hab. Mandai, in débris. The description is taken from female examples.

PARASCOPAEUS, n. gen.

Labrum small, transverse, emarginate in front, sides rounded and much contracted towards the base, almost obcordate; mandibles strongly curved, prominent; third joint of maxillary palpi dilated, four small, subulate; labial palpi 3-jointed.

Antennae inserted beyond the outer margin of the mandibles, beneath the frontal margin, widely separated, much nearer the eyes than to each other; the first joint long and stout, rather broadly and deeply grooved on the upper surface from the apex nearly to the base; eyes very small, not prominent; neck about one-fourth the width of the base of the head; gular sutures distinct, separate, a little wider apart in front, otherwise parallel; prosternum keeled in front of the anterior coxae, which, as well as the others, are contiguous; anterior femora dilated, tibiae obliquely truncate at their apices, finely setose; tarsi 5-jointed, the anterior pair simple, the posterior pair with the first four joints short, subequal; suture of elytra simple; abdomen keeled at the base below, the sides margined above.

This genus would appear to stand between *Dacnochilus* and *Scopaeus*; from the former it is distinguished by the sulcate first antennal joint; from the latter by the broader neck and differently shaped labrum. The specimen being unique, a dissection of the mouth-parts has not been made.

27. *Parascopaeus nitidus*, n. sp.

Shining, pitchy-brown; antennae, mouth-parts, legs, and posterior margins of each abdominal segment and anus, testaceous. Length 2.2 mm.

Facies somewhat like that of a minute *Lathrobium*. Head large, quadrate, a little longer than broad; temples long, nearly parallel, slightly contracted behind to the briefly rounded posterior angles; base truncate; disc with smooth, narrow, impunctate line throughout; front and antennal tubercles reddish-testaceous, impunctate, the rest of the surface moderately closely and, for a small species, rather coarsely punctured; no visible ground-sculpture. Antennae shorter than the head and thorax, the 1st joint rather long and stout, deeply sulcate along the upper surface from apex nearly to base, the 2nd short, clavate, the 3rd shorter than the 2nd, the 4th and succeeding joints transverse, the penultimate ones strongly so, about three times as broad as long, the 11th not much longer than broad. Thorax distinctly narrower than the head and elytra, a little longer than broad, widest at the obtusely rounded anterior angles, narrowed in a straight line to the rounded posterior angles; disc with a smooth central line throughout, which is finely grooved; puncturation fine and sparing, finely pubescent. Elytra distinctly longer and broader than the thorax, longer than broad, a little widened behind, finely, sparingly and indistinctly punctured, finely pubescent. Abdomen slightly widened behind, finely, indistinctly, and not closely punctured, sparingly pubescent.

♂. Last ventral segment with a deep, moderately broad, triangular excision of the posterior margin; penultimate segment with a small rounded emargination, in front of which is an oblong impression extending for the whole length of the segment.

Hab. Bukit Panjang, in débris. A single ♂.

28. *Scopaeus niger*, n. sp.

Black, moderately shining; antennae with first six joints pitchy-testaceous, the others clear testaceous; legs testaceous, the femora more or less infuscate. Length 4 mm.

Facies of *S. nitidulus*, Motsch., but differently coloured, head a little narrower, abdomen more slender, the antennae longer and not so stout. A moderately robust and elongate form, entirely black, with the abdomen more or less pitchy; occasionally the whole insect is more or less pitchy black. Head large, convex, orbicular; temples passing insensibly into the base, puncturation very fine and close. Antennae elongate, all the joints considerably longer than broad, gradually decreasing in length, the 2nd joint shorter than the 3rd, 4th to 6th subequal, 7th and 8th of equal length, 9th and 10th likewise equal in length, 11th elongate, oval. Thorax narrower than the head and elytra, oblong-ovate, the anterior

angles not at all distinct, more shining than the head; disc distinctly carinate in the middle line posteriorly and impressed on either side; puncturation very close, much finer than on the head, almost imperceptible; pubescence very fine. Elytra parallel, longer than the thorax, longer than broad, puncturation very fine, close and asperate; pubescence fine and close. Abdomen a little widened posteriorly, densely and very finely punctured, pubescence fine and close; apex reddish-testaceous.

Hab. Mandai, on the bank of a stream. Four females.

29. *Calliderma rufum*, n. sp.

Rufous, elytra reddish-brown; head and abdomen shining, thorax opaque; antennae and legs pale reddish-testaceous. Length 5-6 mm.

Near *C. indicum*, Kr., but larger and differently coloured, the head longer in front of the eyes, the basal impression much broader, and the abdomen more coarsely punctured. Head shining, elongate, distinctly longer than the breadth including the eyes, the sides parallel in front of these; temples small, strongly rounded and passing insensibly into the base; the vertex posteriorly with a deep semi-circular impression, from which on either side a sulcus passes outwards to the orbit, and another, much wider behind, forwards, nearly reaching the apex of the broad smooth triangular space between the antennal tubercles; this space, the sulci, and the basal impression, glabrous and highly polished, the rest of the surface in front of the orbital sulci coriaceous, with a few large superficial setiferous punctures; the surface behind the orbital sulci and the temples without ground-sculpture, but with obsolete setiferous puncturation. Antennae with the 1st joint as long as the five following joints together, the 2nd to the 5th longer than broad, gradually decreasing in length, the 6th and 7th moniliform, the 8th to 10th slightly transverse, 11th short, oval. Thorax opaque, a little longer than broad, slightly broader than the head, widest just before the middle, the sides obtusely angulate at this point, from thence rounded and converging anteriorly, sinuate and more strongly converging posteriorly; disc in the middle line behind with a short, shining longitudinally sulcate carina, and on either side with a sinuated, elevated line extending from the posterior to the anterior margins, but not coalescing either with them or with the median carina; the extreme ends of these lines are shining, and except for these and the median carina, the whole of the surface is opaque, densely and finely punctured; the sides with a few

setae; the lines on the disc are so curved as to resemble the outline of a lyre. Scutellum shining, impunctate. Elytra about as long as the thorax, a little longer than broad, not quite so dull as the thorax, and more obscurely coloured; densely and closely, but less finely punctured than the thorax. Abdomen pretty closely and moderately coarsely punctured, especially at the bases of the segments, more finely punctured posteriorly; pubescence rather long, but not dense; anal styles testaceous, slightly curved upwards.

♂. Seventh ventral segment with a deep, narrow, triangular excision in the posterior margin, the sides of which are finely bordered.

Hab. Bukit Timah, on the bank of a jungle stream.

30. *Calliderma nitens*, n. sp.

Rufous, shining, elytra black, less polished; legs, palpi, and antennae testaceous, the apex of the 1st, and the whole of the 2nd, 3rd and 4th joints infusate. Length 5 mm.

A very shining insect, with glabrous, impunctate thorax, and dark elytra, except for the extreme base, which is shining and rufescent. Head shorter than in *C. rufum*, the temples longer, straighter and converging, the impression on the vertex triangular; puncturation sparing, obsolete and setiferous, the antennal tuberosities and the sides of the head in front of the eyes with coriaceous ground-sculpture; the front, the space between the antennal tubercles, and the immediate vicinity of the median sulcus and the temples, without ground-sculpture. Antennae longer and more slender than in *C. rufum*, with the 1st joint about equal to the five following joints together, the 2nd a little shorter than the 3rd, the 3rd to the 9th all distinctly longer than broad, gradually decreasing in length, the 10th as long as broad, the 11th short, oval. Thorax narrower than in *C. rufum*, the sides more sharply angulate and without trace of puncturation or ground-sculpture; the disc with a sulcate carina extending from the base almost to the level of the widest part, where it opens out into a longitudinal impression that extends almost to the anterior margin, and on either side with a raised sinuate line, which in front turns inwards to join its fellow limiting the median impression and separating it from the anterior margin, and behind likewise unites with its fellow and the median carina; sides strongly impressed behind the anterior angles; the lyre-shaped pattern formed by the raised lines not so obvious as in some of the other species of the genus, this being due to the uniformly shining surface. Scutellum red, impunctate. Elytra

about as long as the thorax, longer than broad, parallel; the extreme base shining, rufescent, and very sparingly punctured, the rest blackish, not very shining, glabrous, densely and not very finely punctured. Abdomen rufous, moderately finely and not very closely punctured on the anterior segments, especially at their bases; pubescence rather long, yellowish; anal styles testaceous, up-curved.

♂. Seventh ventral segment with a deep, narrow, triangular excision in the middle of the posterior border, the apex of which is rounded and the sides not margined.

Hab. Mandai, on the bank of a jungle stream.

31. *Calliderma rugicolle*, n. sp.

Black, rather shining; thorax in front narrowly, behind much more broadly, red; abdomen red, the fourth (visible) and greater part of the fifth segments pitchy-black; antennae, palpi and legs testaceous, the 2nd, 3rd and 4th joints of the former, infusate. Length 5 mm.

From the description this species would appear to be allied to *C. uspericolle*, Fauv. Head narrower than in *C. indicum*, Kr., with the temples straighter and convergent, and the occipital fossa rhomboidal; the front and the triangular smooth space between the antennal tuberosities shining, reddish-testaceous, without visible sculpture; the rest of the surface (except in the immediate vicinity of the longitudinal sulcus, occipital fossa, and the temporal regions) coriaceous, with obsolete setiferous puncturation, more distinct on the temples. Antennae long, the 1st joint as long as the five following joints together, the 2nd a little shorter than the 3rd, the 2nd to the 9th all distinctly longer than broad, gradually decreasing in length, the 10th scarcely longer than broad, 11th short, ovoid. Thorax distinctly longer than broad, obtusely angulate before the middle, narrowed from thence anteriorly in a nearly straight line, and posteriorly in a straight line; disc in the posterior third with a broad, deeply grooved keel, anteriorly with a digital impression; the raised lateral lines distinct throughout, turned inwards and confluent with the central carina posteriorly, and with the margins of the digital impression anteriorly; the sides with rather obsolete impression behind the anterior angles; puncturation coarse, rugose and confluent, wanting on the anterior border, the digital impression and the spaces between the central keel and the lateral lines, all of which are completely smooth and shining; the surface red, with a narrow black fascia nearer the anterior than the posterior border. Scutellum red, shining, impunctate. Elytra black, rather

shining, longer than broad, parallel, about as long as the thorax, very closely and moderately coarsely punctured (more strongly than in *C. indicum*). Abdomen shining, finely and sparingly punctured throughout, less distinctly so posteriorly; anal styles testaceous and curved upwards.

Hab. Mandai, on bank of a jungle stream. A single ♀.

32. *Cryptobium foveatum*, n. sp.

Black, shining, fore-parts closely and coarsely punctured; abdomen rather less shining, finely and closely punctured; antennae reddish-testaceous; legs pale testaceous. Length 8.5 mm.

Very near *C. fossigerum*, Kr., but larger and more robust, rather more shining and with still coarser puncturation and longer antennae, the first joint of which is unicolorous. Head oblong, temples parallel, posterior angles rounded, puncturation coarse, close and umbilicate; space between antennal tuberosities smooth and shining; pubescence fine. Antennae unicolorous, pale reddish-testaceous. 1st joint fully equal to the three following together, the 2nd shorter than the 3rd, 4th to 10th all longer than broad, gradually decreasing in length, the penultimate joint but slightly longer than broad, 11th as long as broad. Thorax nearly cylindrical, feebly rounded towards the anterior angles, the smooth median line broken anteriorly; puncturation as on the head; pubescence griseous. Scutellum punctured. Elytra as long as the thorax, coarsely and closely punctured. Abdomen closely punctured throughout, more coarsely so anteriorly, especially at the bases of the segments; pretty thickly clothed with rather long greyish pubescence.

♂. Seventh ventral segment with a rather broad triangular emargination; the sixth with a large, deep, round fossa, clothed with long converging hairs, in the middle of the base; the posterior border slightly produced in the middle line, and bearing a feeble tubercle, slightly emarginate on either side; the space between the fossa and the posterior border impressed and glabrous.

Hab. Singapore town, at light. A single specimen.

XANTHOLININI.

33. *Oligolinus parvus*, n. sp.

Black, shining; antennae, mouth-parts and legs reddish-testaceous, the femora and middle and posterior tibiae more or less pitchy. Length 4 mm.

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Allied to *O. leucoenemis*, Kr., but much smaller and narrower, more depressed and with shorter head, the posterior angles of which are much less broadly rounded, differently coloured legs, and the thorax much more narrowed behind. Head quadrate, temples parallel, the posterior angles briefly rounded, the median sulci very short and broad, foveate, the orbital sulci short and oblique; punctures very few, fine, and scattered, four rather larger ones placed quadrately on the vertex; ground-sculpture scarcely perceptible, strigose. Antennae short and stout, the 2nd joint not much longer than broad, the 3rd to 10th transverse, the penultimate ones strongly so. Thorax scarcely broader than the head, distinctly longer than broad, the sides contracted in a straight line posteriorly from the obtusely rounded anterior angles; the disc on either side with an irregular series of six small punctures, and externally with a curved row of four still finer ones; ground-sculpture as on the head. Scutellum quadripunctate. Elytra as long and as broad as the thorax, parallel, often more or less brownish near the sutural and apical margins; exceedingly finely and sparingly punctured; suture imbricate. Abdomen shining, exceedingly finely and sparingly punctured; pubescence yellowish, rather coarse and sparing.

♂(?). Sixth ventral segment obtusely produced posteriorly and feebly sinuate on either side.

Hab. Keppel Harbour, a single specimen in débris. Woodlands, under bark.

31. *Somoleptus linearis*, n. sp.

Shining, head and abdomen black, thorax and elytra pitchy-brown; antennae, mouth-parts and legs testaceous. Length 3 mm.

A smaller and narrower insect than *S. parvulus*, Sharp. Head black, wider than the thorax, longer than broad; temples almost parallel, very slightly widened towards the posterior angles, which are rather broadly rounded; eyes much shorter than the temples; base truncate, neck slender, about one-fourth the breadth of the head; frontal furrows parallel, not well marked, the lateral wanting, the orbital linear, oblique, passing backwards and inwards towards the middle line; puncturation moderately close and fine on the temples, rather coarser in front behind the furrows, the middle of the disc impunctate; no visible ground-sculpture. Antennae short and stout, the 1st joint long and thick, the 2nd about one-fourth the length of the 1st, the 3rd to the 10th transverse, increasing in width, the penultimate ones nearly discoidal, 11th short, conical.

Thorax narrow and elongate, nearly half as long again as broad, widest at the anterior angles, which are rounded, the sides but slightly converging in a straight line to the posterior angles, which pass insensibly into the base; puncturation as on the head, and leaving a narrow impunctate median space throughout; sides with a few fine setae; pubescence fine and sparing. Scutellum triangular, impunctate; transversely strigose. Elytra pitchy-brown, lighter about the suture, which is imbricate, as long as the thorax, and a little longer than broad; sparingly and finely punctured; pubescence fine, stiff, and griseous. Abdomen pitchy, the apex and posterior margins of the segments narrowly lighter, very sparingly and finely punctured; pubescence rather long, stiff, griseous.

Hab. Bukit Panjang, in rotten logs. The specimens examined do not appear to present any visible sexual characters.

35. *Eulissus lateralis*, n. sp.

Black, shining, elytra and abdomen pitchy, the former obscurely testaceous on the disc, the latter with the lateral margins clear testaceous; antennae, mouth-parts and legs reddish-testaceous, the tibiae a little infusate. Length 7 mm.

A very distinct species, the lateral margins of the segments of the abdomen being bright testaceous yellow. Head, black, shining, subquadrate, the temples parallel, the posterior angles with a minute tooth; median sulci parallel, extending to the same level as the lateral ones, these passing backwards and slightly outwards, and connected with a short oblique orbital furrow, the juncture being marked with a large umbilicate puncture; temples bounded above by a deep, rather broad furrow extending from the posterior margin of the orbit to the posterior angles, the furrow provided with two or three large umbilicate setiferous punctures; sculpture consisting of larger and smaller, scattered and irregular punctures, the space between the median sulci impunctate; temples grooved longitudinally; no visible ground-sculpture. Antennae short, the 2nd joint subequal to the 3rd, the 4th strongly transverse, as are the following joints, which, however, do not increase in breadth towards the apex, the 11th short, oval. Thorax formed as in *E. anachoreta*, Er., with three punctures on each side—one at the anterior angles, one at the posterior angles and one on the anterior margin—otherwise impunctate and without ground-sculpture. Scutellum shining, with three or four somewhat asperate punctures. Elytra as long as the thorax, longer than broad, pitchy, the posterior two-thirds of the pleura and an indeterminate macula on each disc

more or less testaceous; sculpture consisting of a sutural row of fine somewhat obsolete punctures, and a distinct row from the humeral angle to the posterior margin of about twelve punctures; the pleura have also an irregular series of eight or nine punctures, otherwise the surface is impunctate and shows no sign of ground-sculpture. Abdomen pitchy, the extreme apex, the posterior margins of the segments very narrowly, and the explanate lateral margins entirely, bright yellow-testaceous; puncturation very fine and sparing; pubescence stiff and scanty.

Hab. Woodlands, in dry dung. A single ♀.

36. *Diochus pulchellus*, n. sp.

Pitchy-black, shining; thorax entirely, apex of elytra broadly reddish-testaceous; abdomen pitchy-red, the apex testaceous; antennae, mouth-parts, and legs testaceous. Length 3 mm.

A brightly-coloured, shining insect. Head subtriangular, longer than broad; front with a minute tubercle in the middle line on a level with the bases of the antennal tuberosities; sculpture consisting of a row of four punctures on either side—one at the base of the antennal tuberosity, a second a little behind the level of the posterior border of the eye, a third at an equal distance from the second as this is from the first, and a fourth in front of the base of the head; temples with a few fine setiferous punctures; ground-sculpture very fine, transverse, strigose. Antennae reaching the posterior margin of the thorax, the 2nd and 3rd joints of equal length, 4th and 5th subequal, a little longer than broad, the 6th as long as broad, the 7th scarcely, the 8th to 10th slightly, transverse. Thorax red, widest at the rounded posterior angles, longer than broad, the sides slightly converging anteriorly to the widely rounded anterior angles; disc with a row of three setiferous punctures converging behind on either side, and also with two externally near the anterior angles, and a minute one at the posterior angles; the sides setose. Elytra pitchy-black, shining, the sides, posterior angles and apical margin broadly reddish-testaceous; shorter than the thorax, transverse, widened posteriorly; sculpture consisting of a row of four or five obsolete, scarcely visible setiferous punctures on each disc; sides with rather long dark setae. Abdomen pitchy-red, the 5th (visible) segment reddish-testaceous, the 6th testaceous; finely and closely punctured and pubescent throughout, the sides setiferous, each segment also with erect setae.

Hab. Sembawang, in débris. Unique.

STAPHYLININI.

37. *Holisus parvus*, n. sp.

Depressed, linear, shining pitchy-brown; elytra obscure testaceous; the first three joints of the antennae fusco-testaceous; legs testaceous.

Length 2-3 mm.

Head large, a little longer than broad; temples parallel, the posterior angles briefly rounded; eyes small; front truncate; puncturation (for a small species) rather large superficial, feebly umbilicate and rather close on the disc, temples almost impunctate; pubescence fine, sparing; mouth-parts pitchy-testaceous. Antennae rather short, the 2nd and 3rd joints of equal length, the 4th as broad as long, the 5th slightly transverse, the following joints gradually but slightly increasing in breadth, 11th oval. Thorax narrower than the head, slightly transverse trapezoidal, widest at anterior angles, narrowed in a straight line to the rounded posterior angles; disc broadly but feebly impressed posteriorly; puncturation very fine and not very close; pubescence fine, less sparing than on the head. Elytra slightly widened behind, a little longer than broad, wider than the thorax, obscure testaceous more or less infusate about the scutellum and sides; puncturation and pubescence very similar to that of the thorax. Abdomen a little widened behind, the first three visible segments finely and moderately closely, the following much more finely and sparingly, punctured; pubescence fine and sparing.

Hab. Mandai.

One specimen found under bark.

38. *Holisus cingulatus*, n. sp.

Pitchy-black, scarcely shining, the thorax, 2nd, 3rd, 4th, 8th and posterior portion of the 7th abdominal segments and legs reddish-testaceous; first two joints of the antennae pitchy-testaceous. Length 1.75 mm.

A very small, narrow, parallel-sided insect, at once distinguished from the preceding by the colour, smaller size, and shorter head. Head large, massive, square, very slightly dilated at the temples, which are long, with rounded posterior angles; disc broadly impressed towards the front; puncturation rather fine, superficial and moderately close, obsoletely umbilicate; finely pubescent. Antennae short, the 2nd joint shorter than the 1st, the 3rd much shorter than

the 2nd, the 4th to the 10th transverse, increasing in breadth, the penultimate three times broader than long, the 11th conical. Thorax shorter and a little narrower than the head, transverse, widest at the anterior angles, the sides converging in a straight line to the rounded posterior angles; the disc rather broadly impressed in the middle throughout its length; puncturation very fine and rather close; finely pubescent. Elytra scarcely longer but a little broader than the thorax, square, pitchy, obscurely lighter on the disc; puncturation very fine and rather close; finely pubescent. Abdomen slightly widened behind, finely and sparingly punctured and pubescent throughout.

Hab. Bukit Timah.

One specimen, taken from beneath bark.

39. *Actobius laticeps*, n. sp.

Black, shining; antennae and legs fuscous, the 1st and 2nd joints of the former and the femora, testaceous. Length 4 mm.

More slender, with more pointed abdomen, broader head and thinner antennae than *A. signaticornis*, Muls. Head large, quadrate, slightly transverse; the temples slightly converging to the rounded posterior angles; moderately finely and rather sparingly punctured, a broad area from the front to the base in the middle quite impunctate; punctures setiferous; the eyes larger and more prominent than in *A. signaticornis*; no ground-sculpture visible. Antennae slender, the 2nd joint dilated, shorter than the 3rd, the others distinctly longer than broad, gradually decreasing in length. Thorax a little narrower than the head with the eyes, widest at the broadly rounded anterior angles, narrowed posteriorly in a straight line, slightly longer than broad; disc with a somewhat irregular row of seven or eight moderately-sized setiferous punctures on either side, externally finely, sparingly and irregularly punctured. Scutellum triangular, sparingly punctured. Elytra a little longer than the thorax, slightly longer than broad, finely, asperately and somewhat sparsely punctured, more finely and not so closely punctured as in *A. signaticornis*. Abdomen closely and finely punctured and pubescent throughout, the posterior margins of the segments narrowly and obscurely reddish; the puncturation not so dense and fine as in *A. signaticornis*.

♂. Anterior tarsi dilated; the last ventral segment with a small triangular excision at the posterior margin.

Hab. Mandai, on the bank of a jungle stream.

40. *Philonthus sulcatus*, n. sp.

Black, shining; suture of elytra, first joint of the antennae and the legs rufo-testaceous, the tibiae a little infuscate; penultimate joints of the antennae as long as broad; front of the head deeply sulcate; dorsal series of thoracic punctures five * in number. Length 6.5–7 mm. Build of *P. sanguinolentus*, Grav., but with smaller head, stouter antennae, and much less closely punctured abdomen. Head suborbicular; eyes not prominent, viewed from above, their length less than that of the temples; front in the middle line with a deep longitudinal sulcus reaching to the anterior margin; the median intra-ocular punctures much further apart from one another than from the lateral ones; temples with four or five setiferous punctures; ground-sculpture fine, transverse, strigose. Antennae with the 1st joint and base of the 2nd reddish-testaceous, the 3rd scarcely longer than the 2nd, the 4th to the 7th each a little longer than broad, gradually decreasing in length, the 8th to the 10th about as long as broad, 11th short, oval. Thorax scarcely longer than broad, a little wider than the head, the sides parallel, scarcely converging in front; disc with a series of five rather large punctures on either side, of which the anterior and posterior ones are further apart from the rest of the series; the sides with five punctures—three near the anterior angles, and two external to the dorsal row. Scutellum very finely punctured and pubescent. Elytra as long as the thorax, bronze-black, shining, the suture distinctly and sharply reddish-testaceous; less finely and less closely punctured than in *P. sanguinolentus*, pubescence rather long and yellowish. Abdomen iridescent, finely but not very closely punctured throughout; pubescence rather long, coarse and griseous; posterior margins of the ventral segments reddish-testaceous. First joint of posterior tarsi scarcely longer than the last, about equal to the two following joints united.

♂. Anterior tarsi simple; sixth ventral segment feebly emarginate in the middle of the posterior border.

Hab. Keppel Harbour, in débris.

41. *Philonthus castaneipennis*, n. sp.

Black, shining, thorax and elytra chestnut-red, the latter scarcely infuscate at the postero-external angles; abdomen pitchy; antennae and mouth-parts reddish-testaceous, legs testaceous-yellow; thorax with dorsal series of five punctures. Length 6 mm.

* Including the anterior puncture in the series.

Near *P. circumductus*, Fauv., but rather more robust, with longer, uniformly coloured antennae and reddish thorax. Head transversely quadrate, widest across the eyes, temples slightly converging posteriorly, the posterior angles rounded; median pair of intra-ocular punctures much further from each other than from the lateral ones, the disc with two obliquely placed punctures on either side and a group of three or four near the postero-internal border of each eye; all the punctures setiferous. Antennae nearly as long as the head and thorax, the 2nd joint a little shorter than the 3rd, 4th a little longer than broad, 5th as long as broad, the 6th to 10th scarcely transverse, the 11th oblong-oval, acuminate. Thorax about as broad as the head, very little narrower at the anterior angles, the sides nearly straight; disc with a row of five rather small setiferous punctures, of which the second and third are more approximate than those of the rest of the series; sides with a curved row of three other punctures and a fourth puncture just behind the anterior angle; posterior margin with a row of five setiferous punctures also. Scutellum distinctly and sparingly punctured, as in *P. circumductus*. Elytra a little broader than, and as long as the thorax, square, of a bright reddish-chestnut colour, appearing in certain lights obscurely darker at the postero-external angles; finely, asperately, and sparingly punctured, as in *P. circumductus*; all the punctures setiferous. Abdomen dark pitchy-red, the extreme margins of the segments obscurely testaceous; puncturation sparing and setiferous, the bases of the segments less closely punctured than in *P. circumductus*. First joint of posterior tarsi scarcely as long as the last joint.

♂. Anterior tarsi dilated; sixth ventral segment with a triangular impression, the base (which corresponds to the posterior margin) rather deeply emarginate.

Hab. Mandai, in rotting fungus.

42. *Philonthus belonuchoides*, n. sp.

Depressed, black, rather shining; first joint of antennae, tibiae and tarsi obscure testaceous, coxae pitchy, femora clear testaceous; thorax with dorsal series of five punctures. Length 8-8.5 mm.

In build this species presents a remarkable resemblance to *Belonuchus mutator*, Fauv. Head broad, transverse, widest across the eyes, the temples very slightly converging to the briefly rounded posterior angles; vertex with a deep, broad, longitudinal rhomboidal impression, the median intra-ocular punctures a little more distant from each other than from the lateral ones; disc posteriorly with an

oblique row of three punctures on either side, and two or three more punctures behind the eyes and on the temples; ground-sculpture fine, transverse, strigose. Antennae about as long as the head and thorax, the 2nd joint scarcely shorter than the 3rd, the 4th to the 6th slightly longer than broad, decreasing in length, the 7th to the 9th as long as broad, 10th scarcely transverse, the 11th short, oblong oval, emarginate below. Thorax as long as broad, widest at the anterior angles, which are depressed and obtuse, the sides (viewed from above) converging in a straight line to the rounded posterior angles; disc on either side with a row of five large punctures, of which the fifth is more remote, externally with a curved row of three smaller; ground-sculpture as on the head. Scutellum moderately coarsely and rather closely punctured, and with long yellowish pubescence. Elytra shining, a little broader than, and as long as, the thorax, slightly longer than broad, rather finely and by no means closely punctured; pubescence yellowish. Abdomen finely, but not very closely punctured and pubescent throughout. First joint of posterior tarsi about as long as the last joint.

♂. Anterior tarsi simple; head much larger, broader than the thorax; sixth ventral segment with a shallow emargination of the posterior border; the fifth segment produced, narrowed and rounded in the middle, the border set with short black setae.

Hab. Keppel Harbour, in débris and dry dung.

43. *Orthidus cupreipennis*, n. sp.

Shining brassy-bronze, elytra copper-bronze; antennae, mouth-parts, and legs, ferruginous. Length 10 mm.

Almost identical in build with *O. cribratus*, Er., but smaller and differently coloured. Head shining, brassy-bronze, slightly transverse, quadrate, fully as broad as the thorax, the median pair of intraocular punctures much larger than the lateral, about equidistant; vertex with a large puncture on either side of the middle line; the temples pretty closely and rather coarsely punctured and setiferous; the disc with a few exceedingly, fine scattered points; ground-sculpture very fine, strigose. Antennae ferruginous, the upper surface of the 1st joint infusate; the structure the same as in *O. cribratus*. Thorax brassy-bronze, as long as broad, distinctly wider at the anterior angles, which are rectangular, narrowed in a straight line to the rounded posterior angles; disc with a series of four rather large punctures on each side, of which the first is more remote from the second than this is from the third; anterior margin with a small puncture on either side; anterior angles with a group

of five or six punctures; no visible ground-sculpture. Scutellum closely and rather coarsely punctured. Elytra copper-bronze, longer than the thorax, a little longer than broad, less shining than the fore-parts; coarsely and closely punctured as in *O. cribratus*. Abdomen pitchy-black, margins of the segments obscurely and narrowly reddish; moderately coarsely and somewhat thickly punctured and pubescent, as in *O. cribratus*; ground-sculpture distinct, transverse strigose. Under surface reddish-castaneous.

Hab. Pasir Panjang, in seaweed. A single ♀.

QUEDIINI.

11. *Acylophorus rotundicollis*, n. sp.

Black, shining, abdomen iridescent. Thorax with strongly rounded sides, the disc with a single puncture on either side of the middle line. Femora and tarsi dark testaceous, the tibiae pitchy. Length 6-7 mm.

Very similar in general appearance to *A. glaberrimus*, Herbst., of Europe, but differs as follows: the head is much narrower, the disc has a very few very fine punctures, and the temples are rather closely punctured; the antennae are less stout, but of similar build; the thorax is broader, with more strongly rounded sides, and the disc has a single large puncture on either side of the middle line and a very minute one towards the anterior angles; the elytra are transverse, shorter and a little more coarsely punctured; the abdomen is distinctly iridescent and less finely punctured; and the legs are lighter.

Hab. Bukit Timah.

Found in flood débris.

(To be continued.)

III. *Australian Braconidae in the British Museum.* By
ROWLAND E. TURNER, F.Z.S., F.E.S.

[Read February 6th, 1918.]

Subfamily *BRACONINAE*.

STIGMATOBRACON, gen. nov.

SCAPE ovate, nearly twice as long as the greatest breadth, antennae as long as the whole insect or longer. Head transverse, eyes moderately large. Parapsidal furrows shallow, but distinct. Abdomen longer than the head and thorax, parallel sided, rather elongate; first tergite much longer than broad, with a deep longitudinal groove on each side; second tergite without a median area, with a deep oblique groove on each side from the base to the apical angles, the grooves nearer to each other at the base than to the anterior angles, the segment as long as its apical breadth; second suture feebly crenulate; the whole abdomen smooth and shining, the sutures, except the second, shallow and smooth. Terebra short and very stout, not more than one-third of the length of the abdomen, slightly curved downwards, the valvulae broad, especially at the apex and pubescent. Sternites 1-4 longitudinally carinate in the middle; the fifth sternite large, with a median longitudinal sulcus, narrowly emarginate at the apex and projecting much beyond the apex of the abdomen, so that the terebra has the appearance of originating on the dorsal surface instead of ventral. Third tergite with the basal angles only very indistinctly divided from the rest of the segment. Nervulus interstitial; first abscissa of the cubitus almost straight; first discoidal cell almost as high at the apex as at the base; stigma large, the radius originating before the middle; first abscissa of the radius very short, second very long; radial cell almost reaching the apex of the wing. Hind and intermediate tarsi no longer than the tibiae.

KEY TO THE SPECIES.

- | | |
|---|--------------------------------|
| 1. Stigma yellow. | 2. |
| Stigma black, with a very small yellow spot at the base | <i>S. torrensensis</i> , Turn. |
| 2. Wings wholly dark fuscous, except the stigma | <i>S. xanthostigma</i> , Turn. |
| Wings more or less yellow at the base. | 3. |

3. Mesosternum and the greater part of
the hind and intermediate legs
black. *S. diversipennis*, Turn.
Thorax and legs wholly testaceous red. *S. basipennis*, Turn.

Type of the genus *S. xanthostigma*, Turn.

Stigmatobracon xanthostigma, sp. n.

♀. Rufa, capite, abdomine, tarsisque posticis nigris, segmentis abdominalibus duobus basalibus rufis, secundo apice nigro; mandibulis palpisque testaceis; alis fuscis, stigmate flavo.

Long. 15 mm.; terebrae long. 3 mm.

♀. Face shining, shallowly and rather sparsely punctured; vertex smooth and shining. Third joint of antennae nearly half as long again as the fourth, antennae with more than 100 and less than 110 joints. Thorax and median segment smooth and shining, a few scattered punctures with a short hair springing from each on the median segment. The longest spur of the hind tibia is about half as long as the hind metatarsus. Valvulae finely transversely striated on the basal half. An oblique hyaline streak in the first cubital cell extending into the angle of the second discoidal cell.

Hab. N. QUEENSLAND, Townsville (*F. P. Dodd*), November 29, 1901; Mackay (*Turner*), November 1892.

Described from two females.

Stigmatobracon basipennis, sp. n.

♀. Very near *xanthostigma*, but has the terebra shorter, only 2 mm. in length; the red colouring extends further on the abdomen, almost reaching the middle of the third segment; and the wings are yellow at the base for about one-sixth of their length.

Long. 14 mm.; terebrae long. 2 mm.

Hab. N. QUEENSLAND, Kuranda (*Turner*), May 1913.

Stigmatobracon diversipennis, sp. n.

♂. Rufo-testacea; capite, mesonoto lateribus postice, mesosterno, segmento mediano, segmentis abdominalibus quarto, quinto sextoque, coxis, tarsis posticis intermediisque, femoribus posticis intermediisque, apice extremo excepto, tibiis intermediis subtus, tibiisque postica dimidio apicali nigris; alis ad nervulum flavis, dimidio apicali fuscis, stigmate fasciaque lata sub-stigmate flavis.

Long. 14 mm.; terebrae long. 2 mm.

The antennae are a little shorter than in *basipennis*, being

scarcely as long as the whole insect, but the joints seem as numerous.

Hab. VICTORIA (*French*). (Possibly from a more northern locality.)

Stigmatobracon torresensis, sp. n.

♂. Rufa; capite, abdomine, tarsisque posticis nigris; segmentis abdominalibus duobus basalibus rufis; mandibulis palpisque testaceis; alis fuscis, stigmatate nigro macula parva basali flava.

Long. 10 mm.

♂. Differs from *xanthostigma* in the colour of the stigma. The abdomen is more slender than in females of the genus, the third tergite being fully as long as broad, as are also the fourth and fifth tergites. The seventh tergite is short, very broadly subtruncate at the apex.

Hab. QUEENSLAND, Cape York (*Turner*), May 1902.

Genus BRACON, Fabr.

Bracon walkeri, sp. n.

♀. Rufo-testacea, nitida; capite, valvulis terebrae, unguiculisque nigris; alis dimidio basali flavis, dimidio apicali fuscis, stigmatate maculaque magna sub stigmatate flavis.

Long. 7 mm.; terebrae long. 1.5 mm.

♀. Smooth and shining; head transverse, distinctly narrowed behind the eyes; scape short, ovate; antennae fully as long as the whole insect, excluding the terebra. Parapsidal furrows distinct. Abdomen and neuration as in *B. bimaridis*, but the second tergite is as long as the third and much narrowed to the base, second suture straight in both species.

Hab. N. QUEENSLAND, Kuranda (*Turner*), June and July; NORTHERN TERRITORY, Adelaide River (*J. J. Walker*), August 1890.

Belongs to the group of *B. urinator*, Fabr. The colour of the wings is prevalent among the *Braconidae* in tropical Australia, especially in the genera *Cyanopterus* and *Disophrys*, but I do not know another instance in the genus *Bracon*.

Bracon bimaridis, sp. n.

♀. Rufa, nitida; capite, prothorace, valvulis terebrae, pedibusque nigris; segmentis abdominalibus apicalibus interdum etiam nigris; alis venisque fuscis.

Long. 7 mm.; terebrae long. 7 mm.

♀. Smooth and shining; head transverse; antennae as long as the whole insect, excluding the terebra; scape short, ovate. Parapsidal furrows distinct, but rather shallow. Abdomen as long as the head and thorax, a little broader than the thorax, the sides almost parallel; first tergite a little longer than its apical breadth; second tergite shorter than the third, twice as broad at the base as long. Radial cell reaching to the apex of the wing, the radius originating just before the middle of the stigma; first abscissa of the cubitus strongly bent at about one-third from the base; recurrent nervure received very distinctly before the first transverse cubital nervure.

Hab. TASMANIA, Eaglehawk Neck (Turner), February.

This belongs to the group of the European *B. urinator*, Fabr. The brilliant red colour renders it very conspicuous.

Genus CYANOPTERUS, Hal.

KEY TO THE AUSTRALIAN SPECIES.

1. Wings yellow from the base to the basal nervure. 2.
 Wings fuscous the stigma only yellow. *C. innotatus*, Turn.
2. A broad yellow band extending from the yellow stigma almost to the inner margin of the fore-wing . . . *C. profiscator*, Fabr.
 The stigma yellow, but without a yellow band below the stigma . . . *C. rufus*, Szép.

I have not seen *C. crassicaudis*, Szép., which belongs to the genus, the locality of which is doubtful. *C. festivus*, Szép., from New Guinea and *C. levissimus*, Cam., from Tenimber also belongs to the genus. The latter is *Iphiaulax levissimus*, Cam. 1912 (*nee* Cam. 1906), and is very nearly allied to *C. profiscator*, differing in the rather shallower emargination of the apical margin of the second tergite and in the red colour of the base of the hind metatarsus. I do not agree with Szépligeti in including the group of *Bracon capitator*, Fabr., in the genus.

Cyanopterus profiscator, Fabr.

Ichneumon profiscator, Fabr., Syst. entom., p. 335, 1775.

Bracon profiscator, Fabr., Syst. Piez., p. 105, 1804.

This species is very closely allied to *C. rufus*, Szép.,

differing in the presence of a broad yellow band which crosses the wing below the stigma, almost reaching the inner margin. In some specimens the hind tibiae are black at the extreme apex, in others wholly testaceous red. *C. crassicaudis*, Szép., may be a synonym, but the description is too short for certain identification.

Hab. NORTHERN TERRITORY, Port Darwin (*J. J. Walker*); QUEENSLAND, Cape York (*Turner*), April and May; Kuranda (*Turner*), May; Mackay (*Turner*), September to January.

Cyanopterus rufus, Szép.

Iphiaulax rufus, Szép., Termes. Fuzetek., xxiv, p. 397, 1901.
Cyanopterus rufus, Szép., Ann. Mus. Nat. Hungar., iv, p. 586, 1906.

Hab. NEW SOUTH WALES, Hunter River; QUEENSLAND, Mackay (*Turner*), September, October and March.

Cyanopterus innotatus, sp. n.

♀. Rufo-testacea; capite, valvulis terebrae, tarsisque posticis nigris; alis fuscis, stigmatе flavo, apice extremo fusco.

Long. 8 mm.; terebrae long. 3 mm.

♀. Scape less than twice as long as broad; face shining, closely and minutely punctured, vertex smooth and shining. Parapsidal furrows shallow and indistinct. Thorax and abdomen smooth and shining; first tergite a little longer than the apical breadth, the sides deeply grooved longitudinally; second tergite twice as broad in the middle as long, the grooves separating the raised anterior angles from the rest of the segment separated in the middle of the anterior margin by a rather narrow raised space, the hind margin of the segment widely and shallowly emarginate in the middle. Sheath of the ovipositor thickened towards the apex. First abscissa of the radius straight, not bent at the base.

Hab. QUEENSLAND, Kuranda (*Turner*), January.

Closely allied to *rufus* and *profiscator*, but easily distinguished by the fuscous colour of the wings, and in the less strong emarginate apical margin of the second tergite.

Genus IPHIAULAX, Först.

Iphiaulax transiens, sp. n.

♀. Flavo-testacea; capite, mesothorace, segmento mediano; segmentis abdominalibus quinto sequentibusque, valvulis terebrae,

coxis femoribusque posticis, tibiis posticis dimidio apicali, tarsisque posticis apice nigris; alis dimidio basali flavis, dimidio apicali fuscis, stigmatе maculaque sub-stigmatе flavis.

♂. Feminae similis.

Long. ♀, 8 mm.; terebrae long. 2.5 mm.; ♂, 3-9 mm.

♀. Antennae as long as the whole insect, including the terebra; scape less than twice as long as broad. Head smooth and shining, the face with scattered punctures. Thorax and median segment smooth and shining, parapsidal furrows distinct. Abdomen smooth and shining; the first tergite scarcely longer than its apical breadth, the raised median portion long and narrow, without carinae, the lateral grooves almost as wide as the raised area. Second tergite short and broad, about twice as broad at the base as long, elevated in the middle at the base, but without a defined basal area; the basal angles with a broad raised area which touches the elevation in the middle of the anterior margin, and extends nearly to the apical angles; second suture not quite straight, very feebly arched in the middle, very delicately crenulated. Areas of the anterior angles of the third tergite large, those of the fourth tergite smaller. Recurrent nervure interstitial, first abscissa of the cubitus straight.

Hab. N. QUEENSLAND, Mackay (*Turner*), February to May 1900; Kuranda (*Turner*), May and June 1913; NORTHERN TERRITORY, Port Darwin (*J. J. Walker*), June; N. W. AUSTRALIA, Baudin Island (*J. J. Walker*).

This is one of the commonest *Braconidae* in Northern Australia. It approaches *Cyanopterus* very closely, but has the second suture finely crenulated, so cannot be included in that genus as defined by Szépligeti.

Genus MACROBRACON, Szép.

Macrobracon nobilis, sp. n.

♀. Rufa; capite, mandibulis palpisque exceptis, valvulis terebrae, tarsis posticis, unguiculisque nigris; alis dimidio basali flavis, dimidio apicali fuscis, stigmatе, cellula cubitali prima, secunda fere tota, cellula discoidali secunda macula magna basali, cellulaque radiella macula basali flavis.

♂. Feminae similis; oculis maximis.

Long. ♀♂, 17 mm.; terebrae long. 6 mm.

♀. Antennae as long as the whole insect; front opaque, rugose; vertex shining with very minute and sparse punctures. Mesonotum smooth and shining, the parapsidal furrows obsolete posteriorly. Median segment short, shining, with a few small scattered punctures.

Abdomen opaque, very finely rugose; second and third sutures erenulate. First tergite short, with a longitudinal carina which does not reach the apex; second tergite longer than the third, broadened from the base, shorter than its apical breadth, the median area large, not sharply defined, triangular, the apex of the triangle touching the apical margin. First abscissa of the radius much shorter than the second, nearly as long as the second transverse cubital nervure; nervulus not quite interstitial, received a little beyond the basal nervure.

Hab. N. QUEENSLAND, Mackay (*Turner*), April 1900, May 1899, 3 ♀♀; Townsville (*F. P. Dodd*), 1 ♂.

Differs in the points of neuration mentioned from typical *Macrobracon*, which has the second abscissa of the radius a little shorter than the first, whereas in the present species it is nearly half as long again. This is due to a lengthening of the second cubital cell, and not to a shortening of the first abscissa of the radius.

To this genus also belong *Iphiaulax clavimaculatus*, Cam. and Strand (1912), from Flores, and *Iphiaulax fulvopilosus*, Cam. (1905), from Ceylon, in both of which the second cubital cell is much longer than in the typical species of the genus, as is also the case in *Iphiaulax megapterus*, Cam. (1905), (*nec* Cam. 1887) = *successor*, Schulz (1906), which also belongs to the genus. I have not seen males of any of these species.

Genus MEGALOMMUM, Szép.

Megalommum annulatum, sp. n.

♀. Nigra; capite thoraceque rufis; antennis segmentoque mediano nigris; segmento abdominali primo ventrali, tergite primo lateribus, segmentisque 3-7 margine apicali anguste albidis; alis fusco-hyalinis, stigmatate venisque nigris.

♂. Feminae similis.

Long. ♀, 9 mm.; terebrae long. 2 mm.; ♂, 8 mm.

♀. Face finely rugose, not very narrow; eyes large, widely but shallowly emarginate on the inner margin near the base of the antennae; front deeply hollowed between the base of the antennae and the anterior ocellus; the vertex smooth and shining. Thorax and median segment smooth and shining, the parapsidal furrows almost entirely obsolete. First tergite broadened from the base, nearly half as long again as its apical breadth, the black median portion separated from the white lateral portions by distinct

marginal carinae; second tergite broader than long, with a triangular area at the middle of the basal margin, the apex of the triangle reaching beyond the middle of the segment, the base occupying not more than half of the basal margin, the triangle margined by a smooth groove on each side, an oblique lateral groove on each side of the segment, second suture smooth. Third tergite with a very small area at each of the anterior angles; the whole abdomen smooth and shining. First abscissa of the eubitus strongly curved near the base; radius originating close to the middle of the stigma.

Hab. TASMANIA, Eaglehawk Neck (*Turner*), February 1913; S. W. AUSTRALIA, Yallingup (*Turner*), October to December 1913.

The eyes are not quite as large as in typical species of the genus, and the face is therefore broader. The tegulae are large.

Genus MERINOTUS, Szép.

This genus is mainly Malayan, though several species occur in Africa. There seems to be only one Australian species.

Merinotus xanthocephalus, sp. n.

♀. Nigra capite flavo; thorace, pedibus anticis, pedibusque intermediis, coxis exceptis, rufis; segmento mediano nigro, in medio nonnunquam rufo suffuso; abdomine nigro, rufo-brunneo suffuso; ventre albo-flavido, lateribus nigro-maculato; alis fuscis, stigmatibus fusco, venis nigris.

♂. Feminae similis.

Long. ♀, 12 mm.; terebrae long. 25 mm.; ♂, 10 mm.

♀. Rostrum a little elongate, the palpi normal, none of the joints broadened. Face very finely and rather closely punctured, shining; front and vertex smooth; a rather shallow rounded depression above the base of the antennae. Parapsidal furrows well defined, the median lobe of the mesonotum not prominent; thorax and median segment smooth and shining. Abdomen rather slender; first tergite nearly half as long again as the apical breadth, with deep lateral furrows, the lateral margins of the segment and the margins of the elevated median area forming carinae, the space between the carinae shining, finely and irregularly rugulose. Second tergite with an oblique carina on each side from near the inner side of the basal angles, separated at the apex by about half the distance which separates them at the base; with a small elongate triangular area in the middle of the basal margin, from the apex of the triangle

a carina runs to the apex of the segment, the surface of the segment shining, with irregular rugae; second and third sutures crenulate. Anterior angles of the third tergite divided from the rest of the segment by a crenulated groove, the segment with a median longitudinal carina, the base longitudinally striated; the remaining segments smooth. First abseissa of the cubitus almost straight; the first discoidal cell much higher on the basal than on the recurrent nervure.

Hab. NORTH QUEENSLAND, Mackay (*Turner*), October to May; Kuranda (*Turner*), November.

The scheme of colouring is fairly common among the larger *Braconidae* of the Austro-Malayan region and extends to the tropical districts of Queensland. This species is somewhat allied to *palpalis*, Szép., which has the third and fourth joints of the palpi broadly flattened, and to *medianus*, Szép., which has the face rugose.

I doubt if the genus *Merinotus* can be separated from *Sigalphogastra*, Cam., which has priority; but the male of *Sigalphogastra* has only five visible tergites, the fifth being very large; in *M. xanthocephalus* the male shows six tergites, the fifth very large and the sixth small. In both the mouth parts are somewhat elongate. The female of *Sigalphogastra* is still unknown. The male of the common South African species *Merinotus bellosus*, Sm., has six tergites visible, the fifth not unusually large and the sixth not very small. Until larger collections are available it is perhaps better not to sink the name *Merinotus*.

Genus CAMPYLONEURUS, Szép.

KEY TO THE AUSTRALIAN SPECIES.

- | | |
|---|---------------------------------|
| 1. Thorax and abdomen red-brown. | 2. |
| Thorax red, abdomen black | <i>C. mutator</i> , Fabr. |
| 2. Wings flavo-hyaline | <i>C. australiensis</i> , Szép. |
| Wings fusco-hyaline. | 3. |
| 3. Stigma yellow, the apical third or less black. | 4. |
| Stigma black, a narrow spot in the middle only yellow | <i>C. praeclarus</i> , Turn. |
| 4. Sixth and seventh tergites black; tergites 3-5 finely rugose | <i>C. profugus</i> , Turn. |
| Tergites wholly red-brown; tergites 3-5 almost smooth, shining | <i>C. praeptens</i> , Turn. |

1. *Campyloneurus mutator*, Fabr.

Ichneumon mutator, Fabr., Syst. entom., p. 335, 1775.

Bracon mutator, Fabr., Syst. Piez., p. 109, 1804.

♀. Nigra; thorace, segmento mediano, pedibusque anticis rufis; tibiis tarsisque intermediis fusco-ferrugineis; alis fuscis, stigmatate venisque nigris; ventre basi albedo.

Long. 6-7 mm.; terebrae long. 2-2.5 mm.

♀. Front very finely punctured; vertex, thorax and median segment smooth and shining; parapsidal furrows shallow. First tergite finely rugulose; second tergite rugulose, with a small, smooth, triangular area at the base, which is produced at the apex into a carina which does not quite reach the apex of the segment, an oblique carina on each side starting from near the basal angles, and not quite reaching the apex of the segment; the remaining tergites finely and closely punctured. First abscissa of the cubitus sharply bent near the base.

Hab. N. QUEENSLAND, Mackay (Turner), September and March; Kuranda (Turner), May 1913.

Brullé wrongly identifies this species, placing it in his genus *Myosoma*. I have not been able to identify his species, but it is certainly not the Fabrician species. Dalla Torre, without any apparent reason, gives America as the locality. The type of *mutator* is in the Banksian collection.

2. *Campyloneurus australiensis*, Szép.

Iphiaulax australiensis, Szép., Termes. Fuzetek., xxiv, p. 369, 1901, ♂ (*nec* Szép. 1905).

Campyloneurus australiensis, Szép., Ann. Mus. Nat. Hungar., iv, p. 561, 1906.

Hab. N. QUEENSLAND, COOKTOWN.

I have not seen this species, which appears to be closely allied to the two following. The wings are flavo-hyaline, the stigma yellow, and the fifth tergite of the male black.

3. *Campyloneurus profugus*, sp. n.

♀. Rufo-castanea; capite, segmentis abdominalibus sexto septimoque, pedibusque nigris; tibiis tarsisque anticis ferrugineis, intermediis posticisque fusco-ferrugineis; alis pallide fuscis, stigmatate flavo, apice nigro, venis nigris.

Long. 8 mm.; terebrae long. 5 mm.

♀. Face finely rugose; vertex, thorax and median segment smooth and shining; parapsidal furrows shallow. Raised median area of the first tergite finely granulate, with a low median longitudinal carina, the lateral grooves deep. Second tergite rugulose, with a small, smooth, triangular basal area, from the apex of which a carina extends almost to the apical margin; on either side of the basal area is another smooth, elongate area, which is slightly oblique and becomes narrowed and obsolete towards the apex. Second suture erenulate; tergites 3-5 delicately rugose; the apical margin of each slightly raised with a punctured groove before the apex. First abscissa of the cubitus sharply bent near the base.

Hab. N. QUEENSLAND, Mackay (*Turner*); Kuranda (*Turner*), May 1913.

4. *Campyloneurus praeclarus*, sp. n.

♀. Rufo-castanea; capite nigro, orbitis hic illic angustissime rufo-marginatis, segmentis abdominalibus sexto septimoque, pedibusque posticis nigris, tarsis posticis, tibiisque tarsisque intermediis ferrugineis; alis pallide fuscis; stigmate flavo, apice costaque late nigris; venis nigris; ventre albido, nigromaculato.

Long. 6-7 mm.; terebrae long. 3.5-4 mm.

Very similar to *profugus*, but differs in the colour of the stigma, which is broadly black on the costa; the terebra is shorter, and tergites 3-5 are shining as in *praepotens*. The colour of the intermediate legs is variable.

Hab. N. QUEENSLAND, Mackay (*Turner*), April.

The male has the median segment partly black in some specimens. It is possible that this will prove to be a variety of *C. profugus*, the sculpture of tergites 3-5 and the colour of the stigma showing some tendency to vary.

5. *Campyloneurus praepotens*, sp. n.

♀. Rufo-castanea; capite nigro; pedibus intermediis posticisque nigris, rufo-variegatis; alis pallide fuscis, stigmate flavo, apice extremo nigro, venis fuscis.

Long. 9 mm.; terebrae long. 9 mm.

Very similar to *C. profugus*, but differs in the much longer terebra; in the sculpture of tergites 3-5, which are smooth and shining, punctured only in the ante-apical groove, and in the colour of the apical segments. The

black spot at the apex of the stigma is also less extensive in the present species.

Hab. N. QUEENSLAND, Mackay (*Turner*); Townsville (*Dodd*).

Genus IPOBRACON, Thoms.

***Ipobracon ingressor*, sp. n.**

♀. Rufa; capite flavo, antennis nigris; abdomine, tarsis intermediis articulis tribus apicalibus, tibiisque tarsisque posticis nigris; tergitis 3-8 apice angustissime albo-marginatis; sternitis albidis, utrinque nigromaculatis; alis pallide fuscis; stigmatibus venisque fuscis.

Long. 11 mm.; terebrae long. 45 mm.

♀. Head rather large, not narrowed behind the eyes; face minutely and closely punctured, a narrow groove reaching from between the antennae to the anterior ocellus. Scape twice as long as broad; antennae distinctly longer than the whole insect, measuring about 13 mm. Vertex and thorax smooth and shining, the parapsidal furrows almost obsolete. Median segment sparsely and minutely punctured; abdomen smooth and shining; second tergite with a large triangular basal area, which nearly reaches the apical margin, the marginal grooves of the basal area smooth; the anterior angles of the second tergite bounded by a smooth groove which runs from the basal angles of the triangular area to beyond the middle of the lateral margin of the tergite; second suture broad and finely crenulate in the middle, narrow and smooth at the sides. Anterior angles of the third tergite large, the grooves bounding them reaching to the middle of the lateral margin of the segment, but not to the middle of the basal margin. First abscissa of the cubitus sharply bent at about one-third from the base, recurrent nervure received by the first cubital cell a little before the apex; nervulus not quite interstitial, received just beyond the basal nervure.

Hab. N. QUEENSLAND, Kuranda (*Turner*), December 1901; Mackay (*Turner*), October 1899.

I took three specimens at the same time at Kuranda, flying round a fallen log in dense jungle. The Mackay specimen is smaller measuring 10 mm., terebra 27 mm., but I think it belongs to the same species.

This seems to belong to the group of *I. marginatus*, Szép

***Ipobracon pallidicolor*, sp. n.**

♀. Rufo-testacea; antennis, valvulis terebrae, unguiculis pedibusque posticis nigris; capite, prothorace, pedibusque anticis

intermediisque flavis; alis subhyalinis, stigmatе venisque fusco-testaceis.

♂. Feminae similis.

Long. ♀, 7 mm.; terebrae long. 6 mm.; ♂, 4-7 mm.

♀. Scape more than twice as long as broad; antennae longer than the whole insect, measuring 9 mm. in length. Face shining, indistinctly punctured, with a longitudinal sulcus on the upper half; front and vertex smooth and shining; head not narrowed behind the eyes. Thorax and median segment smooth and shining; parapsidal furrows distinct, but shallow. Raised area of the first tergite broad, almost smooth, distinctly margined. Second tergite with a lanceolate raised median area, which extends very narrowly almost to the apex, a small elongate-ovate subconceave space on each side of the area; the apical margin of the segment broadly and shallowly emarginate, the second suture smooth. Anterior angular areas of the third tergite small; the whole abdomen smooth and shining. First abscissa of the cubitus bent near the base, recurrent nervure received before the first transverse cubital nervure; nervulus interstitial.

Hab. N. QUEENSLAND, Mackay (*Turner*), October 1899, March to May 1900; Kuranda, July 1913.

The second suture is interrupted in the middle by a narrow ridge, but there is no raised area on the third segment.

***Ipobracon quadricolor*, sp. n.**

♀. Variegata; capite flavo; thorace pedibusque anticis rufis; segmentis abdominalibus tribus basalibus quartoque basi ochraceis; antennis, mesopleuris, segmento mediano, segmentis abdominalibus apicalibus, valvulis terebrae, pedibusque intermediis posticisque nigris; femoribus intermediis apice tibiisque intermediis basi fusco-ferrugineis; tergitis sexto septimoque, interdum etiam quinto, apice angustissime albo-marginatis; alis fusco-hyalinis.

Long. 6 mm.; terebrae long. 4 mm.

♀. Antennae about equal in length to the whole insect. Very similar in structure and sculpture to *I. pallidicolor*; but the raised area of the second tergite is broader, and bounded by deep smooth grooves, not by a broader subconceave area, the raised spaces at the basal angles are also much larger, almost extending to the basal angles of the raised area; the lateral grooves reach the apex, which is not the case in *pallidicolor*; the third tergite has a small, raised, triangular area at the base, and the areas at the anterior angles are large.

Hab. N. QUEENSLAND, Kuranda (*Turner*), May 1913; Mackay (*Turner*), September 1899.

***Ipobracon gilberti*, sp. n.**

♀. Variegata; capite flavo; prothorace mesonotoque rufis; antennis, mesopleuris, mesosterno, scutello, segmento mediano, segmentis abdominalibus tertio apice, quarto sequentibusque, valvulis terebrae, pedibusque intermediis posticisque nigris; segmentis abdominalibus primo, secundo, tertioque basi ochraceis; segmentis 4-7 dorsalibus apice angustissime albido-marginatis; femoribus intermediis apice, tibiisque intermediis basi fusco-ferrugineis; alis fusco-hyalinis, stigmatate venisque fusco-testaceis.

Long. 11 mm.; terebrae long. 8 mm.

♀. Closely allied to *I. quadricolor*; but is a larger species, with the face distinctly punctured; the basal area of the second tergite is large, forming an equilateral triangle, the grooves bounding it indistinct, the raised areas at the basal angles large, touching the median area at the base, the lateral grooves not reaching the apex of the segment; the apical margin of the segment shallowly emarginate in the middle. Third tergite without a raised median area, the areas at the basal angles fairly large. Second suture smooth. Otherwise as in *quadricolor*, but the recurrent nervure almost interstitial.

Hab. N. QUEENSLAND, Mackay (*Turner*), October 1899; Kuranda (*Turner*), November, May and July.

This species, together with *pallidicolor* and *quadricolor*, seems to be related to the New Guinea species *I. elegans*, Szép. In all these the second tergite is much broader than long, as is usual in Australian species of the genus.

***Ipobracon torridus*, sp. n.**

♀. Rufa; capite pedibusque anticis intermediisque rufo-flavescentibus; abdomine ochraceo; antennis, pedibus posticis, valvulisque terebrae nigris; alis subhyalinis, leviter infumatis, venis fusco-testaceis.

Long. 11 mm.; terebrae long. 8 mm.

♀. Though very different in colouring I cannot find that this differs either in sculpture or structure from *I. gilberti*. I do not think, however, that it can be a mere colour variety of that species.

Hab. N. QUEENSLAND, Cape York (*Turner*), April 1902.

***Ipobracon flaviceps*, Cam.**

Poecilobracon flaviceps, Cam., Ann. Mag. Nat. Hist. (7) viii, p. 122, 1901, ♀.

A variety of this occurs at Mackay. The typical form has the tergites black, the second sometimes stained with fusco-ferruginous; in the Mackay form the three basal tergites at least are yellowish brown; the legs are black in the type, but in the Mackay form the fore legs entirely and parts of the intermediate and hind legs are testaceous brown. The second suture in this species is straight and crenulated. As the colour differences appear to be constant, I propose for the Mackay form the name *I. flaviceps* subspec. *mackayensis*, subspec. n.

Hab. N. QUEENSLAND, Mackay (*Turner*), October and November 1899.

The locality given for the type is Australia, but it probably came from the south-eastern portion of the continent.

***Ipobracon fraterculus*, sp. n.**

♀. Nigra; capite flavo; segmentis dorsalibus duobus basalibus ochraceis, quarto sequentibusque apice angustissime albidomarginatis; ventre albedo, nigro-maculato; tibiis tarsisque anticis brunneo-ferrugineis; tegulis testaceis; alis fusco-hyalinis, venis fuscis, stigmatate pallide brunneo-flavescente.

Long. 10 mm.; terebrae long. 9 mm.

♀. Face subopaque, minutely punctured; the antennal tubercles prominent; front and vertex smooth and shining, a shallow depression between the anterior ocellus and the base of the antennae; scape more than twice as long as broad, cylindrical; head not narrowed behind the eyes. Thorax and median segment smooth and shining; the parapsidal furrows distinct, but shallow. First tergite smooth, longer than the apical breadth, the lateral grooves narrow and not margined externally; the raised portion with an indistinct median longitudinal carina and with distinct lateral carinae. Second tergite short, broader at the base than long, widened to the apex; the basal raised area large, triangular, margined at the sides by broad and rather shallow grooves in which are a few oblique striae; the lateral grooves of the segment very narrow, but extending to the apical angles; second suture almost straight, crenulated. The areas at the anterior angles of the third tergite are rather large. Recurrent nervure almost interstitial; first abscissa of the cubitus straight.

Hab. S. W. AUSTRALIA, Yallingup (*Turner*), October 1913.

Closely related to *flaviceps*, Cam., but differs in the straight first abscissa of the cubitus, in the colour of the basal tergites, in the striation of the grooves by the median area of the second tergite and in the very much smaller raised areas at the anterior angles of the same tergite. The terebra is also considerably longer.

As I have not seen several of the Australian species of this genus described by Szépligeti, I am unable to give a key to the species.

Subfamily AGATHINAE.

Genus MICRODUS.

KEY TO THE AUSTRALIAN SPECIES.

1. With a distinct longitudinal carina on the middle lobe of the mesonotum; median segment with an enclosed median area *M. rufobrunneus*, Turn,
Mesonotum without a carina; median segment without an enclosed area. 2.
2. Median segment coarsely punctured rugose; antennae 27-jointed. 3.
Median segment shining, almost wholly smooth; antennae 37-jointed *M. martialis*, Turn.
3. Head black; thorax red *M. rufithorax*, Turn.
Head yellowish brown, with a broad black band on the vertex; meso thorax and scutellum black *M. xanthopsis*, Turn.

I have not seen *M. pedunculatus*, Szép. (1905), described from Sydney. In this species the mediellan vein is obsolete, which is not the case in any species described here.

Microdus rufobrunneus, sp. n.

♀. Rufo-brunnea; capite pedibusque intermediis posticisque nigris; tibiis tarsisque intermediis, tibiis posticis basi, tarsisque posticis basi et apice pallide flavis; alis subhyalinis, leviter infuscatis, stigmatibus venisque brunneo-testaceis.

Long. 6 mm.; terebrae long. 4 mm.

♀. Smooth and shining, the face closely and minutely punctured; antennae inserted further from each other than from the eyes, 35-jointed. Mesonotum minutely punctured, parapsidal furrows deep and well marked, the median lobe furnished with a distinct longitudinal carina. The sulcus at the base of the scutellum broad and containing several longitudinal carinae; median segment with a well-defined elongate oval enclosed median area, which is transversely striated, the remainder of the dorsal surface transversely rugulose, a patch of yellowish white pubescence on each side before the posterior coxae. First tergite a little longer than its apical breadth, with a few delicate longitudinal carinae on the basal half; impressed transverse line of the second tergite arched, close to the base at the sides; curving to the middle of the segment. Second cubital cell triangular, petiolate; nervulus interstitial.

Hab. N. QUEENSLAND, TOWNSVILLE (*F. P. Dodd*).

***Microdus xanthopsis*, sp. n.**

♀. Nigra; capite, pronoto, mesopleuris antice, pedibusque anticis flavo-testaceis; vertice fascia lata transversa antennisque nigris; tibiis intermediis macula subbasali, posticis basi anguste et in medio latissime, calcaribusque albis; alis hyalinis, leviter infuscatis, stigmatibus venisque fuscis.

♂. Feminae similis.

Long. 4 mm.; terebrae long. 3 mm.

♀. Slender, smooth and shining; parapsidal furrows distinct but not deep; scutellum long and narrow, with a slightly arched crenulated sulcus at the base; median segment coarsely punctured-rugose, sparsely clothed with whitish hairs, the sides of the segment finely punctured. Second tergite with a distinct transverse impressed line near the middle; the first tergite subtriangular, longer than the apical breadth. Hind coxae and femora finely punctured, clothed with short white hairs; valvulae sparsely clothed with very short black hairs. Antennae 27-jointed, the third joint distinctly longer than the fourth, longer than the scape. Second cubital cell triangular, sometimes subpetiolate.

Hab. S. W. AUSTRALIA, Yallingup (*Turner*), November and December 1913.

***Microdus rufithorax*, sp. n.**

♀. Nigra; mandibulis palpisque testaceis; thoracae pedibusque anticis et intermediis rufis; segmento dorsali secundo basi, tibiisque

posticis dimidio basali, prope basin nigro-annulatis, albidis; alis pallide fusco-hyalinis, stigmatate venisque fuscis.

♂. Feminae similis.

Long. 4 mm.; terebrae long. 4 mm.

♀. Head smooth and shining, the face microscopically punctured. Thorax shining, the parapsidal furrows distinct and fairly deep; the transverse furrow at the base of the scutellum very feebly crenulated. Median segment black, coarsely punctured-rugose, the sides of the segment finely punctured. First tergite longer than its apical breadth, very feebly rugulose in the middle; transverse line on the second tergite very distinct. Hind femora punctured at the base. Antennae 27-jointed. Second cubital cell triangular, distinctly petiolate.

Hab. S. W. AUSTRALIA, Kalamunda (*Turner*), March 1914; Yallingup (*Turner*), October 1913.

Differs from *M. xanthopsis* in colouring, in the longer terebra, the deeper parapsidal furrows, the sculpture of the first tergite and the less hairy median segment.

***Microdus martialis*, sp. n.**

♀. Rufo-testacea; antennis, articulis duobus basalibus exceptis, nigris; tarsis posticis fuscis; alis fusco-hyalinis, stigmatate venisque fuscis.

♂. Feminae similis.

Variat: ♀♂, Abdomine supra nigro.

Long. 5 mm.; terebrae long. 4 mm.

♀. Slender, smooth and shining, the face microscopically punctured. Antennae 37-jointed, clothed with minute hairs. Parapsidal furrows distinct, but rather shallow; the transverse furrow at the base of the scutellum crenulated. Median segment shining and almost smooth; abdomen smooth and shining, the transverse furrow of the second tergite obsolete.

Hab. N. QUEENSLAND, Kuranda (*Turner*), May 1913.

The second cubital cell is petiolate.

In addition to colour differences this species is easily distinguished from *xanthopsis* and *rufithorax* by the greater number of antennal joints, by the almost smooth median segment and by the absence of a transverse groove on the second tergite.

Genus AGATHIELLA, Szécp.

AgathIELla, Szécp., Termes. Fuzetek., xxv, p. 73, 1902.

The species of this genus seem to be numerous in Australia, especially in the southern half, and doubtless many more species remain to be discovered. The structural differences are usually small, and without a long series of specimens it is rather difficult to come to definite conclusions as to the extent of colour variation, but where I have taken a number of specimens I have not found any important colour varieties.

KEY TO THE AUSTRALIAN SPECIES.

- | | |
|--|--------------------------------|
| 1. Mesonotum, scutellum and median segment black. | 2. |
| Mesonotum at least red. | 5. |
| 2. Intermediate and hind legs entirely black. | <i>A. latibalteata</i> , Cam. |
| Intermediate legs yellowish or reddish testaceous. | 3. |
| 3. Hind tibiae wholly black, hind coxae and tibiae testaceous red. Length 8 mm. | <i>A. festinata</i> , Turn. |
| Hind tibiae with a narrow white ring at the base. Length 5 mm. | 4. |
| 4. Hind legs black; scape black . . . | <i>A. ruficeps</i> , Szép. |
| Hind coxae, trochanters, femora and the scape yellow testaceous . . . | <i>A. tenuissima</i> , Turn. |
| 5. Median segment punctured-rugose. | 6. |
| Median segment smooth. | 8. |
| 6. Intermediate femora wholly black, hind tibiae black, with a narrow white ring at the base. Length 8 mm. | <i>A. maligna</i> , Turn. |
| Intermediate femora mostly or entirely testaceous. Length not exceeding 5 mm. | 7. |
| 7. Hind tibiae black, with a very narrow obscure whitish ring at the base. . | <i>A. minima</i> , Turn. |
| Hind tibiae with the basal half white, with a narrow black ring near the base | <i>A. rugosa</i> , Turn. |
| 8. Intermediate legs wholly black. . . | <i>A. meridionalis</i> , Turn. |
| Intermediate legs not wholly black. | 9. |
| 9. Intermediate legs wholly testaceous . | <i>A. unimaculata</i> , Turn. |
| Apex of intermediate femora and middle of tibiae yellowish | <i>A. tricolor</i> , Szép. |

Agathiella latibalteata, Cam.

Agathis latibalteata, Cam., Entomologist, xxxix, p. 26, 1906.

This is an *Agathiella*, not a true *Agathis*, having the face short and broad and no parapsidal furrows. As far as I am aware typical *Agathis* does not occur in Australia.

Hab. AUSTRALIA.

Agathiella ruficeps, Szép.

Agathiella ruficeps, Szép., Ann. Mus. Nat. Hungar., iii, p. 52, 1905, ♂.

Hab. SYDNEY.

From the description this must be very near *latibalteata*, but the hind tibiae are white at the base instead of wholly black, and the intermediate legs are red, not black. It is also a smaller species.

Agathiella tricolor, Szép.

Agathiella tricolor, Szép., Ann. Mus. Nat. Hungar., iii, p. 52, 1905, ♀.

Hab. SYDNEY.

Agathiella meridionalis, sp. n.

♀. Nigra; capite, prothorace, mesothorace, femoribus anticis dimidio apicali, tibiis tarsisque anticis rufis; segmento abdominali primo albido, macula maxima mediana nigra supra et infra; secundo basi et lateribus albido, tertio angulis basalibus albido; alis pallide fusco-hyalinis, stigmatibus venisque fuscis; calcaribus nigris.

Long. 5-6 mm.; terebrae long. 5-6 mm.

Variat: scutello scapoque rufis.

♀. Feminae similis.

Variat: capite pedibusque anticis nigris.

♀. Smooth and shining; the median segment with microscopic punctures on the sides, but smooth on the dorsal surface; first tergite more than half as long again as the apical breadth, shorter in the male; second tergite as broad at the apex as long. Second cubital cell petiolate, triangular, not very small.

Hab. TASMANIA, Mt. Wellington, 2300 ft. (Turner), January to April 1913.

Agathiella unimaculata, sp. n.

♀. Rufo-testacea; segmento mediano, abdomine, antennis, pedibusque posticis nigris; abdomine segmentis duobus basalibus albo-flavidis, segmento primo dorsali macula magna rotundata nigra; alis fusco-hyalinis, stigmatate venisque brunneis.

Long. 4-5 mm.; terebrae long. 3.5-4 mm.

♀. Median segment smooth and shining; first tergite about half as long again as the apical breadth; second tergite broader than long; hind tarsi distinctly shorter than the hind tibiae, a little shorter in proportion than in *A. maligna*. Second cubital cell triangular, the petiole short.

Hab. N. QUEENSLAND, Kuranda (*Turner*), May to July 1913.

The median segment is black on the dorsal surface only. In a specimen from Sydney (*P. de la Garde*), January 1898, the black is reduced to a median streak; the wings are also paler.

Agathiella tenuissima, sp. n.

♀. Nigra; capite, prothorace, tegulis, segmentis abdominalibus duobus basalibus, primo basi nigro suffuso, pedibusque flavo-testaceis; femoribus posticis apice, tibiis tarsisque posticis fuscis; alis pallidissime fusco-hyalinis; stigmatate venisque pallide fuscis.

Long. 5 mm.; terebrae long. 5 mm.

♀. Median segment smooth and shining; abdomen very slender; first tergite at least twice as long as the apical breadth; second tergite longer than broad. Second cubital cell very small, the petiole long, nervulus not interstitial, distinctly postfural.

Hab. VICTORIA (*French*).

Possibly the female of *A. ruficeps*, Szépl., but the present species has the scape yellowish, the flagellum brownish beneath on the basal two-thirds, and the basal portion of the hind legs is flavo-testaceous. Nor can the median segment be described as "etwas uneben."

Agathiella festinata, sp. n.

♀. Nigra; capite rufo; antennis nigris, articulis duobus basalibus rufis; pedibus rufo-testaceis, posticis trochanteribus, tibiis tarsisque nigris; abdomine albo-flavido, segmentis dorsalibus primo secundoque macula mediana, tertio, quarto, quintoque basi nigris; tertio angulis anticis late albo-flavidis; alis fusco-hyalinis, venis brunneo-testaceis.

Long. 8 mm.; terebrae long. 7 mm.

♀. Very similar in structure to *A. maligna*, differing in the sculpture of the median segment, which is smooth and shining on the dorsal surface, with the sides very minutely punctured; in the shape of the second tergite, which is much broader at the apex than long, and in the slightly longer terebra.

Hab. S. QUEENSLAND (*ex coll. Turner, received from French*).

***Agathiella maligna*, sp. n.**

♀. Nigra; capite, thorace, pedibusque anticis rufis; antennis segmentoque mediano nigris; segmentis abdominalibus duobus basalibus albo-flavidis, tergitis duobus basalibus macula magna mediana nigra; tibiis intermediis posticisque macula parva basali albo-flavida; alis fuscis, stigmatate nigro.

Long. 8 mm.; terebrae long. 6 mm.

♀. Head smooth and shining; seen from in front much broader than long. Thorax smooth and shining, the parapsidal furrows absent; median segment finely punctured-rugulose, the apex smooth, the sides of the segment very finely punctured and sparsely clothed with short white hairs. First tergite distinctly longer than its apical breadth; second tergite a little longer than broad, with a rather indistinct impressed transverse line near the middle, which curves towards the sides and becomes obsolete before reaching the anterior angles; a slightly oblique lateral groove running from near the anterior angles to the middle of the lateral margin. Valvulae clothed with short delicate hairs. Second cubital cell very small, petiolate.

Hab. S. W. AUSTRALIA, Yallingup (*Turner*), November 1913.

***Agathiella rugosa*, sp. n.**

♀. Nigra; capite, vertice interdum antennisque nigris, prothorace, mesothorace, scutello, coxisque anticis rufis; segmentis abdominalibus duobus ventralibus totis, dorsalibusque basi anguste albidis; femoribus tibiisque anticis, femoribus intermediis dimidio apicali, tibiisque intermediis dimidio basali, basi anguste nigro-annulatis, testaceis; tibiis posticis dimidio basali albis, nigro-annulatis; alis pallide fusco-hyalinis, stigmatate venisque fuscis; calcaribus albis.

Long. 5 mm.; terebrae long. 5 mm.

Variat: scutello nigro.

♂. Feminae similis, segmentis dorsalibus duobus basalibus albidis, primo in medio nigro-maculato.

Long. 5 mm.

♀. Face shining, minutely punctured, with sparse and very delicate pubescence; median segment rather coarsely rugose. First tergite nearly twice as long as the apical breadth; second tergite as broad at the apex as long, the impressed transverse line distinct. The male has the first tergite shorter, less than half as long again as the apical breadth.

Hab. TASMANIA, Eaglehawk Neck (*Turner*), February; Mt. Wellington, 2300 ft. (*Turner*), March 1913.

This differs from *A. tricolor* in the sculpture of the median segment. The second cubital cell is very small, the petiole long. The West Australian *Microdus rufithorax* closely resembles this species, but has the parapsidal furrows well developed and the head black.

Agathiella minima, sp. n.

♀. Nigra; prothorace, mesothorace scutelloque rufis; palpis pedibusque anticis intermediisque testaceis; segmentis abdominalibus duobus basalibus albo-flavidis, dorsali primo macula magna basali nigra; tibiis posticis macula parva, obscura, basali, albida; alis subhyalinis, costa nigra, stigmatate venisque pallide brunneis.

Long. 3 mm.; terebrae long. 2 mm.

♀. Smooth and shining; the median segment finely punctured-rugose. First tergite scarcely half as long again as the apical breadth; second tergite as broad at the apex as long, the impressed transverse line very distinct. Calcaria of hind tibiae pale testaceous. Second cubital cell triangular, the petiole short.

Hab. N. QUEENSLAND, Kuranda (*Turner*), July 1913.

It is possible that Ashmead's genus *Orgiloneura* may be founded on a species of this genus with somewhat reduced neuration, but his description is too short for any conclusions to be drawn.

PLATYAGATHIS, gen. nov.

Nearly allied to *Disophrys*, with which it agrees in the short broad face, in the distinct marginal carinae of the frontal depression and in the very short terebra. It differs from *Disophrys* in the very broad and somewhat flattened abdomen, which is sessile, with the first tergite as broad at the base, as long and somewhat broader at the apex; the intermediate and hind-tarsal ungues are simple, the ungues of the fore tarsi bifid. The median segment is

hairy; the parapsidal furrows strong. The only species known to me is

***Platyagathis leaena*, sp. n.**

♀. Nigra; capite rufo, antennis mandibulisque nigris; segmentis dorsalibus primo, secundoque lateribus latissime, tertioque basi lateribus, ventralibus primo secundoque in medio nigro-maculatis, tertioque basi albis; tibiis anticis basi, tarsisque anticis fusco-ferrugineis; alis fusco-hyalinis, venis fuscis.

Long. 7 mm.

♂♂. Smooth and shining; the face very finely and closely punctured; two short longitudinal carinae between the antennae as in *Disophrys*. Antennae 49-jointed in both sexes, nearly as long as the whole insect in the female, distinctly longer in the male; marginal carinae of the frontal depression well defined, vertex smooth and shining. Parapsidal furrows and the sulci of the mesopleurae punctured; scutellum with a finely striated depression at the base; median segment short, the dorsal surface no longer than the scutellum, coarsely reticulate, with six rather ill-defined longitudinal carinae, covered with rather short whitish hairs, which partly conceal the sculpture. Abdomen smooth and shining; the white lateral bands of the two basal tergites as broad as the black median bands, and continued more narrowly on the basal half of the third tergite. Second cubital cell subquadrate, with the stump of a vein springing from the second transverse cubital nervure; nervulus interstitial. The cubital margin of the first cubital cell is open in the middle.

Hab. S. W. AUSTRALIA, Yallingup (*Turner*), January 1911.

IV. *On the naming of Local Races, Subspecies, Aberrations, Seasonal Forms, etc.* By LORD ROTHSCHILD, F.R.S., etc.

[Read February 6th, 1918.]

IN the "Entomological News," vol. xxviii, pp. 463-67, Sir George Hampson has an article on "The Determination of Generic Types in the Lepidoptera." In the last paragraph he protests against what he calls the "INSIDIOUS GERMAN SPECIFIC POLYNOMIAL NOMENCLATURE," and says it is unnecessary to name *local, seasonal, sexual, polymorphic* and other forms. Nevertheless, he proceeds to say that when dealing with a species they must all be DESCRIBED. He further adds that no such thing as a "SUBSPECIES" exists in nature, and if the term is used, it is only a PROOF of IGNORANCE.

These statements only prove that Sir George Hampson has utterly failed to grasp the meaning of the term "SUBSPECIES," and also has misunderstood the main objects of Zoological Nomenclature.

I will deal with the last question first. In my opinion and that of the bulk of my zoological acquaintances "ZOOLOGICAL NOMENCLATURE" has been established to enable the students of this branch of knowledge to communicate their ideas in speech and writing in the most concise, clearest and most orderly manner.

Now we all, I think, take our starting-point from Linnæus, and he was the first to name local races, inventing for them the term VARIETAS. If this were the end of the question, I would be the first to range myself under the Linnean Banner, but subsequent writers have used the term "VARIETY," "VARIETAS," to mean indiscriminately local race, and individual aberration, and therefore I and most other zoologists have determined, backed up by the International Commission on Nomenclature, to reject the term "VARIETAS" altogether and to substitute the term ABERRATION for an individual variation or monstrosity, and SUBSPECIES for LOCAL = GEOGRAPHICAL RACE. Thus Sir George Hampson himself acknowledges, in spite of his denial quoted above, that SUBSPECIES DO exist in Nature, for he acknowledges the existence of LOCAL RACES but proves himself unable to grasp that SUBSPECIES and LOCAL RACE are one and the same thing.

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As to the point he raises that anything lower than a "SPECIES" should not be named, I consider it raises directly the fundamental question of the purpose and convenience of "Nomenclature."

Surely the following illustration should clinch the argument. Of the butterfly *Colias fieldii* there are two geographical races—one the Indo-Burmese race, which is smaller and paler and is the typical race, and a much larger and brighter Chinese race. Now surely it is much more concise and comprehensive to say *Colias fieldii chinensis* than to say "THE LARGER AND MORE BRIGHTLY-COLOURED CHINESE RACE OF COLIAS FIELDII."

Again, if the term *Colias hyale* ab. *nigra* is used, it is more convenient than the sentence, "THE BLACK ABERRATION OF COLIAS HYALE."

It is to be regretted, I agree, that some authors, such as Dr. Roger Verity, have been led into error in a different direction, and have expanded the quite legitimate and absolutely necessary trinomial nomenclature into a polynomial one. But this is entirely due to their futile attempts to arrange Zoological Nomenclature on a purely PHYLOGENETIC basis.

The result of this is, that they take the several local races of a widespread insect, and, thinking the phylogenetic relationship is evidenced by closer or less close resemblance, proclaim the local races most alike in appearance to be nearest in fact. Therefore they name them as subspecies of subspecies, and so on. The truth is, that in many cases local races at the extreme ends of the area of a species are the closest in appearance, while the most different races occur in between. It is therefore obvious that two races which are nearest in appearance may be phylogenetically the widest apart. The only course open, and the one we, *i. e.* the majority, adopt, is, that as the original ancestral form and many other intermediate links have long disappeared, to treat all local forms of one species as co-equal in value, and name them all trinomially.

The object of naming other lower categories is always the same, *viz.* to facilitate their discussion; but here again, led by several English zoologists, the naming of individual aberrations has been carried too far, and in some cases almost every second specimen has received a name. It is, however, always of importance to name seasonal, dimorphic, and sexually polymorphic forms.



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MOLIPPA SIMILLIMA ♂ AND M. SABINA ♂.

EXPLANATION OF PLATE III.

Upper fig. *Molippa simillima*, D.-Jones, ♂.
Lower ,, ,, *sabina*, Wlk., ♂.

EXPLANATION OF PLATE IV.

Upper fig. *Molippa simillina*, D.-Jones, ♀.
Lower ,, ,, *sabina*, Wlk., ♀.



André. Sleigh & Anglo, Ltd.

MOLIPPA SIMILLIMA ♀ AND M. SABINA ♀.

V. *Molippa simillima*, *D.-Jones: A Correction.* By
E. DUKINFIELD-JONES, F.E.S.

[Read February 6th, 1918.]

PLATES III, IV.

IN the Transactions of the Society of June 20th, 1907, there is a short paper of mine on the remarkable resemblance between two species of *Molippa*.

I have recently discovered that the specimen I had included amongst the *M. simillima* group and photographed as such is in reality *M. sabina*, Wlk.

I can only surmise that the unfortunate error arose from my having accidentally placed one of the *sabina* pupae in the box containing pupae of *simillima*, for I marked the imagines of *sabina*, *a*, and those of *simillima*, *b*, as they emerged, and this specimen was marked *b*.

My statement that the same description will serve for both species was chiefly based upon the specimen figured and must be modified. The principal difference is that in *M. simillima* the dark postmedial line of the hind-wings is strongly bent outwards from vein 1 to the inner margin, whereas in *sabina* it is straight.

The accompanying plates, III and IV, show the two species.

It is difficult in a subject of this kind to make a satisfactory comparison without a long series of specimens. The discocellular spots, for instance, are very variable in size and shape in both species, and the very dark shade on the inner margin of the hind-wings of *M. sabina* is, I find, almost absent in many of the specimens in the British Museum.

EXPLANATION OF PLATES III, IV.

[See Explanations facing the PLATES.]

VI. *On Mimicry in certain Butterflies of New Guinea.*
By F. A. DIXEY, M.A., M.D., F.R.S.

[Read March 6th, 1918.]

IN Seitz's "Macrolepidoptera" (Indo-Australian Region; English Edition, p. 147) under the genus *Huphina*, Fruhstorfer speaks of *abnormis*, Wall., "*euryxanthe*," Hour., and "*ornythion*," Godm. & Salv., as related species. This passage contains two minor inaccuracies and one distinct error. Hourath's insect was named by him *euryxantha*. Oberthür afterwards spelt the name with a final *e*, in which he has been followed by other authors. Standinger, however, in "Iris," and Grose Smith and Kirby in their "Rhopalocera Exotica" rightly give the original spelling. The second inaccuracy is in the name "*ornythion*," which was written by its authors *ornytion*.

These are trivial matters; of greater importance is the statement of affinity between *ornytion* and the other two species. Though it bears so striking a resemblance to *Huphina abnormis*, the relationship of *ornytion* to that butterfly is not close, for it belongs in fact, as shown by structural characters, to the very distinct genus *Delias*. Much confusion has prevailed with regard to all three butterflies now named, and it may be worth while to attempt to clear this up before proceeding to the actual subject of my paper.

In his well-known memoir on the Eastern *Pieridae*, published in 1867, Mr. Wallace described and figured under the name of *Tachyris abnormis* a remarkable Pierine from New Guinea.* He observes that in coloration "it bears a striking general resemblance to the beautiful nymphalideous butterfly, *Mynes Geoffroyi*, which inhabits the same country." The type specimen, which may still be seen in the National Collection, is a female; if Wallace had been acquainted with the male, he could scarcely have avoided noting that it does not possess the anal tuft of hairs which characterises the genus *Tachyris*. But the

* Trans. Ent. Soc. Lond., Series III, vol. iv, p. 368; Pl. VIII, fig. 5, ♀.

general appearance of his specimen seemed to him to indicate that it came nearest to such forms as *ada*, Cram., and *clavis*, Wall., and he therefore placed it tentatively in his genus *Tachyris* next after those species. In 1889 Messrs. Grose Smith and Kirby* figured both the upper and under side of the same form; Wallace's figure only showing the latter. On the plate in "*Rhopalocera Exotica*" the species appears under Wallace's name of *Tachyris abnormis*, but in the text and indices its genus is given as *Delias*. The figure is said to represent a male, but is really (like Wallace's) that of a female. The mistake as to sex was afterwards corrected by the authors.† In the same work, vol. ii, *Pierinae*, p. 17, *abnormis* is once more referred to the genus *Delias*, and is said to belong to the group of *D. ladas*, Grose Smith, and *D. ornytion*, Godm. & Salv. But in the note (*Ibid.*, p. 22) cited above, the authors add, "Herr von Mitis points out ('*Iris*,' vi, p. 114), that the four-branched subcostal nervure removes both *Abnormis* and *Euryxantha* from *Delias*." This is quite true; and *euryxantha*, which appears in the plate ("*Rhop. Exot.*," vol. ii, *Pierinae*; *Delias*, vi, figs. 7, 8) as a *Delias*, is in the text called a *Tachyris*.

Honrath,‡ who described *euryxantha* as a variety of *abnormis*, expressed a doubt as to whether Grose Smith and Kirby's figure of *abnormis* represented a male as stated; he adds, however, that those authors in their text rightly placed *abnormis* in the genus *Delias*, "to which genus, instead of to *Tachyris*, Wallace, if he had known the male, would certainly have also assigned it." Staudinger§ definitely pronounced Smith and Kirby's figure to be that of a female.

As a matter of fact, neither *abnormis* nor *euryxantha* is either a *Delias* or a *Tachyris*. So far as I am aware, the first author to perceive their true affinity was von Mitis,|| who, as above stated, pointed out that their neuriation was not that of *Delias*. Von Mitis himself places them in the neighbourhood of *judith*, *amalia*, *emma*, etc.; *i. e.* in the group named by Moore *Huphina*, though ranked by the former writer under the wide designation of *Pieris*.

* "*Rhopal. Exot.*," vol. i, *Pierinae*, Pl. II, figs. 6, 7.

† *Ibid.* vol. ii, *Pierinae*, p. 22, note.

‡ *Berl. Entom. Zeitschr.*, xxxvi, p. 435 (1892).

§ "*Iris*," vii, pp. 117, 118 (1894).

|| *Ibid.* vi, pp. 113, 114 (1893).

While there is little doubt that *abnormis* and *eurycantha* are best referred to *Huphina*, it is also true that they appear to stand somewhat apart from other members of that genus. The genitalia of both species are of the *Huphina* type, but the valves differ slightly in shape from those of *H. agnata*, Gr. Smith, and *H. nerissa*, Fabr. The genitalia in *Delias* are quite different. The scent-scales of *H. abnormis* cannot easily be distinguished from those of *H. eurycantha*, if, indeed, they can be distinguished at all. They are of the *Huphina* type, though shorter and proportionately broader towards the apex than those of other species of the genus. The difference in neuration between *Huphina* and *Delias* is well known. The neuration of *abnormis* and *eurycantha* is that of the former genus. Von Mitis agrees with Honrath in attributing Wallace's mistake to the fact that he was only acquainted with the female. Standinger* speaks of von Mitis as having shown that *abnormis* and *eurycantha* belong to the genus "*Pieris* (or *Appias*)"; but these forms have certainly no more to do with "*Appias*" than they have with *Tachyris*, nor did von Mitis suggest the contrary.

As already stated, there is little or no doubt that *abnormis* and *eurycantha*, whether they are distinct species, or whether, as thought by Honrath, von Mitis and Standinger, forms of the same species, have their true affinity with the Pierines included in Moore's genus *Huphina*. This was correctly recognised by Mr. A. G. Butler † in his Revision of that genus. But while rightly placing them in *Huphina*, to which group they almost certainly belong, he associates with them in the same genus *ladas*, *ornyion* and *dohertyi*, adding the following comment: "I must confess that the fact of the last five species occurring together in New Guinea, in conjunction with the fact that similarly coloured species of the Nymphalid genus *Mynes* occur there, is very suspicious. I cannot help thinking that breeding experiments would tend greatly to reduce the number of these 'species' in both genera." Mr. Butler's suspicions that something was wrong were well founded; and it is quite probable that breeding experiments would show that *abnormis* and *eurycantha* are conspecific, as was supposed by Honrath, Standinger and others. But along with

* "*Iris*," vii, pp. 117, 118 (1894).

† *Ann. Mag. Nat. Hist.*, 7th Series, vol. iii, p. 206 (1899). It may be noted that Mr. Butler's reference to Oberthür's "*Études*" should be to p. 6, not to p. 61.

a possible reduction in the number of species, what is really required in the five forms associated in the "Revision" is an increase in the number of genera. The first two forms of the five, viz. *euryxantha* and *abnormis*, belong, as we have seen, to *Huphina*; but *ladas* and *ornytion* are certainly members of the genus *Delias*. With regard to the fifth species, viz. *dohertyi*, there is a fresh complication. A *Pieris dohertyi* from Jobi and a *Delias dohertyi* from Timor were both described in 1891, the former by M. Oberthür, the latter by Lord Rothschild. Oberthür's description having been published in August, and Rothschild's in September, it would seem that the former has priority. I have never seen Oberthür's type, but from the description and figure I have no doubt that it is a *Delias*. Rothschild's *dohertyi* is certainly a *Delias*, and quite distinct from Oberthür's. In his Revision of the genus *Delias*,* Mr. Butler refers under *D. dohertyi* to Rothschild's description above mentioned, and also to Grose Smith and Kirby's figures in "Rhopal. Exot.," ii. *Delias*, Pl. IV (not Pl. VI, as Butler), figs. 7, 8, which represent Rothschild's type. He adds, "It is a curious thing that in the same year when the above was described M. Oberthür described a *Pieris Dohertyi* from New Guinea. The latter, however, appears to me to be allied to *P. ornytion* of Godman and Salvin, in which case it is not a *Delias* (although *P. ornytion* has erroneously been referred to this genus by von Mitis)." But, as we have seen, *ornytion* is a *Delias*, and if Mr. Butler is right, as I believe he is, in thinking that Oberthür's *dohertyi* is allied to *ornytion* (of which species it seems to be the representative in the Island of Jobi), we have two *dohertyi* in the same genus, Oberthür's being apparently the one that is entitled to stand; unless indeed Oberthür's *dohertyi* should turn out to be a mere synonym of *ornytion*; in which case I presume that Rothschild's would stand as the true *dohertyi*. This, however, is a question that I would fain leave in the hands of experts in nomenclature.

Turning now to Fruhstorfer's treatment of these forms, we find that he ends his account of *Huphina* with the same five species as those to which Butler called attention in the passage above quoted, adding to them "*persephone*, Staud. (= *olyssia*, Frust. i. l.)." † His notice of this

* Ann. Mag. Nat. Hist., 6th Series, vol. xx, p. 153 (1897).

† Seitz, "Macrolepidoptera" (Indo-Australian Region), Engl. Ed., p. 147.

assemblage is no doubt based on the "Revision";* and we have already seen that three of its members, viz. *ornytion*, *ludas* and *dohertyi* belong not to *Huphina* but to *Delias*. There remains *persephone*, Staud., from Waigiou. This form, as Fruhstorfer says, "was formerly only known in one defective male specimen, and described as *Delias*." His figure, which appears in *loc. cit.*, Pl. 63 d, as *Huphina odyssea*, is indistinguishable from specimens of *ornytion* from the Arfak Mountains in N.W. and from Kapaur in W. New Guinea, on the underside of which forms the submarginal red line of the hind-wing is wanting, and the yellowish patch on the apex of the fore-wing may also be absent, as in the figure of "*odyssea*." Staudinger † was no doubt right in placing *persephone* in the genus *Delias*; there was also some justification for his surmise that a larger number of specimens, perhaps from other localities, might show that *persephone* is a local form of *ornytion*. As we have seen, there is no assignable difference between the Waigiou form and specimens of *D. ornytion* from Western New Guinea. Staudinger speaks of *ornytion* as from S.W. New Guinea, but Godman and Salvin's specimens, including the type, were taken near Port Moresby. Even in these the submarginal red line was almost obsolete; in another specimen from Port Moresby it is entirely lacking, as in the type of *persephone*.

We may sum up as follows:—

Abnormis is not a *Tachyris* (as Wallace, and Grose Smith and Kirby in their plate); nor a *Delias* (as Grose Smith and Kirby in their text and indices, also Honrath); nor a "*Pieris (Appias)*" (as Staudinger); but a *Huphina* (as von Mitis, ‡ Butler and Fruhstorfer).

Euryxantha (not *euryxanthe*) is not a *Delias* (as Honrath in his description and Grose Smith and Kirby in their plate §); nor a *Tachyris* (as the two latter authors in their text and indices); nor a "*Pieris (Appias)*" (as Staudinger); but a *Huphina* (as von Mitis, Butler and Fruhstorfer). It may probably be conspecific with *abnormis*.

* The reference to Oberthür's *Études*, "p. 61" (instead of p. 6), above noted in the "Revision," is repeated in Fruhstorfer's Alphabetical List of Indo-Australian Pierines; *loc. cit.*, p. 185.

† "*Iris*," vii, p. 355 (1895).

‡ He calls it *Pieris*, but is aware of its true affinities.

§ Both *abnormis* and *euryxantha* are also assigned to *Delias* by Grose Smith in *Novit. Zool.*, i, pp. 334, 335 (1894).

Ornytion (not *ornythion*), described as a *Pieris*, is not a *Huphina* (as Butler and Fruhstorfer); but a *Delias* (as Staudinger, von Mitis, and Grose Smith and Kirby).

Persephone is not a *Huphina* (as Fruhstorfer); but a *Delias* (as Staudinger).

Dohertyi, Oberth., described as a *Pieris*, is not a *Huphina* (as Butler and Fruhstorfer); but a *Delias*. The three last-mentioned forms are very probably conspecific.

Dohertyi, Roths., is rightly assigned to *Delias* by its describer, by Grose Smith and Kirby, and also by Butler.

Ladas is not a *Huphina* (as Butler and Fruhstorfer); but a *Delias* (as Grose Smith and Kirby).

The confusion that has prevailed with regard to these species affords a good illustration of the way in which even skilled entomologists may be misled as to affinity by striking resemblances in colour and pattern. It is surely not unreasonable to suppose that analogous mistakes may be made by insectivorous enemies.

To turn now to the main subject of this paper. It will be observed that all the forms that have been mentioned are inhabitants of New Guinea and adjacent islands; also that, leaving *Huphina eurgyantha* and the form of *Mynes geoffroyi* with a light hind-wing out of account, the remainder are characterised by a uniform dark coloration of the under surface of the hind-wing, in some cases relieved by streaks, touches or lines of bright red. The butterflies in question belong to three different genera; two of the genera, viz. *Delias* and *Huphina*, being included in the subfamily *Pierinae*, and the third, viz. *Mynes*, in the subfamily *Nymphalinae*. Of all these forms, *Delias ornytion* may perhaps be regarded as the most characteristic. I am not acquainted with the habits and postures of any of the members of this assemblage; but if *D. ornytion* behaves like most other Pierines, its attitude while feeding or resting during the intervals of flight would show on the underside a striking contrast between the dark hind-wing and apex of fore-wing on the one hand, and the white portion of the fore-wing on the other. The appearance of the butterfly, already conspicuous and distinctive, would be rendered still more so by the red costal streak and red patches or submarginal line of the hind-wing. *Huphina abnormis* under similar conditions would display the

like contrast between white, blackish brown and scarlet, though here it is interesting to observe that on a close comparison the scarlet streak in *abnormis* is seen to be not, as in *ornytion*, on the costa of the hind-wing, but on that of the fore-wing. The thin scarlet submarginal line, often present in *ornytion*, is also absent from *abnormis*, though a suggestion of it may occur in the form of a few scarlet patches. *Mynes geoffroyi*, or rather the form *doryca*, would present, as was observed by Wallace, the same general appearance as *abnormis*, the contrasting colours being very nearly the same. But here the relative position of the scarlet touches is again somewhat different. Comparing *doryca* with *abnormis*, we see a rough correspondence between the scarlet costal streak on the hind-wing of the former and that on the fore-wing of the latter; also between the scarlet submarginal spot on the hind-wing of the latter and that on the fore-wing of the former. As in *abnormis*, so in *doryca*, the hind-wing has no scarlet submarginal line. The apex of the fore-wing is in *doryca* diversified with certain light-coloured marks; these are absent from *abnormis*, but many specimens of *ornytion* show a paler area, much less conspicuous than in *doryca*, but in the corresponding situation.

If these insects, after the usual manner of butterflies, depress the fore-wings during the periods of protracted rest, so as to conceal the white portion of the fore-wing and leave visible only the apex of the fore-wing and the whole expanse of the hind-wing, the resemblance between them becomes perhaps even more detailed. The costal and submarginal red marks fall more nearly into their right relative positions, irrespective of their situation on fore- or hind-wing; and the assemblage is now joined by another *Delias* from New Guinea, viz. *D. irma*, Fruhst. In the male of this butterfly the under surface of both wings is black, with the exception of a scarlet patch on the costa of the hind-wing, like that of *D. ornytion*, but somewhat shorter in proportion; there may also be a powdering of orange-yellow scales about the distal end of the cell in the fore-wing, though this is often evanescent or absent.

It is difficult to see how the facts with regard to these four insects can be interpreted without recourse to the theory of mimicry. The resemblance between two of them, as has been seen, has been sufficient to cause great con-

fusion, even on the part of skilled entomologists: and it is hardly necessary to point out the improbability of this striking resemblance between insects differing in affinity, but all inhabiting the same region, being due to simple coincidence. Nor, again, is it easy to suppose any factor in the climate or external conditions of New Guinea which could lead directly, on the part of three or four of its butterflies, to the assumption of a dark underside with red markings; these markings, be it observed, belonging in some cases to the fore-wing, in others to the hind-wing, but always contributing to the same general effect. Whether the explanation founded on mimicry is adequate, can only be finally decided by observation and experiment; at present I think it must be admitted to hold the field.

The scarlet markings on the hind-wing underside of *Delias ornytion* would seem to be an attenuated version of the subcostal red patch and submarginal red band seen in the corresponding position on the hind-wing of *Delias harpalyce*, *Donov.*, and *Delias nigrina*, *Fabr.* This series of markings has a wide distribution among the species of *Delias*, being more or less completely represented in such species as *D. aganippe*, *Donov.* (Australia); *D. kummeri*, *Ribbe*, *iltis*, *Ribbe*, and *bakeri*, *Kenr.* (New Guinea); *D. mysis*, *Fabr.* (Australia); *D. argenthona*, *Fabr.* (Australia); *D. caeneus*, *Linn.* (Moluccas); *D. eucharis*, *Drury* (India); *D. stollii*, *Butl.* (China); *D. eumolpe*, *Gr. Smith* (Borneo). A comparison of these and other forms appears to favour the conclusion that in *D. ornytion* we have the red submarginal series in an obsolescent rather than in an incipient stage: and it is observable that although the subcostal scarlet patch is persistent throughout the whole range of this species, the submarginal scarlet line, which is nearly always present in specimens from Eastern New Guinea, and is well marked in a specimen from the Louisiade Archipelago, has, in all the examples known to me from Western New Guinea and the adjacent islands, completely vanished without leaving a trace. Now it is to be remarked that the failure of the red line in *D. ornytion* brings its underside, with closed wings, into relation with that of *Delias inferna*, *Butl.* (or as *Fruhstorfer* calls it when it occurs in New Guinea, *D. irma*). On the mimetic hypothesis, it would be natural to ask whether the darkening of *inferna* has been influenced by *ornytion*, and the loss of

red in *ornytion* by the condition in *inferna*. No doubt much remains to be discovered about the distribution of these forms in New Guinea, which is a very large country. But as far as is known at present, the disappearance of the red line of *D. ornytion* in the western part of its area cannot be connected with the presence of *D. inferna* or "*irma*," for the latter form appears not to occur in the western half of the island. On the other hand, it would seem to be not impossible that the dark coloration of *inferna* as compared with the other members of the *aruna* group may have been influenced by *ornytion*; for the only region outside the range of the latter where *inferna* occurs appears to be the northern extremity of the Cape York peninsula.

It is doubtful whether any geographical relation can be traced in the case of the red spots of *Huphina abnormis*. The submarginal series of the hind-wing occurs in greater or less development in specimens from Eastern New Guinea, the first at least of the series being apparently always present. The type, which is entirely destitute of the hind-wing series, is said by Wallace to have come from "N.W. Papua"; but the present data are obviously insufficient for forming any conclusion on this head. Nor, again, can it be said that *Mynes doryca*, which is generally distributed throughout New Guinea, shows any difference in the development of its red spots in correspondence with locality.

The facts that can be affirmed with certainty are that these four forms, viz. *Delias ornytion*, *D. irma*, *Huphina abnormis* and *Mynes doryca*, all resemble each other, and depart from most of their congeners, in the possession of a dark, almost black under-surface to the hind-wing, on which occurs a series of red markings in a greater or less state of development; that in two of them (*Mynes* and *Huphina*) the red series is divided between fore- and hind-wing, but presents the same general appearance as in the two *Delias* in which it is to be seen on the hind-wing alone; and that in one of the four (*D. irma*) the under-surface of the fore- as well as of the hind-wing is dark, so that in the other three the attitude of complete rest (fore-wings depressed between hind-wings) must be adopted in order to produce resemblance to the first. Whether these facts are open to an interpretation on the basis of the theory of mimicry is a question which will be answered in different senses by different authorities; but to those who admit the

validity of the theory in any form, it will seem probable that some mimetic influence at any rate has here been at work, though it may not be possible to determine its exact extent.

We have seen that there is little doubt that the markings on the hind-wing underside of *D. aganippe* are generally homologous with those in the corresponding situation of *D. nigripa*; and equally little doubt that the scarlet markings of *D. ornytion* are an attenuated version of the subcostal patch and red band or chain of spots seen in the two former and many other species of *Delias*, especially those belonging to what may be called the *eucharis* section of that genus. In Trans. Ent. Soc. Lond., 1891, pp. 300, 301, and Proc. Ent. Soc. Lond., 1909, p. cxiii, reasons were given, on the combined evidence of wing-markings and scent-scales, for supposing that the *eucharis* section is a natural group distinct from the *belisama* section, though no doubt at one time linked with it through a form more or less resembling *Delias aganippe*. *D. inferna*, which is a local race of *D. arana*, Boisd., is shown by both kinds of evidence to be closely akin to *belisama*, and so to belong to an assemblage in which the red subcostal patch is nearly always present, and the red submarginal chain is as a rule not to be found.* It was therefore rather to be expected, on the theory of a mutual approach between *D. inferna* and *D. ornytion*, that the latter should be more apt to lose the already attenuated submarginal line than the former to revive it or start it afresh.

Two other points of interest in connection with this assemblage remain to be noticed.

(1) With regard to *Myges doryca* it is to be remarked that not only does the underside recall in a striking manner the appearance of *Delias ornytion* and *Huphina abnormis*, but its upperside also is of a Pierine rather than of a Nymphaline character. On a superficial view there is little to distinguish it from the female of *D. ornytion* or of *H. abnormis*, and the same applies to the probably conspecific form, *M. geoffroyi*. The facies is the not unusual Pierine arrangement of a pale area surrounded by a dark border, broader in the Pierine female than in the male.

* It is, so far as I am aware, only present among *Delias* of the *belisama* group in *D. cumolpe*, Gr. Smith, from North Borneo and *D. funera*, Roths., from Hahmaheira.

It is further remarkable that the same aspect is shared on the upperside by the male of *Nepheronia* (*Pareronia* of Bingham) *jobaea*, Boisd., the representative of its genus in Ceram, Bouru, Western New Guinea and the adjacent islands. It is well known that the females of *Nepheronia* are mimics of other butterflies, chiefly Danaines and Papilionines, that inhabit the same regions. The males, however, are not usually considered to be mimetic, with the exception perhaps of *N. tritaea*, Feld., of Celebes, *N. argolis*, Feld., of the Moluccas, and *N. phocaea*, Feld., of the Philippines. But the contrast between the uniformly-tinted ground-colour of *N. jobaea* ♂ and the black veining of the upper surface of the male *Nepheronias* from further west, such as *N. hippia*, Fabr., and *pingasa*, Moore (mainland), *naraka*, Moore (Andamans), *valeria*, Cram. (Java and Sumatra), *boebera*, Eschsch. (Philippines), is so striking as to suggest the possibility that this *Nepheronia* has been influenced in a mimetic direction by the New Guinea assemblage now under discussion. As between the *Nepheronia* and the *Mynes*, the correspondence is specially close, for it extends even to the tint of the pale area of the wing, which in neither butterfly is pure white. In both species the disc of the hind-wing is pale greyish blue; and that of the fore-wing is pale greenish yellow in the *Mynes*, and either that or very pale blue in the *Nepheronia*. It may also be remarked that the underside of *N. jobaea* ♂, by its dark hind-wing, does to some extent recall the underside of *M. dorycea*, *D. ornytion* and *H. abnormis*, though it is entirely devoid of red spots or streaks. This feature of the hind-wing is exceptional in *Nepheronia*, though some approach to it is visible in *N. argolis*. A somewhat similar underside to that of *N. jobaea* ♂ is seen in *Delias ludas*, Gr. Smith, the range, however, of the latter insect appears to lie outside of the region inhabited by *N. jobaea*.

(2) It was mentioned above that *Huphina abnormis* and *H. euryxantha* are believed by some good authorities to be conspecific. Whether this be so or not, there is no doubt that the two forms are at least very closely allied. Each possesses an underside which presents a type of coloration very different from that which is usual in the genus; and it is interesting to remark that while *H. abnormis* bears a strong resemblance to one *Delias*, viz. *D. ornytion*, the very different underside of *H. euryxantha* at once recalls the *Delias* forms of the *mysis* group, particularly *D. tara*,

Boisd., which, like *euryxantha* itself, is an inhabitant of New Guinea.

It is obvious that with regard to all these forms much remains to be learned concerning their relative frequency, their exact distribution and local variation, their modes of flight and postures during rest, and the extent to which they are the prey of insectivorous birds or other enemies. Only when more data are forthcoming on these heads will it be possible to pronounce with any approach to confidence on their respective bionomic relations.

My thanks are due to Lord Rothschild, F.R.S., for personal help in examining the collections at Tring; and to Dr. Eltringham for his skilful preparations of the genitalia mentioned on p. 120.

VII. *An Instance of Mutation: Coccus viridis, Green, a Mutant from Pulvinaria psidii, Maskell.* By K. KUNHI KANNAN, M.A., F.E.S.

[Read March 6th, 1918.]

PLATES V—VIII.

SUMMARY.

Coccus viridis, Green, has seven segments in the antennae. This was so in the Mysore specimens when the pest first appeared in the State in 1912. But specimens collected in 1913 and afterwards, though undoubtedly *C. viridis* in other respects, showed in the antennae a reduction to three segments by the coalescence of the terminal five into one. This indicated an instability in the species, which has now been placed beyond a doubt by the fact that there are in Java, besides the typical *C. viridis*, two distinct types, with very variable but usually eight antennal segments, highly unstable and with a host of intermediate forms. A new form from Uganda, described first as a subspecies, has been recently given specific rank by Newstead. *C. viridis* is therefore clearly unstable.

Pulvinaria psidii is also very variable in size, antennae, and anal plates, and some variations distinctly recall those of *C. viridis*. The chief distinguishing feature, of the secretion of meal for oviposition, may also be absent. *P. psidii* has, moreover, at least two subspecies. The gap between *P. psidii* and *C. viridis* being bridged over by the variations in both these, involving the same structures, and being in the same direction, *P. psidii* is the mutating species, *C. viridis* and its variants being derived directly or indirectly.

Similar relations between species in *Coccidae* have been noticed by others, and are best explained by the theory of Mutation applied as above. An exact parallel to the phenomenon, which occurred in *C. viridis*, has been noticed by Green in *Phenacoccus mangiferae*. The relations described by Quayle, of the University of California, between *Coccus citricola* and *C. hesperidum* are also similar to

those between *P. psidii* and *C. viridis*, and are similarly explained by the theory of regressive mutation.

The two insects dealt with in this paper belong to two closely allied genera in the order *Coccidae*. They are flat, oval scale or scab-like bugs, which are provided with hair-like tubes for feeding on plant sap. The adults show little trace of segmentation. They have three pairs of legs, a pair of segmented antennae, a pair of eyes, and two pairs of spiracles, which are situated a little distance from the margin, but are connected with it by shallow grooves called stigmatic clefts. At the place where the grooves touch the margin there are three stout spines, of which the central spine is twice the size of the other two. At short intervals along the entire margin, there are smaller spines which are dilated or toothed at the extremity. The anus is about a sixth of the distance from the margin, and is guarded by two triangular chitinous plates known as the anal plates, which lift up and open apart when there is a discharge. From the anus, in a line with the opening of the plates, there runs to the margin, a cleft dividing the posterior end into two lobes. The chitin of the dorsum has a definite pattern made up of what are called dermal cells, which are depressions or pits* of different shapes varying from irregularly oval to round. *Coccus viridis* is viviparous, the eggs developing inside the body and hatching usually at the time of discharge. *Pulvinaria psidii*, on the other hand, secretes a cottony waxy stuff to lay eggs in.

Coccus viridis, or green bug, is a serious pest of Coffee, which appeared in Ceylon so far back as 1882, and had no small share in the destruction of Coffee there. It has since appeared in the Pulneys, the Shevroys, the Nilgris, and finally in Mysore and Coorg. It feeds on a large number of plants, besides Coffee, viz. Tea, Guava, Citrus plants, Cinchona, several species of *Manihot*, *Gardenia*, *Ixora*, *Plumiera*, *Eugenia*, *Loranthus*, *Antidesma*, and several varieties of garden shrubs.

* The dermal cells cannot be correctly described as "depressions or pits." They are actual cells in the chitinous substance of the derm, each cell communicating with the surface by a minute pore. They have no connection with the superficial depressions (usually of a more or less polygonal form) that may be observed on the dorsum of the living insect.—E. E. G.

Pulvinaria psidii is known popularly as the "mealy bug" * for the reason already mentioned, that it secretes a large quantity of waxy substance which appears like cotton and forms a sort of cushion beneath the abdomen of the insect, lifting it up and bringing it at an angle to the surface of the leaf. The eggs are laid in this mass. Like green bug, it is quite at home on a variety of plants, viz. Coffee, Tea, Cinchona, Citrus plants, *Eugenia*, Guava, Myrtle, *Ficus*, Cardamom, *Duranta*, *Garcinia*, *Antidesma*, *Alpinia*, and numerous other plants.

Both these species have been studied in the Entomological Section of the Department of Agriculture in Mysore, ever since *Coccus viridis* appeared as a pest in the State in 1912, and this paper attempts to give some of the results of the investigation and their explanation.

When the pest first appeared, a number of planters sent in specimens for identification. All these were determined as *Coccus viridis*, as they answered in all respects to the description of the species given by Green in his book "The Coccidae of Ceylon." About a year afterwards, when specimens happened to be microscopically examined again, a remarkable change had appeared. The antennae, which are seven-segmented in the species, showed a reduction to three by the coalescence of the five apical segments into one. Several hundreds of specimens from all parts of the State were then examined, but none with seven-segmented antennae were found. From one estate, however, from which specimens were obtained immediately on the outbreak of the pest there in 1913, a few bugs were obtained which showed four or five segments in the antennae (Pl. VII, fig. 4, drawing i). Specimens from the Pulneys, Shevroys, the Nilgiris, and Coorg have also been examined, and all show a reduction to three segments, though in some there are traces of additional segmentation. There is little doubt, therefore, that in South India the three-segmented condition of the antennae is practically universal, though there is one important exception to which reference will be made later.

The reduction may make it appear probable that the bugs originally identified by Dr. Coleman and myself were not the same as the bug described by Green. Since,

* *Pulvinaria psidii* may be locally known as "mealy bug" in Southern India; but that term is more usually applied to members of the genus *Pseudococcus* and its allies.—E. E. G.

however, a seven-segmented antenna is one of the specific characters relied on by Green, a reduction had it occurred then would not have passed unnoticed. Moreover, a photograph of one of these earlier specimens fortunately shows seven distinct segments (Pl. V, fig. 1). There is little doubt, therefore, that the present form is derived from the typical *Coccus viridis*.

The reduction is not a character acquired by the adult, but appears in nymphs just hatched. This is remarkable, since Green mentions as a characteristic of not only the genus *Lecanium* (*Coccus*) but of all the genera in the family that the nymphs have six-segmented antennae, and as regards *Lecanium* (*Coccus*), he says, "the facts seem to indicate a primitive six-jointed antenna." Maskell, another authority, considers that six is the normal number of segments in all Coccids. The number six in the young persists in the adult, or is increased by a few more, but is seldom reduced.

Save for the inherited degeneration in the antennae, the Mysore form is identical with the bug from Ceylon in all microscopical details. The Ceylon specimens, obtained recently, are smaller in size. It is also probable that their reproductive powers are limited. Green says the bug produces only about 20,* whereas in Mysore the number has reached over 500. But these are minor details which do not affect the structural identity of the two forms except as regards the antennae.

Closely allied to the Ceylon form in sex, colour, and antennae, specimens were obtained from one citrus plant in Bangalore in May 1916. Periodical examination of specimens from this plant have been made since, and so far the reduction to three has not yet appeared, though there seems to be a tendency for the third and fourth, and fifth and sixth to coalesce. These specimens are therefore the typical *Coccus viridis* of Green. Save for this one instance a three-segmented condition of the antennae appears to be universal in the South Indian form.

It is remarkable that this seven-segmented condition should be found to persist in bugs collected in 1915 in

* I do not know where the author obtains his authority for this statement. I can find no such remark in my description of the species ("Cocc. Ceylon," iii, p. 200). On the contrary, I have distinctly stated (*loc. cit.*) that "a constant succession of larvae is produced during the life of the insect."—E. E. G.

Bangalore, when as early as 1913 the degeneration had already taken place all over Mysore and Coorg. In Bangalore itself, specimens from the same locality and elsewhere show the degeneration.

The variability in the number of segments in the antennae appears to be of frequent occurrence in the genus *Lecanium*, and also in *Pulvinaria*. I tabulate below the variations noted by Mr. Newstead in his book on "The Coccidae of the British Isles," and by Green in his "Coccidae of Ceylon," the only literature on the subject to which I have been able to gain access.

FROM "THE COCCIDAE OF THE BRITISH ISLES."

	Normal No. of Segments.	Abnormal No. of Segments.	Remarks.
<i>Pulvinaria vitis</i>	8	6	
„ <i>floccifera</i>	8	6	
<i>Lecanium persicae</i>	7	6	
„ <i>ciliatum</i>	8	7	
„ <i>bituberculatum</i>	8	7	
„ <i>capreae</i>	7	6 or 8	
„ <i>nigrum</i>	7	8	

FROM "THE COCCIDAE OF CEYLON."

	Normal No. of Segments.	Abnormal No. of Segments.	Remarks.
<i>Pulvinaria tomentosa</i>	8	7	
<i>Lecanium capparidis</i>	6	7	
„ <i>formicarii</i>	8	7	
„ <i>acuminatum</i>	6	7	
„ <i>viride</i>	7	8	through incomplete division of the 4th.
„ <i>discrepans</i>	7	8	from an obscure division of the 7th.
„ <i>marsupiale</i>	7	8	
„ <i>bicruciatum</i>	6	7	
„ <i>longulum</i>	8	9	probable.
„ <i>psidii</i>	7	8	

An analysis of these variations shows that of the total number of 51 species (42 *Lecanium* and 9 *Pulvinaria*) described in the two books there is variation recorded in 17, viz. 33 $\frac{1}{3}$ per cent. of the number. Of these 17, the variation is by the addition of a segment in 12, by the reduction of a segment or two in 4 and by both in 1. It is thus clear that the reduction from seven to three in *Coccus viridis* cannot be placed in this category, but has

to be classed separately, not only because the reduction is by as many as four segments, but also because it is inherited. There are only two cases on record which may be held to approach this one, which I have not included in the analysis above. These are *Coccus acutissimus* and *Paralecanium (Lecanium) expansum*. In the former Green could only distinguish two basal segments, but he noticed "lighter transverse marks which suggest an original division into six or seven segments." The antennae of *Paralecanium (Lecanium) expansum* are described as "with incomplete divisions, though a terminal one and a basal two can easily be distinguished." Whether the nymphs of these two species were examined by Green is not definitely stated. But the fact that there were traces of six or seven segments in one and a terminal fourth in the other makes it probable that, at any rate at the time the species were described, the nymphs had six-segmented antennae. And it is improbable that Green would have omitted to examine the nymphs of the only two species in which there is a reduction of antennal segments beyond what he himself gives as the normal number for all nymphs of the family *Lecaniinae*.

The reduction from seven to three segments in the Mysore form must therefore be held to be unique. The fact that it is inherited by the nymphs renders no longer tenable the character of a six-segmented antenna in the nymphs as a feature of the genus *Lecanium*. The Mysore form is therefore entitled to specific rank, and I propose to name it *Coccus colemani* in honour of Dr. Coleman, as a mark of gratitude for the valuable scientific training I have received at his hands.

Coccus colemani, sp. n. (Plate V, figs. 2, 3.)

Adult ♀ characters as in *Coccus viridis*. But antennae three-segmented, the first and second segments subequal, the third from five to six times the length of the first and having a number of apical and subapical hairs. The dorsal α -wise carina not found in any stage. Dermal cells more round than oval, scattered over the derm and from 30 to 80 μ apart.

Colour pale lemon-yellow to greenish-yellow. Shape oval, the anterior end being narrower but is liable to variation in specimens fixed on the sides of veins of leaves in which the anterior end is more or less acuminate, and either the right or the left side may be

shortened and straight. The insect is ovoviviparous, but a few eggs may be found laid occasionally. Reproduction continues for about a month and a half after reaching the adult stage. The number of young produced may reach over 500.

The newly hatched larva is of a pale greenish-yellow, broadly oval. The antennae three-segmented as in the adult. The relative lengths of the segments as in the adult. Other characters as in the nymphs of *Coccus viridis*. Male unknown.

Length of adult 2-4 mm.

It may perhaps appear necessary to create a separate subgenus for the reception of this new species, but I cannot decide the question until I have made a more detailed study of the group and examined *C. acutissimus* and *P. expansum*.

The sudden formation of *C. colemani* made it appear probable that *Coccus viridis* was unstable. Green himself says that a new variety of his species was created by Mr. Newstead from specimens obtained from Lagos, but "that sufficient material was not examined to establish the fact." The report of the Department of Agriculture, Uganda, for the year 1916 states that a new form of "green bug" found along with the typical form but with eight-segmented antennae and described by Mr. Newstead originally as a subspecies has been given specific rank under the name *Coccus africanum*. There was therefore considerable justification for the belief that *Coccus viridis* was a mutating species. Requests for specimens were therefore made to the Entomologists of the Agricultural Departments of all countries where green bug occurs, but so far they have been received only from Ceylon, Java, Hawaii, Seychelles, and Honolulu. Samples sent from Uganda were unfortunately lost in transit. The material obtained is of very great interest.

The specimens from Ceylon, Hawaii, Seychelles, and Honolulu are all true to the description of Green. The Javan specimens, on the other hand, exhibit an enormous variation. Prof. Keuchenius of Java remarks in a letter received from him that "the variability of *Lecanium* (*Coccus*) *viride* is a difficult and troublesome question. Green in his standard work does not mention at all any variability, and therefore in the beginning I thought that I had to do with two different species, but afterwards I

came to the conclusion that *Lecanium (Coccus) viride* varies strongly. On the same locality and the same garden and the same kind of Coffee (but different trees) one may distinguish the following forms—

“ 1. A large form with a very flat body, which is of a clear green colour.

“ 2. A smaller form with a more elevated body, which is less acuminate in front and of a darker dirty greenish colour. Between these extremes there exist all kinds of nuances.”

The following are the descriptions of the two forms referred to in Prof. Keuchenius's letter.

The Round Form. (Plate VI, fig. 1.)

The margin nearly circular. The marginal setae stout and frayed. The skeleton is thick. The dermal cells large, irregularly oval towards the margin, approximate, and smaller and more circular towards the centre. Body elevated to give a more or less elevated shape. Colour dull brown to dull yellow. The loop more or less inconspicuous. Dorsum thrown into minute transverse folds. Antennae very variable in number and relative length of segments, the more usual number eight. Measurements:—

Length/Breadth : 3/2.2, 5/2.5, 3/2.25, 2/6/1.75, 2/5/1.75, 2/5/1.75, 3/2.5/1.75, 3/2.5/2, 3/2, 3/2, 3/2, 3/2, 3/2, 3/2, 2/5/1.6, 3/2.5/2, 3/2.5/2, 3/2.5/2, 3/2.5/2, 2/6/1.75, 2/2.5/2, 3/1.75, 3/2.5/1.75, 2/2.5/1.75, 3/1.75, 3/2, 2/2.5/2, 2/5/1.5, 3/1.75, 3/2, 2/1.75, 2/6/2, 2/5/1.75, 3/2, 3/2 mm.

The Flat Oval Form. (Plate VI, fig. 2.)

Oval, flat, anterior extremity subacuminate. The marginal setae less strongly developed but of the same shape as the round form. The loop more or less conspicuous. The chitinous skeleton thinner, and the dermal cells round, fewer, scattered and not approximate. Colour varies from greenish-yellow to greenish-blue. Dorsum not thrown into folds. Antennae more usually eight-segmented, but very variable in number and relative length of segments.

Measurements:—

Length/Breadth : 4/2, 4/1.75, 4/2, 4/6/2, 3/5/2, 3/5.5/2, 3/2.5/2, 4/2, 4/2, 4/2.20, 3/1.75, 3/5/2, 4/2, 3/1.75, 2/7.5/1.75, 3/2, 2/7.5/1.75, 3/2, 2/7.5/2, 2/7.5/1.75, 3/20/2, 3/5/2, 3/2.5/2, 3/5/2.25, 2/7.5/1.75, 4/2, 3/2, 3/2.5/2, 3/5/2, 3/2, 3/1.75, 3/2.5/2.25, 3/2, 3/5/2, 2/7.5/1.7, 4/2 mm.

The antennal variability in these two forms is very great and is disclosed by the following analysis :—

Round Form (of 25 examined).				Long Form (of 33 examined).			
Antennae	8	segmented in	15	Antennae	8&8	segmented in	16
„	8&7	„	3	„	8&7	„	6
„	8&6	„	1	„	7&7	„	8
„	7&7	„	1	„	7&6	„	2
„	6&6	„	3	„	5&5	„	1
„	6&5	„	1				
„	5&5	„	1				

From this it appears that among the round form, of the 25 examined 10 had abnormal antennae, or 40 per cent. In the long form of 33, 17 had antennal abnormality, or 51·5 per cent. The range of variation as shown in the charts (Pl. VII, figs. 1 and 2) is very great and far exceeds the limits of ordinary variation. It is not alone that segments show a reduction in number and relative length, but in the same specimens the antennae may be different in the number and relative length of segments, producing an asymmetry. The variability in size, colour, shape and elevation appears to continue to the same extent in the specimens sent by Prof. Keuchenius in 1916 as when he studied the pest two years previously.

Between these two varieties described above, there are several intermediate forms, presenting several stages and gradation in details of structure, size, colour, elevation and conspicuousness of the loop, but they are mainly grouped round these two types. From a study of the material the impression is forced on one that the Javan forms are highly unstable. Two of these forms described above are entitled to specific rank. One of these, the oval flat form, may prove identical with the new form described by Mr. Newstead as *Coccus africanum*. The other has, so far as I am aware, not been described. I refrain from creating species for the reception of these two, until I have an opportunity to examine *Coccus africanum*.

These facts of variation prove that *Coccus viridis* is a mutating species. In Mysore the bug was all but caught in the act, and in Java the saltatory variations continue. In Uganda a new form has been in existence since 1898, when *C. africanum* was first described as a subspecies.

There are two views possible in regard to this interesting

phenomenon: (1) that *Coccus viridis* produces different forms under the stimulus of different conditions; (2) that *Coccus viridis* itself is a mutant from another unstable species. One or both these may be true. If *Coccus viridis* and the forms regarded as its derivatives all maintain the distance from other species, which entitled it to specific rank, then the inference is justified that the mutating species is *C. viridis*. If, on the other hand, *C. viridis* or one of its so-called derivatives structurally approaches or is very nearly identical with another species of scale insect and this latter is an unstable species, then it follows that the mutating species need not be necessarily *C. viridis* alone, but the species with which *C. viridis* or one of its derivatives is found to closely agree.

We have now to see which of these alternatives has application in regard to the variations described above. The flat form from Java, the South Indian form, the *Coccus africanum* of Uganda, are more or less referable to *Coccus viridis*. But the round form from Java is different in structural detail. The round contour is not a great difference, for it has been found occasionally among the South Indian forms. The eight-segmented antennae are common to *C. africanum* and to the oval flat form from Java itself. The antennae are just like those of *P. psidii*, as will appear from the charts (Pl. VII). The irregularly oval approximate dermal cells and the strongly developed marginal setae are peculiar to the round form, which makes it structurally identical with *P. psidii* as it occurs in Mysore. Specimens of these placed under the microscope so approach each other in structure that it would be difficult to tell the difference except from the contour, which is round in one and oval in the other. It is not known what shape *P. psidii* takes in Java, but the shape is as already indicated of very little consequence.

The structural similarity of the round form with *P. psidii* assumes a new significance and importance when the variability of *Pulvinaria psidii* is considered. Its variability is a feature of this bug which Green himself has noticed both in regard to size and anal plates. After noting a minor variation in the length of the fourth segment, he proceeds: "Valves of the anal operculum variable in form in the same community and is particularly marked in some examples from myrtle, of which no two individuals are identical in this particular. . . . Length of insect

averaging from 3-3.50 mm., but exceptionally large individuals have reached 5 mm., some examples from myrtle, while showing all the structural characters of the type, were exceptionally small, the adult insect only measuring 2 mm. in length, with a correspondingly small ovisac."

To these variations have now to be added those of the antennae, which as shown in the drawings are reduced from the normal eight to as low as five (Pl. VII, fig. 4). In the same specimen, as in the Javan form, one antenna may vary in one direction the other in another. Here, again, the reduction may be greater than that which has ever been noticed in other species of *Pulvinaria*, for in *psidii* it may be by as many as three segments, whereas in other species of the genus it is never greater than by one or two segments.

These variations reduce the gap between *P. psidii* and *C. viridis*. The differences between the two species are tabulated below.

<i>P. psidii</i> .	<i>C. viridis</i> .
Shape oval, not variable.	Shape variable, one side straight the other curved, rarely oval.
Colour varies from dark or dirty green to greenish-yellow, very variable. Dull.	Greenish to pale lemon-yellow. Not very variable. Shiny.
Antennae 8-segmented.	Antennae 7-segmented.
Oviparous.	Ovoviviparous.
Secrete meal to lay eggs in.	Does not secrete meal.
Chitin thick, loop therefore invisible.	Chitin thin, loop therefore visible.
Dermal cells large, irregularly oval, approximate towards the margin, but more or less round towards the centre.	Dermal cells round.

The distinction between the antennae is of little importance in view of the variation in both the species. It has already been shown that antennal segments in *Pulvinaria psidii* may be reduced to as low as five. As regards mode of reproduction, though no *P. psidii* has shown any departure from ovipary it is not unusual to find beneath green bugs a few developed eggs. The majority of species in the genus *Lecanium* are oviparous. Therefore it appears

to me that the ovovivipary of *viridis* is an advanced stage transitional from ovipary. With regard to the loop the presence or absence of it is by itself an unimportant distinction as it is only the appearance of the Malpighian tubes which will be visible or invisible according as the chitin is thin and transparent or thick and opaque. The variations in *P. psidii* are so great that those of *C. viridis* come within their limits. A similar remark holds good in regard to size. The difference in the shape of the dermal cells is not great. There are specimens of *C. viridis* in which the dermal cells distinctly approach the shape and arrangement in *P. psidii* (Pl. V, fig. 1). The main distinction on which Green appears to rely is, that *P. psidii* secretes meal and *viridis* does not. But this distinction breaks down, for in *L. hemisphaericum*, as I have found, and as Green himself has observed, there is a secretion of meal along the margin. Green says in regard to it that "at this time (of gestation) the inner marginal surface is dusted with white mealy powder, and where a scale has been detached from the plant, an oval white ring marks the previous position." As a matter of fact the secretion of meal is in much greater quantity than indicated in this description, in specimens of *L. hemisphaericum* from Mysore (Pl. VIII, fig. 1).

There is also the fact that one apparently healthy mealy bug has been discovered by me to lay eggs beneath the body without a preliminary secretion of meal. Diseased specimens have also been occasionally observed to lay eggs without secreting meal. Furthermore, in green bug there appears to be a secretion of meal, though in the minutest quantity. When specimens are lifted off from the leaf they do not always drop to the ground but often hang by a thread, which must therefore be secreted by the bug itself,* and Green notices the presence of wax-secreting glands round the reproductive opening. The resemblance goes further. I have already remarked on the feature of *psidii* of being tilted at an angle to the surface of the host by the secretion of meal beneath. This habit has been found in large numbers of green bug.† In other species

* I think that the author has misinterpreted this phenomenon. When one of the insects is detached without unnecessary violence, it will often remain hanging by its long rostral filaments, which are inserted into the tissues of the plant.—E. E. G.

† The "tilting" of the body, in *L. viride*, is usually a symptom

of *Lecanium* (*Coccus*) in Mysore this habit has not been found or is slight and inconspicuous. In *Coccus viridis* it is so great that the dorsum may be thrown into minute folds (Pl. VIII, fig. 3). It is difficult to explain this except as an inherited tendency persisting after the necessity has disappeared.

If the difference between *psidii* and *viridis* appears, then, of little importance, the difference between *psidii* and the Javan round form is much less. The structural characters of these two are, as I have already shown, identical. The only serious difference is in the method of reproduction. The Javan round form is thus intermediate between *psidii* and *viridis*. The series of forms commencing from *psidii* on one side and extending to *viridis* and *colemani* on the other, exhibit a gradual degeneration not by fluctuating variation but by saltatory variations, or what De Vries would call retrogressive mutations. For, on the one side, we have a meal-secreting habit, more numerous and larger cells in the derm, strong marginal setae, a larger size, and eight-segmented antennae, and at the other end a smaller size and three-segmented antennae, absence of meal, less numerous and more rounded cells in the derm and very feebly developed marginal setae. The intermediate types approach one or other of these extremes, and some of them are extremely unstable. The conclusion appears therefore to be justified, that *Coccus viridis* arose as a mutant from *Pulvinaria psidii*, and the various forms from South India, Java and Uganda are derivatives from the latter species either directly or through *C. viridis*.

This hypothesis that two species which are placed in different genera have mutational relations is the only one that fits the facts given above. Short of actual demonstration, it is difficult of acceptance at first sight, and demonstration is difficult under the widely different conditions of distant countries in which the mutations have occurred. It does not appear probable that the various forms so produced can all be produced in one of these, especially when the parthenogenetic condition of these forms prevents their crossing. South India yields only

of disease, and commonly occurs in the incipient stages of infection by the parasitic fungus *Cephalosporium*. I have never observed a healthy insect in this position.—E. E. G.

one form; so also Ceylon. In Uganda the two types are probably fairly fixed. Java, where the types are not yet fixed and where the closest approach to *psidii* is found, seems to be the most promising field for the experimental demonstration of a common origin of the various forms, though it appears unlikely that *Coccus colemani* will be produced there.

Until these experiments are conducted in Java or elsewhere (some of these are being attempted in Mysore), I must look for confirmation of my hypothesis in facts which have already been recorded by Coccidologists.

With regard to the two genera *Pulvinaria* and *Lecanium*, Green writes as follows in his book on "The Coccidae of Ceylon," p. 258: "In all purely structural characters there is nothing to distinguish the members of this genus (*Pulvinaria*) from those of *Lecanium*, so much so that until the period of oviposition it would be impossible to determine whether an individual should be placed in one genus or the other," and later, on p. 264, when dealing with *P. psidii*, he says, that "in its earlier stages the insect bears a superficial resemblance to *Lecanium (Coccus) viride*, from which it may be distinguished by the absence of the dark intestinal loop."

Newstead is even more emphatic. He says in his book on "The Coccidae of the British Isles," that "this genus comes very near to *Lecanium (Coccus)*, and is only separable from it by the formation of a cottony ovisac below and behind the posterior extremity of the body of the adult female at the period of parturition. . . . All the stages of the male, including the glassy puparium as well as those of the female *up to the time of parturition*, are inseparable from those of *Lecanium (Coccus)*, so that in the absence of the ovisac it is quite impossible to fix this otherwise conspicuous genus." The secretion of meal is found in another important genus, *Protopulvinaria*, in which the meal is smaller in quantity, but is secreted all round the margin. This genus has indeed been placed by Mrs. Fernald under *Pulvinaria* as a subgenus, and I have already referred to the secretion of meal in a species belonging to *Lecanium*, viz. *L. hemisphaericum*. The secretion of meal is not, therefore, an exclusive feature of *Pulvinaria*, but is found more or less in the allied genera and in *Lecanium (Coccus)* itself.

To turn now to the genus *Pulvinaria*, the variations I

have indicated are in individuals. In a mutating species, especially when it is found all over the world, there must be well-marked varieties, and this is what we find. Apart from the "phytophagous" varieties, which are very numerous in Mysore, there are others of a more permanent character. The form of *Pulvinaria psidii* in the Philippines has been given subspecific rank by Cockerell under the name *philippina*. He says in his monograph on "Coccidae from the Philippine Islands" (Putman Memorial Fund, 1905), "the long tibia, long third antennal joint, marginal hairs, long bristles on joints 2 and 5 of antennae, etc., all show this insect to be very close to *Pulvinaria ficus* (Hempel) and *P. psidii* (Maskell). The six-jointed antennae are distinctive, but may not be constant. It is evidently reasonable to treat this insect as a subspecies of *psidii*, and so far as I can make out *P. ficus* should stand as *P. psidii ficus*." That is to say, there are two well-marked subspecies in *P. psidii*. With regard to a third species, *P. cupanae*, Green says that it is doubtfully distinct from *P. psidii*.

A more striking evidence of the consanguinity of the various types I have dealt with is the variability of the anal plates in all of them. Green says in his introduction to the family *Lecaninae* that their form and size afford good specific characters. These characters do not vary with the size of the individual, but are practically constant for each of the several stages, and on p. 236, in describing the variety "*quadratum*" of *Lecanium expansum*, he says, "the size and form of the anal scales of the adult female are usually so constant in any one species of *Lecanium* that such a marked difference as is found in the present instance must be looked upon as varietal." Green has recorded the variability of the anal plates in *P. psidii* and given drawings of the various shapes they assume. The quotations above indicate that this variability is an indication of great instability. Now in the types which I regard as derivatives of *P. psidii* it is not alone that the anal plates are of the same shape when normal, but the variations when they occur are more or less in the same direction. They are more fixed in the more stable forms as *Coccus viridis*, less fixed in *Coccus colemani*, and least in the forms from Java. The shape of the anal plates and their variability in the same direction is quite consistent with the hypothesis I have advanced of a common origin.

The tendency to regressive mutation exhibited by these insects is probably due to the continued absence of a sexual generation, which, if one may judge from the behaviour of species similarly circumstanced, tells on the vigour and vitality of the species. Though *C. hesperidum* is one of the commonest species occurring on numerous plants from the United States to Japan, no male has been recorded at any rate from India, Java or Ceylon; nor have males been recorded for *C. viridis*, the study of which dates as far back as 1882, except for two doubtful ones from Java.

The Weismanian theory that the purpose of sexual reproduction is to induce variability has received no support from the study of variation in parthenogenetic forms, the results of which show that variability in such species is not less than that in sexually produced forms, and that therefore variability is not a factor necessarily introduced by the union of the sexes. But from the fact that parthenogenesis does not induce variability it does not follow that it is the cause of it. I suggest it as a possibility because the types I have been dealing with show a progressive degeneration, and because it seems to me that the continued absence of a male generation prevents the swamping effects of intercrossing, and therefore affords a greater chance for the survival of variations. Whether or not the continued absence of a sexual generation is the real explanation of the instability of *P. psidii*, it is the sort of species where one would look for mutation. Much the same remarks apply to *C. viridis*, which take so many different forms in different countries. There is thus considerable justification apart from the facts I have already given for the conclusion that *C. viridis*, *C. colemani*, *C. africanum*, and the Javan forms are directly or indirectly derived from *P. psidii*.

This conclusion is of great importance and interest. It indicates that the parallelism in structure between genera with ovisacs and those without them have an evolutionary connection, the ovisac condition being antecedent in time. Such genera could be found in families other than *Lecaninae*. In *Dactylopinæ*, for instance, there is a structural similarity between one oviparous and another viviparous species in Mysore. In *Pulvinaria* itself, there are probably other species which stand to species in *Lecanium* in the same relation as *psidii* does to *viridis*. In

Mysore there is at least one instance where such relation appears to occur. This is under investigation. It is significant in this connection that there are several species in *Pulvinaria* in which there are well-marked varieties. Newstead merges in *Pulvinaria vitis* the following species, *P. betulae*, *P. salicis*, *P. oryzaanthae*, and *P. persicae*, but retains *P. ribesiae* as a variety. Similarly the limits of variation are great in *P. floccifera* in which also a number of species have been merged. The study of species like these will throw considerable light on the relationships of the various genera and species of *Coccidae*.

Even more important and valuable will be the instances of mutation which the study is likely to bring to light. I give below two instances which furnish a very close parallel to the phenomena which I have described, where therefore mutation must have occurred. In a most interesting paper on "Some comparisons of *Coccus citricola* and *C. hesperidum*," Mr. H. J. Quayle, of the University of California, gives an account of the relationships between the two species, which are almost similar to those between *P. psidii* and *C. viridis*. I summarise below the differences between the two species.

<i>C. citricola</i> .	<i>C. hesperidum</i> .
Antennae with 8 segments in the great majority.	Antennae with 7 segments.
Ground-colour grey or dirty white. A more even distribution of dark colour pigment.	Ground-colour distinctly yellowish. Colour pigment coalesced in more or less definite areas.
Lustre dull.	Lustre shiny.
Shape oval, not variable.	Shape variable: one side straight, the other curved.
Male found occasionally.	Male unknown.

C. citricola is the more variable of the species. Quayle says: "In 78 specimens of *citricola* in which 139 antennae were examined there were three scales each with seven joints in one antenna and eight in the other. In four scales there were seven joints in both antennae, and in four others there were seven joints in one antenna, while the other was not examined. The remaining number, or 67, had eight joints in both antennae. In 73 specimens of *hesperidum* examined all had seven joints." The paral-

lelism between *C. citricola* and *C. hesperidum*, on the one hand, and *P. psidii* and *C. viridis*, and *C. viridis* and *C. colemani*, on the other, will now be obvious. There is one apparent difficulty. *Citricola* is a species described in 1914, but *hesperidum* was described many years earlier. According to my hypothesis *citricola* should be regarded as the parent species and as having been earlier in time. It has, however, to be remembered that the mere fact of an earlier record is of itself insufficient to prove the later origin of a species. What has probably happened is that *hesperidum* formed out of *citricola* crowded out the parent species, and this would fit in exactly with my hypothesis and with the observations in Mysore and other countries where *Pulvinaria psidii* is seldom a pest, while *C. viridis* and *C. colemani* are notoriously injurious to crops.

The second instance is that which has come to the notice of Green, and to which he refers in the course of an interesting letter received from him on the subject of the phenomenon in *C. viridis*, brought to his notice. He wrote as follows: "Such degeneration, if clearly established, is extremely interesting, and so far as I know has not been recorded before. Curiously enough since reading this paper I have met with an instance that appears to be of a similar nature. In examining some old material from Java, I have found an insect that agrees in every character with *Phenacoccus mangiferae*, described from Ceylon, except that its antennae have only seven instead of nine joints. According to the present classification, this difference would necessitate the relegation of the Javan specimens to a distinct genus (*Pseudococcus*). But I am convinced that they are really conspecific."

What has undoubtedly occurred in *C. viridis* is therefore by no means an isolated instance, and I believe the study of scale insects in the light of the phenomenon recorded and described above will bring to light more instances of mutation. We are still too ignorant of the obscure processes involved in this important phenomenon to neglect what seems to me to be a promising field for its investigation.

In conclusion, I have to thank Dr. Coleman, the Director of Agriculture in Mysore, for his sympathy and guidance, and through him Prof. Keuchenius of Java, Mr. C. C. Gowdey of Uganda, Mr. Lyne, Director of Agriculture in Ceylon, Mr. P. R. Dupont, Curator, Botanic Station,

Seychelles, Mr. Ehrhorn, Entomologist, Honolulu, for kindly furnishing samples of green bug from their countries. I am also indebted to Mr. E. E. Green for the encouragement he gave me.

EXPLANATION OF PLATES V-VIII.

PLATE V, fig. 1. *Coccus viridis*, one of the first specimens sent in for identification on the outbreak of the pest in Mysore in 1912. Fig. 2. *Coccus colemani*. Fig. 3. *C. colemani*. Fig. 4. Larva of *C. colemani*, just hatched. Note that there are only three segments in the antennae.

PLATE VI, fig. 1. The round form from Java. Note the dermal cells. Fig. 2. The long form from Java. Note dermal cells. Fig. 3. *P. psidii*. Fig. 4. *Pulvinaria psidii*.

PLATE VII, fig. 1. Antennae of the long form from Java. Fig. 2. Antennae of the round form from Java. Fig. 3. Antennal variation in *P. psidii*, round form from Java, *C. viridis*, *C. colemani*. Fig. 4. Variation in the antennae of *P. psidii* and stages of reduction from the antennae of *C. viridis* to the antennae of *C. colemani*. Fig. 5. Antennal variation in the abnormal round form from Java, and the abnormal long form from Java.

PLATE VIII, fig. 1. *L. hemisphaericum* turned over to show the waxy secretion along the margin of the body, and the mark left on the leaf as a result of the filaments adhering. Fig. 2. The secretion of meal in *P. psidii*. Fig. 3. *C. viridis* showing the hind end of the body tilted up much as in *P. psidii*. Fig. 4. Variations in the anal plates of *P. psidii* from Green, of *P. psidii* from Bangalore, *C. viridis* from Ceylon, and *C. viridis* from Bangalore.

VIII. *Some Remarks on Mr. Kunhi Kannan's Paper, "An Instance of Mutation."* By E. ERNEST GREEN, F.Z.S.

[Read March 6th, 1918.]

THE author records some extremely interesting observations on a marked degeneration (that has appeared within quite recent years) in the antennae of two nearly related *Coccidae*—*Lecanium (Coccus) viride* and *Pulvinaria psidii*.

In the year 1882 a green scale-insect attracted attention in Ceylon as a serious pest of the coffee plant, though it was not until 1886 that it was recognised and described as a new species—under the name of *Lecanium viride*. The same species was found to be infesting the coffee plantations of Southern India a few years after its first appearance in Ceylon. It does not appear to have been noticed in the Mysore district until 1912, at which time the insect is said to have been quite typical in regard to the structure of the antennae. Mr. Kannan reproduces a photograph of "one of the first specimens sent in for identification at the outbreak of the pest," which exhibits seven-jointed antennae. Yet, by the following year (1913), the Mysore examples of the insect—though otherwise typical of the species—were found to have undergone a remarkable degeneration which took the form of a reduction of the number of antennal joints to 5, 4, and 3, instead of the normal number of 7. This (as may be gathered from the author's figures) was effected by a suppression of intermediate divisions until—in the final stage—there remained only the normal 1st and 2nd joints, with a long compound segment consisting of the other 5 joints with little or no trace of the former divisions. It is now said to be difficult to find a single example with antennae showing more than three visible segments. From a consideration of these facts the author arrives at the conclusion that a new species has been suddenly evolved, and he proceeds to describe it—under a new name—as *Coccus colemani*.

I have had no opportunity of examining examples of this insect, but presuming that it has been correctly identified and that it is really a sudden mutation from the original *Lecanium viride*, it still seems questionable if there is

sufficient justification for the erection of a new species. I should prefer to regard it as merely a local race or—at most—allow it to rank as a subspecies. But Mr. Kannan goes so far as to suggest the propriety of erecting a new subgenus for its reception!

Students of the *Coccidae* are beginning to realise that too much reliance has been placed upon antennal characters as a factor in classification. There is scarcely a single species that does not exhibit variability in one direction or another—in colour, size, or form, or in the structure of one or more of its organs; and it is in the antennae that variation is most liable to occur.

Mr. Kannan describes also what he considers to be two abnormal forms from Java, which he believes to have been similarly evolved from *L. viride*. From his description, one of these (the round, convex form) would appear to be a new species, while the other is probably identical with *L. africanum*—a species which the author believes to have been equally derived from *viride*. It would be interesting to know whether these Javan insects have been submitted to any expert opinion.

But the most important part of Mr. Kannan's paper is concerned with his hypothesis that *Lecanium viride* itself is a direct mutant from *Pulvinaria psidii*. From the title and sub-title of his paper, it may be judged that the author considers that he has fully proved his case. I must confess that his arguments—though most ingenious—are scarcely convincing, and appear (to me) to be founded upon insufficient evidence.

The main argument, when analysed, appears to be as follows:—

1. *Lecanium viride* has suddenly evolved a distinct variety with 3-jointed antennae.

2. There are allied species, subspecies, or races in Africa and Java.

3. *L. viride* "is therefore clearly unstable."

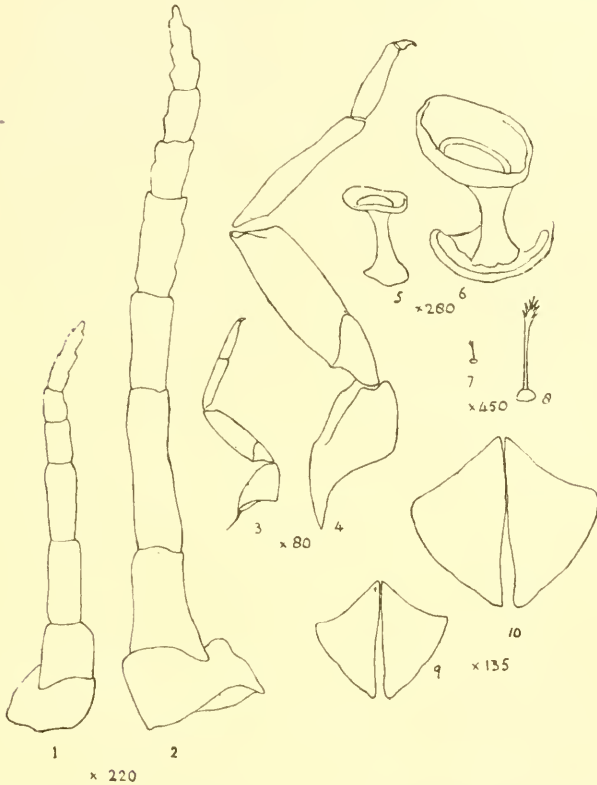
4. *Pulvinaria psidii* is subject to variation and has allied forms in other countries.

5. *L. viride* and *P. psidii* resemble each other superficially and occupy the same regions.

6. Therefore *L. viride* is a mutant of *P. psidii*. Q.E.D.

This, of course, is a very bald way of stating the case. Our author marshals a large array of evidence—or supposed

evidence—in support of his theory; but much of this is open to question. The first four clauses may be accepted



A comparison of various organs of *Lecanium viride* and *Pulv. psidii*. (The figures have been drawn to scale, with the aid of a camera lucida; each pair being amplified to the extent that best shows their relative proportions.)

Lecanium viride.

- 1. antenna, $\times 220$.
- 3. mid leg, $\times 80$.
- 5. posterior spiracle, $\times 280$.
- 7. marginal hair, $\times 450$.
- 9. anal operculum, $\times 135$.

Pulvinaria psidii.

- 2. antenna, $\times 220$.
- 4. mid leg, $\times 80$.
- 6. posterior spiracle, $\times 280$.
- 8. marginal hair, $\times 450$.
- 10. anal operculum, $\times 135$.

almost without comment. except that I may point out that the third does not necessarily follow upon the second,

With regard to clause five, I hold the opinion that the resemblance is superficial only. In his tabulated differences between *viride* and *psidii* the author pays no attention to dimensions, and there is nothing to indicate whether his figures are drawn to scale or not. Though the over-all measurements of the two insects fall within the same range of variation, this is by no means the case with respect to the size of the various organs and the proportionate lengths of the joints of the limbs. In spite of the fact that the two insects are of approximately the same size, it will be seen (*vide* accompanying text figures) that all the organs of *viride* are very much smaller than the corresponding structures of *psidii*. Taking these in order, we find that the length of the antenna of typical *viride* is to that of *psidii* in the proportion of 55 to 97. A still more striking contrast is seen in a comparison of the legs of the two species, which are in the proportion of 6 to 15 (femur 11 to 28, tibia 7 to 22, tarsus 5 to 11). The proportions of other organs show corresponding differences: anal operculum (length) as 8 to 11, (breadth) as 18 to 25; orifice of posterior spiracle, as 9 to 17; marginal hairs, as 2 to 13. The relative proportions of the joints of individual limbs also show strong points of difference: in *viride*, the femur is to the tibio-tarsal member as 11 to 12, and the tibia is to the tarsus as 7 to 5; while, in *psidii*, the same members are in the proportion of 28 to 33 and 22 to 11 respectively. Thus we find that, while in *viride* the tarsus and tibia are approximately equal in length, in *psidii* the tibia is twice as long as the tarsus. The relative lengths of these two joints are usually accepted as useful specific characters.

The fact that a reduction in the number of antennal joints has been observed in South Indian specimens of both *viride* and *psidii* does not, in my opinion, provide an argument in favour of the transmutation of the two species; but suggests, rather, that a similar environment has induced a tendency to variation in the same direction.

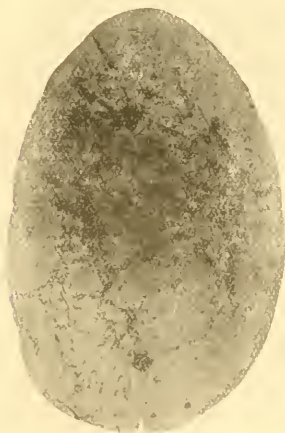
The author remarks that "the main distinction on which Green appears to rely is that *psidii* secretes meal and *viride* does not." I am sorry if any such opinion is to be gathered from my descriptions of the two species. I maintain that the similarity is purely superficial, and that an examination of the microscopic characters would make it impossible to confuse the two insects.



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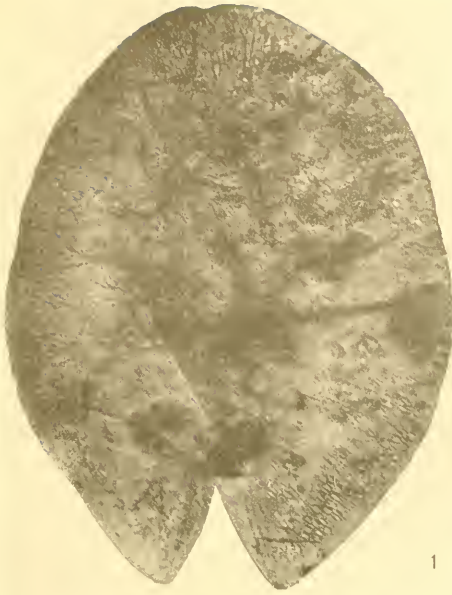
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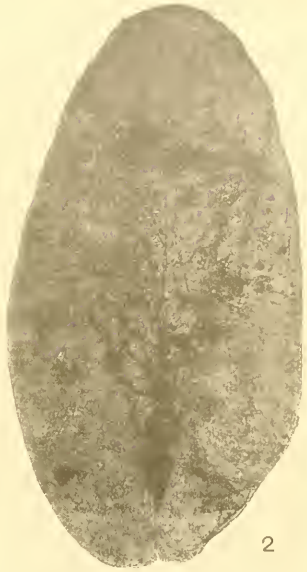
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MUTATION IN COCCIDAE.



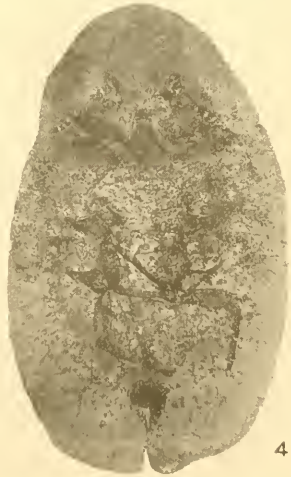
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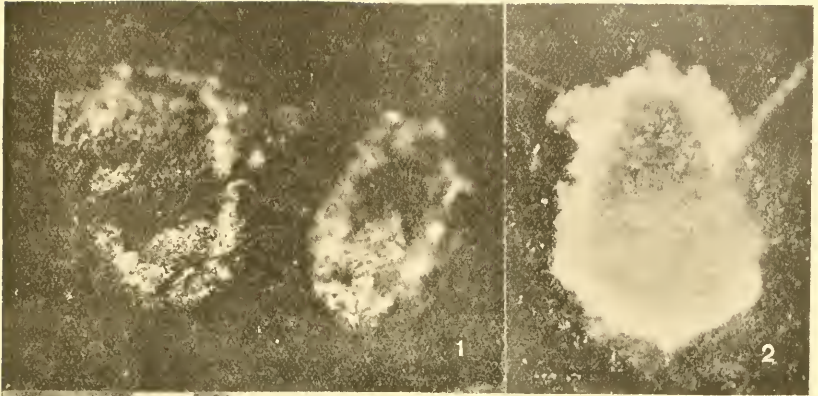
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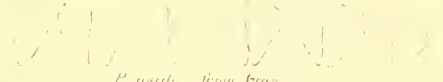
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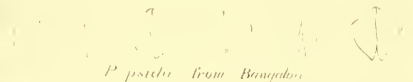
MUTATION IN COCCIDAE.



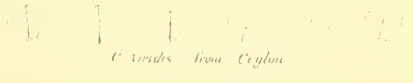
VARIATIONS IN THE ANAL PLATES
OF



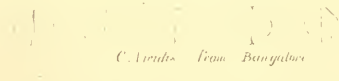
P. psith from Java



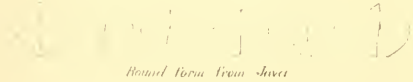
P. psith from Bangalore



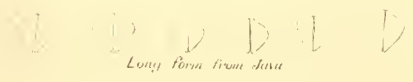
C. viridis from Ceylon



C. viridis from Bangalore



Bonal form from Java



Long form from Java

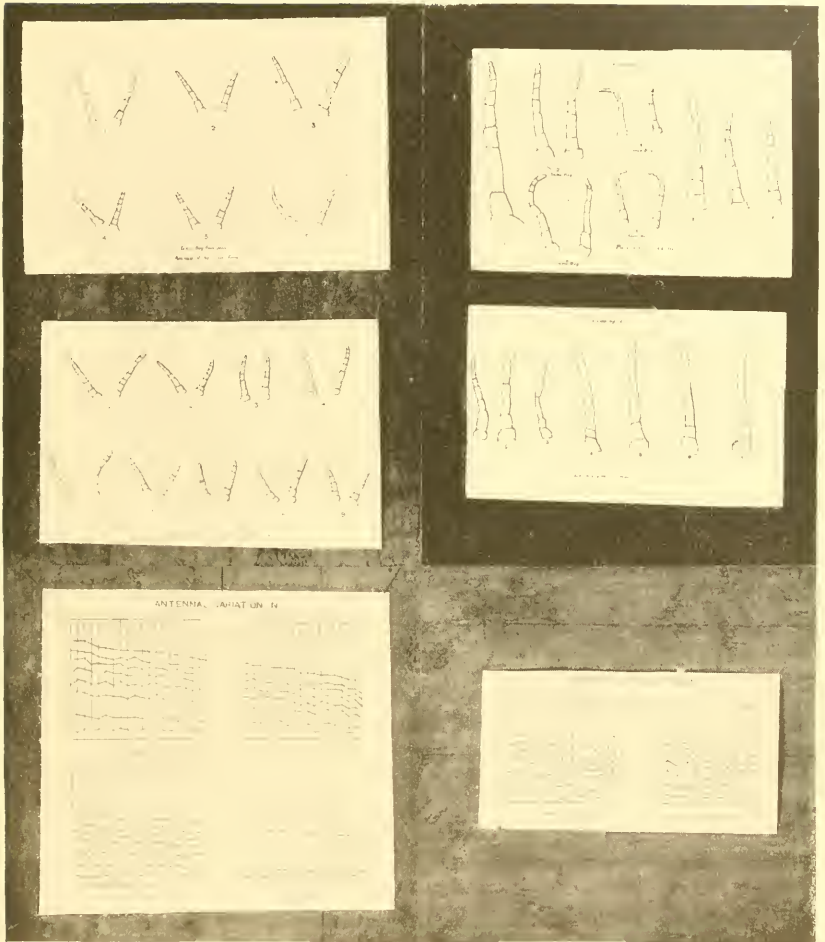


C. Colemanii

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MUTATION IN COCCIDAE.



André, Sleigh & Anglo, Ltd.

MUTATION IN COCCIDAE.

Much stress is laid upon the presence of a slight deposit of mealy powder beneath the bodies of certain species of *Lecanium*; but the secretion of wax—in greater or less profusion—may be said to be common to the whole family of *Coccidae*. In some it is proluse, in others it is small in quantity and restricted to definite areas of the body. It is not the secretion of meal that distinguishes the genus *Pulvinaria*, but the construction of a definite ovisac. I may remark, however, that I do not attach any great value to generic distinctions, but regard them greatly as a matter of convenience.

I am quoted as writing (in the "Coccidae of Ceylon") that "in all purely structural characters there is nothing to distinguish the members of this genus (*Pulvinaria*) from those of *Lecanium*; so much so that until the period of oviposition it would be impossible to determine whether an individual should be placed in one genus or the other." This statement is applicable only to the genera, and must not be held to imply that two known species could not be distinguished at an earlier stage.

In conclusion, I see no more justification for regarding *Lecanium viride* and its allies as having been directly derived from *Pulvinaria psidii* than for assuming a similar relationship between *L. hesperidum* and *P. stoccifera*, or many other pairs that might be mentioned. By a skilful manipulation of figures and charts it might be made to appear that all the genera and species of the *Lecaniinae* (or of any of the other subfamilies) were in an active state of flux. There is no doubt that the genera *Pulvinaria* and *Lecanium* are very closely allied, but their boundaries are quite well defined.

After the kind acknowledgment of encouragement, in the final paragraph of Mr. Kannan's paper, I feel that the above remarks have placed me in a rather invidious position, and may seem to savour more of discouragement than the reverse. But I really consider that the author is to be congratulated upon having brought together so many interesting and valuable observations, and having drawn attention to the close inter-relationship that undoubtedly exists between many species and genera of *Coccidae*. Though I have been unable to agree with all his conclusions, I feel that a broader view of the subject—such as he has here attempted—will be greatly to our advantage, and I trust that Mr. Kannan will continue

and extend his studies. Published work on *Coccidae* has, hitherto (apart from the economic side), been too much confined to pure systematics—to the making and remaking of new species, or to the upsetting of well-established names. Further research, in the direction in which Mr. Kamman has led the way, will assuredly produce valuable results, and may even revolutionise our present knowledge.

IX. *Observations on the Lepidopterous Family Cossidae and on the Classification of the Lepidoptera.* By A. JEFFERIS TURNER, M.D., F.E.S.

[Read March 20th, 1918.]

It has long been known that moths belonging to the family *Cossidae* present certain peculiarities in their neururation; but the importance of these peculiarities and the light they throw on the relationship of the different families of the *Lepidoptera* have never, I believe, been fully recognised. So far as I know, no monograph has appeared on the structure of the whole family. Mr. Meyrick in his "British Lepidoptera" deals with three genera, which he divides into two families rather widely separated in his scheme of classification. Sir George Hampson has dealt with the more numerous Indian genera as one family in his "Moths of India," and has also kindly lent me an MS. key to the world genera represented in the collection of the British Museum. Mr. Barnes and Mr. McDonough have revised and tabulated the North American genera ("Contrib. Nat. Hist. Lep. N. Amer.," i, p. 3). Without attempting a systematic revision of the world genera, I have endeavoured to describe all the more important structural modifications exhibited by them, and to discuss their significance. The accompanying figures are all original, and though roughly diagrammatic, for I have no skill as a draughtsman, they give, I believe, with accuracy the essential details of the neururation in each case.

Family COSSIDAE.

Definition.—Tongue and maxillary palpi obsolete. Fore-wings with an areole, usually large; the parting vein between areole and cell (the *chorda*) distinctly or strongly developed; * a branched median vein distinctly developed in cell, very rarely unbranched; two anal veins 1c and 1b, the latter furcate at base. Hind-wings with a branched median vein in cell distinctly developed, very rarely unbranched; three anal veins 1c, 1b, and 1a, 1b often shortly furcate at base.

* With one exception, which will be described.

By this definition the genus *Paracossus*, Hmps., is excluded from the family, and will be dealt with separately.

To the definition the following particulars must be added: Moths of moderate or large, sometimes exceedingly large, size. The larvae so far as known, and probably in every case, are internal feeders living in wood. The frons is usually flat, but may have a projecting tuft of scales. The labial palpi may be moderate and porrect, or short, or obsolete. The antennae are rarely simple in both sexes, frequently bipectinate in both sexes to apex, in one genus unipectinate, frequently with a double row of long pectinations in the ♂ for part of their length, the pectinations

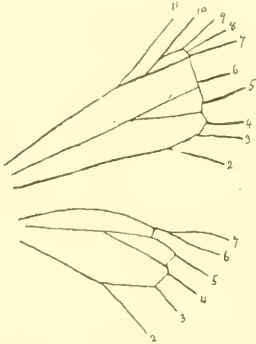


FIG. 1.—*Cossodes lyoneti*,
White.

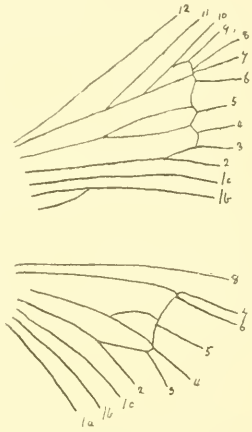


FIG. 2.—*Dudgeona actinias*,
Turn.

usually ceasing or shortening abruptly, and the apices simple or shortly bipectinate, but simple or shortly bipectinate from base to apex in the ♀. The tibial spurs are long and well developed in some of the more primitive genera, but frequently very short or obsolete. The frenulum is sometimes short, not articulating with the retinaculum, and apparently non-functional.

We will commence our survey of the neurations with two of the most primitive genera, *Cossodes* and *Dudgeona*. Both genera have long, well-developed tibial spines and rather long palpi, which are unusual in the family, and confirm the conclusion, that I draw from their neurations, that they are primitive types. *Cossodes* has simple antennae

in both sexes, and contains one Australian species. The type of *Dudgeona* is Indian, and has the ♂ antennae shortly bipectinate to apex, and veins 6 and 7 of the hind-wings are separate; *D. actinias*, Turn., from Australia has the antennae simple in both sexes, and 6 and 7 of the hind-wings connate; there is a third unnamed species from Africa, which is intermediate, having the ♂ antennae simple, but 6 and 7 of the hind-wings separate. In view of their close specific relationship and agreement in all other structural details, it does not seem necessary to divide the genus. In neuration *Cossodes* and *Dudgeona* are closely allied. Both possess an areole of moderate size in the fore-wing, with a branched median nerve in both wings. The areole between 8 and 9 is completed not by the usual anastomosis, but by a short cross-bar, probably a more primitive arrangement. It is interesting to note that in one example of *D. actinias* examined this cross-bar was absent, leaving the areole open. The full importance of this observation will be seen later. The Australian genus *Ptilomacra* has, like many others of the family, lost its tibial

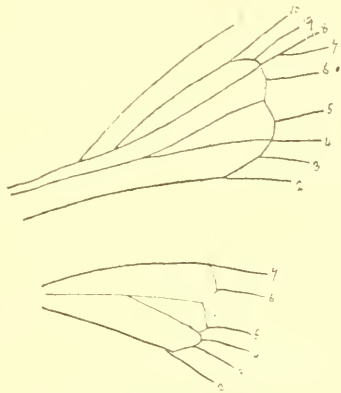


FIG. 3.—*Ptilomacra scirax*, Wlk.

spurs, the antennae of both sexes show a double row of long pectinations to the apex, in the ♂ very long, the palpi are small and very hairy, but in its neuration it agrees very closely with the preceding genera, the only differences in the fore-wing being a larger areole, and staking of veins 7 and 8. The European *Cossus* is not very far removed from *Ptilomacra* in neuration (fig. 21), the principal difference being the smaller and more projecting areole, on the apex of which the origins of 7, 8, 9, 10 are crowded together, and the obsolescence of the dorsal half of the basal fork of 1b, which is vestigial. It has the antennae shortly and evenly bipectinate to apex in both sexes, the palpi moderately short, the tibiae without spurs, and the frenulum in the ♂, though stout, apparently

functionless, being short and not articulating with a retinaculum. *Miacora* agrees in neuration with *Cossus*, but has occasionally, not always, an oblique bar from near the end of cell to vein 8 imperfectly developed; it is doubtfully distinct. *Eremocossus*, Hmps., has very

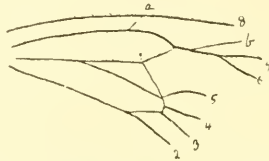


FIG. 4.—*Eremocossus foedus*, Swinh.

similar neuration. I take the opportunity of figuring an abnormal hind-wing of *Eremocossus foedus* ♀ in which two of the missing radial veins appear to be developed, one (*a*) running from the cell into 8, the other (*b*) running from the stalk of 6 and 7, quite distinct but ending in

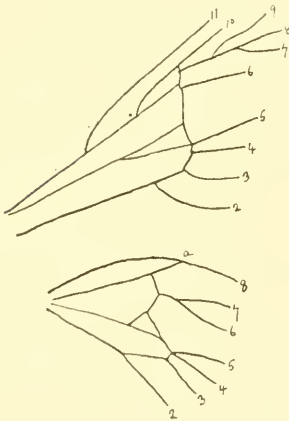


FIG. 5.—*Xystus robiniae*, Bdv.

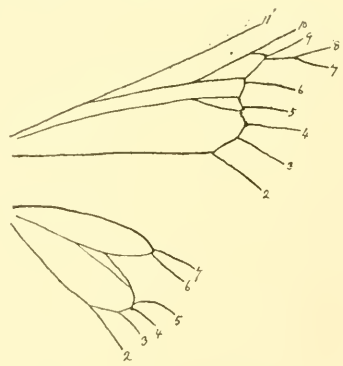


FIG. 6.—*Holocerus nobilis*, Stgr.

disc without reaching margin. On the other side of the same example and in both wings of a ♂ these extra veins are wanting. In the Nearctic genus *Xystus*, which is a member of this group possessing well-formed but rather small tibial spurs and moderate palpi, this vein (*a*) is constantly developed in the hind-wing. Except for this

the genus presents only minor peculiarities of neuration. The Palaearctic *Holocerus*, to which the African *Rethona* is closely allied, is another member of this group with moderately developed tibial spurs. In the hind-wing the

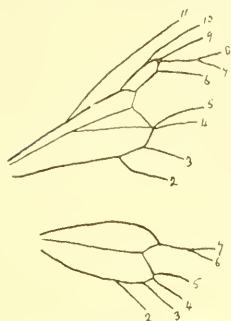


FIG. 7.—*Dyspessa ulula*, Bork.

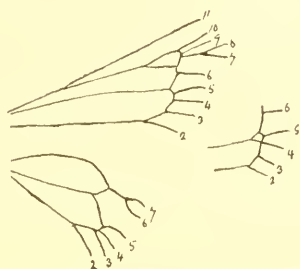


FIG. 8.—*Stygia australis*, Latr.

lower branch of the median is often so close to the lower discocellular as to be nearly fused with it. In *Dyspessa* this has actually occurred, so that the median of this wing appears single, only the upper branch being left. In a third Palaearctic genus of this series, *Stygia*, the median is unbranched in the fore-wing also, a rare degradation of the neuration in this family, though common in other groups. In one specimen the median in the fore-wing is just branched, forming a minute median cell, and I have reproduced this also in the figure; it is interesting as showing that the median cell has been obliterated in normal specimens by coalescence of the two primary branches of the median.

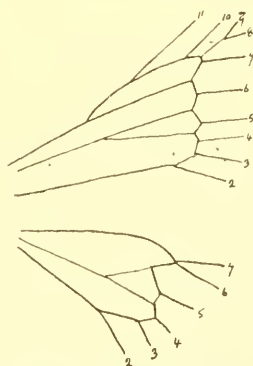


FIG. 9.—*Culama australis*, Wlk.

Stygia marks the extreme development along one branch of the *Cossidae*, and we must now hark back to a more primitive Australian genus, *Culama*, which differs from the ancestral form in only one point of importance, the origin of vein 11 from the areole, which is large. Veins 8 and 9

are stalked, but in *Culama expressa*, Luc. (fig. 22), which should form the type of a new genus,* all the veins arise separately from the areole. Both forms have the tibial spurs well developed, as have the allied Neotropical genera *Schausiana*, Strand (*Hemipecten*, Dyar), and an undescribed genus (sp. *norax*, Druce), which differ from them in minor points only. The former has the antennae unipectinate in both sexes.

The section of the *Cossidae* with hypertrophied areole giving origin to vein 11 form a large proportion of the family, and, so far as I know, no similar structure occurs elsewhere in the *Lepidoptera*.† It may be explained in two ways: (1) the origin of the chorda has been displaced towards the base of the wing—that this has occurred is shown by the increased length of the areole; (2) the basal

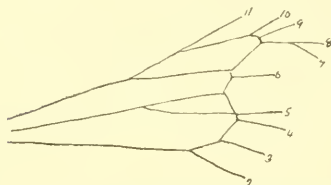


FIG. 10.—*Phragmatoccia parvipuncta*,
Hmps.

part of vein 11 may have partly coalesced with the common stalk of the remaining radial veins (the radial sector) and with the common stalk of the 1st and 2nd radial. The latter factor has been also in operation, and it explains the displacement of the origin of 11 towards the apex. The relative part taken by the two factors could be approximately determined by comparative measurements.

There are in the genus *Phragmatoccia* two types of

* *Macrocyttara*, gen. nov. Frons with anteriorly projecting scales. Palpi moderately long, projecting beyond frons, longer in ♀, smooth-sealed; terminal joint stout, obtuse, in ♂ very short, in ♀ rather long. Antennae bipectinate to apex in both sexes; or in ♂ only, in ♀ simple. Thorax with a small posterior crest. Tibiae with all spurs present and well developed. Fore-wing with areole very large, median vein branching about middle, lower branch ending between 4 and 5, upper between 5 and 6; 2 from towards end of cell, 3 from angle, 4 and 5 separate, 6 from near upper angle, 7, 8, 9, 10, and 11 arising separately from areole. Hind-wings with median cell narrow, lower branch ending between 4 and 5, upper between 5 and 6, where discocellulars are sharply angled inwards; 2 from about $\frac{2}{3}$, 3 from angle, 4 and 5 widely separate, 6 and 7 stalked from upper angle, 8 free.

† Except, as pointed out to me by Mr. Durrant, the Tortricid *Plitheochroa*. In the *Drepanidae* 11 sometimes arises from the areole, but in this instance 11 arises from much nearer the apex.

neuration in the fore-wing so different that at first sight one would pronounce them distinctive of two separate genera. In *P. parvipuncta*, Hmps., the structure of the fore-wing is substantially the same as in *Culama*, but in *P. castaneae*, Hb., the sector runs into the upper branch of the median and the shape of the areole is distorted. Although these two types of neuration seem so distinct, some other species, such as *P. impura*, Hmps., present intermediate forms, in which the anastomosis between chorda and upper median is incomplete. The hind-wing in this genus is similar to that of *Culama*, but is more

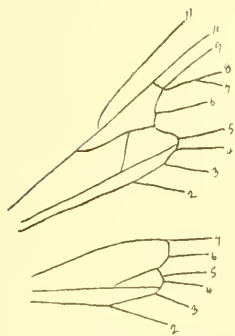


FIG. 11.—*Phragmatoccia castaneae*, Hb.

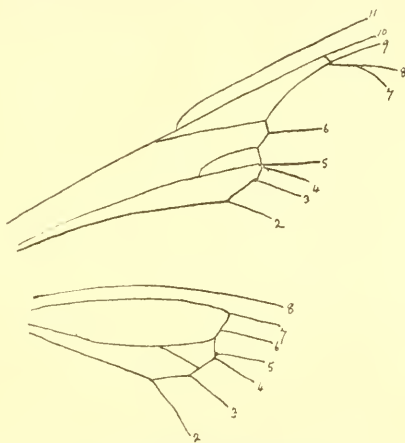


FIG. 12.—*Xyleutes crassa*, Drury (*polioplaga*, Hmps.).

primitive. In all the preceding figures the upper branch of the median, which is the common stalk of veins 5 and 6, terminates between those veins; but the median cell has been narrowed so that the lower branch, which is the common stalk of veins 3 and 4, terminates either opposite 4 or between 4 and 5. Also veins 6 and 7 are separate and parallel. For these reasons I am unable to regard *Phragmatoccia* as a direct derivative of *Culama*; but undoubtedly *Phragmatoccia* is derived from the stem from which *Culama* arose. The former genus is in other respects less primitive than the latter; it has the antennae shortly pectinated nearly to the apex in both sexes, but in the ♂ the pectinations are long for the basal $\frac{2}{3}$ and then become

abruptly shorter, the palpi are short and hairy, and the posterior tibiae have a minute pair of terminal spurs only.

By far the largest genus in the family, *Xyleutes*, Hb., type *crassa*, Drury (= *Chalcidica*, Hb., *Endoxyla*, H.-Sch., *Duomitus*, Butl., *Himaeya*, Moore, *Azygophleps*, Hmps.), is represented in all the warmer regions, but most numerous in Australia. The neuration is that of the more primitive form of *Phragmatoccia*, and it differs from that genus only in the scaling of the head and palpi, but the fore-wing is very constant in structure, only slight differences existing, such as the short-stalking of vein 9, or the lower branch of the median terminating opposite 4 instead of opposite 5 as in *crassa*, or even from shortly before 4, but the median

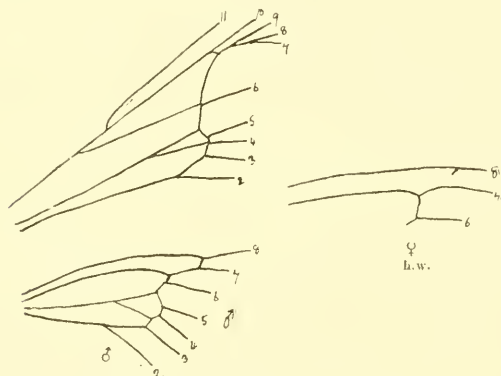


FIG. 13.—*Xylotrypa strigillata*, Fekl.

cell of the fore-wing is always narrow, not broad as in *Zeuzera*.

An undescribed genus,* which contains the species *strigillata*, Fekl., from temperate South America, is an interesting modification of *Xyleutes*. The fore-wing and antennae are the same, but the palpi and tibial spurs are obsolete, and in the hind-wing of the ♂ there is a branch running from vein 7 to 8. This, I think, represents one of the veins of that wing usually undeveloped. It is variable, and in a ♀ example represented by only a short spur on the dorsal side of 8. As there is only one example of each sex in the British Museum I cannot say whether the variation is sexual.

* *Xylotrypa*, gen. nov.

The genus *Zeuzera* presents a curious mixture of characters, some specialised, others primitive. Of the former are the absence of palpi and tibial spurs, and the ♂ antennae, which have a double row of long pectinations to about $\frac{2}{3}$ and then become abruptly simple. Of the latter is the termination of the lower branch of the median between veins 3 and 4 not only in the hind-wings, as in the preceding two genera, but in the fore-wings also. There is also a bar between vein 8 and the cell in the hind-wings, which may merely represent an anastomosis, but probably, as in *Xylotrypa*, represents the vein marked *a* in fig. 4. There is some variability in the genus. In *Z. coffeae* the areole is larger than in *Z. aesculi*, and vein 11 arises from

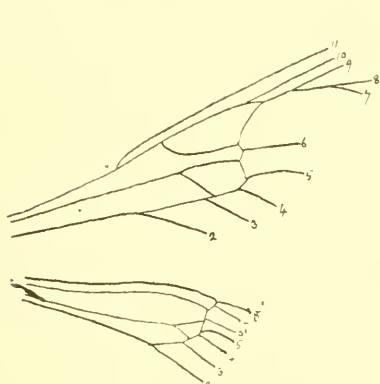


FIG. 14.—*Zeuzera aesculi*, Latr.

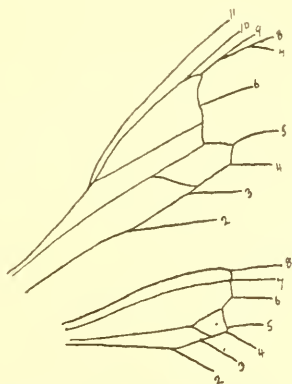


FIG. 15.—*Zeuzera coffeae*, Neitn.

only just behind it. In *aesculi* 7 of the hind-wings arises from the connecting bar, in *coffeae* from the cell. *Z. indica* has the fore-wing as in *aesculi*, the hind-wing as in *coffeae*. In *Z. multistrigata* 9 arises from the areole, connate but not stalked with 8. In an unnamed species from South Africa the chorda runs into the upper branch of the median as in some species of *Phragmatoccia*. The fore-wing of *Zeuzera* being as regards the unnarrowed median cell more primitive than in any other genus, it must have arisen independently from the same stem from which arose *Xyleutes* and its allies, but at a lower level.

We complete our survey of the family with a group of Neotropical genera, some species of which have invaded North America, in which there is a tendency to reduction of

the areole and median cell, the latter being sometimes lost. Apart from the neuration they are characterised by small palpi and tibial spurs; the latter appear to be sometimes

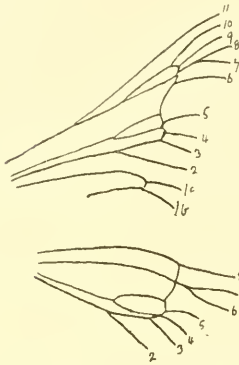


FIG. 16.—*Givira tristis*, Wilk.

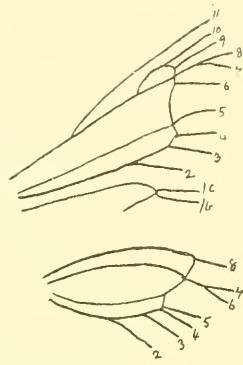


FIG. 17.—*Ingurimorpha basalis*, Wilk.

absent, and by the ♂ antennae being shortly bipectinate from base to apex. Sometimes the frenulum is short and apparently functionless. *Givira* resembles *Zeuzera*, and like

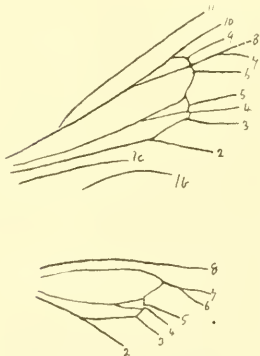


FIG. 18.—*Stenocyttara sabulosa*, Schaus.

it has a bar connecting 8 with the upper angle of the cell in the hind-wings, but both areole and median cells are narrower. A peculiar character not previously noted in this paper is a connecting bar between 1b and 1c of the hind-wings towards their distal extremities. This is, I believe, only paralleled elsewhere in the *Psychidae*, but I do not think it indicates any close relationship with this family. It has been probably an independent development. *Ingurimorpha* is a further development of the same stem, with median cell obsolete in both

wings. An undescribed genus containing *sabulosa*,* Schaus, is near *Givira*, but lacks the bar in the hind-wings. Its median cells are narrow, that of the hind-wings being very

* *Stenocyttara*, gen. nov.

small. The connection between 1b and 1c of fore-wings is not developed, the latter vein becoming obsolete before it reaches the point of connection in *Givira*.

Lentagena is remarkable for its minute areole, which if not carefully looked for might be thought to have been completely lost.* It well illustrates the process by which the areole becomes obliterated by coalescence of its upper and lower enclosing vein-trunks. In the fore-wings there is an oval median cell of some size, but in the hind-wing there is none, and the unbranched median vein has been displaced towards the dorsal margin of the cell.

At first sight it looks as though the upper branch of the median had become obsolete, but comparing it with *Ingurimorpha*, in which the termination of the median above vein 5 shows that the upper branch is represented, it seems to me at least equally probable that the median has become displaced dorsally after coalescence of its branches. In this genus the ♂ antennae are dentate or shortly bipectinate to apex, the palpi are rather small, and there appear to be no tibial spurs.

I have not seen any example of *Trigena*, Dyar, in which there is stated to be no areole, but there is certainly none in the species *tigrata*, Schaus, which I am unable to refer to any described genus.† In this the neuration of the hind-wing is that of *Lentagena*, excepting for the presence of a connecting

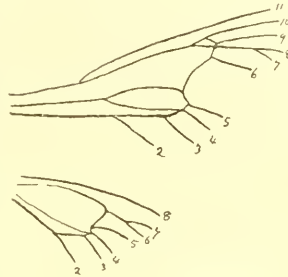


FIG. 19.—*Lentagena tristani*, Schaus.

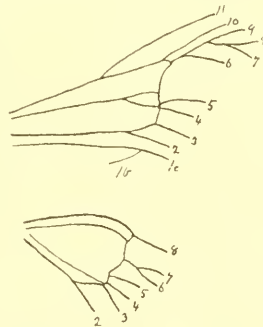


FIG. 20.—*Acytlara igrata*, Schaus.

* Mr. Dyar, Proc. U.S. Nat. Mus., xxix, p. 178 (1906), describes *Lentagena* as having no areole. This may, for all I know, be the case sometimes, but I have examined one example each (all that are accessible to me) of *tristani*, *albicosta*, and *nudaridia*, and found it present in all of them, though in the last, which is the type species, certainly very minute.

† I propose for it the name *Acytlara*, gen. nov.

bar between 8 and the end of the cell. In the fore-wing there is a small median cell, but no trace of an areole, 6, 7, 8, 9 are stalked, and the anal veins anastomose, 1*b* running into 1*c*. The tibial spurs are obsolete; the palpi moderate, porrect; the frenulum well developed, and the ♂ antennae bipectinate to apex.

This concludes my present study of the neuration of the *Cossidae*. I have not attempted to figure every genus, but, so far as I know, I have not omitted any important deviation of structure. As a result I have convinced myself that this is a natural and compact family not divisible naturally even into subfamilies. There is, it is true, a considerable and very interesting degree of variation in several directions, but all these lines of development are linked together by forms of intermediate structure.

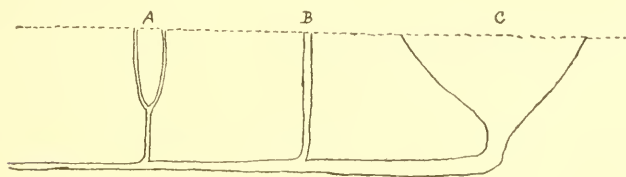
I have also convinced myself that the *Cossidae* have retained the most ancient form of neuration among the existing families of the *Lepidoptera Heteroneura*, and that from this neuration that of all the other families can be easily derived by a process of reduction, the stages of which can be readily traced. The study of this family has therefore appeared to be of fundamental importance, and it is this that has encouraged me to consider it in detail. But to establish my conclusion it is necessary to study also the neuration of these other groups, more particularly of those families that may be considered of primitive type, or at least to contain genera of primitive type. Naturally this survey cannot be undertaken in an exhaustive manner within the limits of a short paper. I can do no more than select one or two of the more primitive genera in the case of each family, paying particular attention to those families which agree with the *Cossidae* in the primitive character of possessing three anal veins, 1*a*, 1*b*, and 1*c*, in the hind-wing. These families are the *Tortricidae*, *Tineidae*, *Castniidae*, *Zygaenidae*, *Limacodidae*, *Psychidae*, and *Pyrulidae*.

THE CLASSIFICATION OF THE LEPIDOPTERA.

Before considering the relationship of the *Cossidae* to other families it is necessary to make a few remarks on the classification of the *Lepidoptera*. It is now generally agreed that the primary division of this order is into two very unequal groups, (*a*) those with closely similar fore-

and hind-wing venuration, and (b) those with unlike venuration of the two wings, the number of the veins in the hind-wings being considerably reduced. For these two groups I accept the names proposed by Mr. R. J. Tillyard in a short but illuminating paper (Proc. Linn. Soc. N.S.W., 1917, p. 167) of *Lepidoptera Homoneura* and *Lepidoptera Heteroneura*. These names are preferable to *Jugatae* and *Frenatae*, for the number of the veins is of more importance than the presence or absence of the frenulum, and as the latter organ is present in two other orders of insects besides the *Lepidoptera*, namely, the *Mecoptera* and the *Neuroptera Planipennia* (Tillyard, *l.c.*, p. 174), it is probably more primitive than has been supposed, and its absence in the *Lepidoptera Homoneura* may well have been due to loss.*

The *Lepidoptera Homoneura* consist of the *Micropterygidae* and *Eriocranidae* (if these are really lepidopterous) and the



Hepialidae. I regard them as offshoots of the primitive lepidopterous stem and not as part of the main line of development, as illustrated in the accompanying diagram.

The dotted line represents the present era. Deeply beneath it is the primitive lepidopterous stem, three branches of which reach the surface; A represents the *Micropterygidae* and *Eriocranidae*, B the *Hepialidae*, and C the *Lepidoptera Heteroneura*. There is no evidence that the two former were ever more numerous than at present, though that is quite possible, but the third are a dominant group at the present day, consisting of a vast number of genera and species, and are consequently represented by a wide-based inverted cone.

The structure of the *Lepidoptera Homoneura* is of great interest in the evolution of the order, but has small connection with the object of the present essay, the natural

* Mr. Tillyard has since this was written sent me a drawing and photographs demonstrating that a frenulum is actually present in the *Micropterygidae*.

classification of the *Heteroneura*, and I shall reserve the former for future consideration.

It is also desirable to look at the neuration from a broad standpoint and to bring it into correlation with that of other related orders of insects. Without entering into fuller discussion, I may say that I consider the primitive lepidopterous wing possessed four main veins, which divided dichotomously, together with three, or perhaps four, *anal* veins. These veins (figs. 21 and 22) were the *subcostal* (the *costal* exists as a separate vein only in fossil insects),

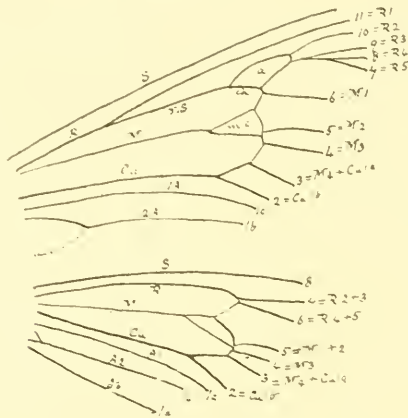


FIG. 21.—*Cossus cossus*, Linn.

S. Subcostal vein. R. Radius. M. Media. Cu. Cubitus. a. Areole. m.c. Median cell. r.s. Radial sector. ch. Chorda. R1, 2, 3, 4, 5. The five radial veins. M1, 2, 3, 4. The four median veins. Cu1a and 1b. The two cubital veins. 1A, 2A, 3A. The three anal veins.

the *radius*, the *media*, the *cubitus*, the first *anal*, the second *anal*, which is furcate at base and probably represents two coalesced veins, and in the hind-wing the third *anal*. The nomenclature adopted is that of the Comstock-Needham system, and brings the lepidopterous neuration into correlation with that of at least several of the primitive orders of insects (Tillyard, *l. c.*, p. 173). In the accompanying figures of *Cossus* and *Macrocyttara* the Comstock-Needham notation is given, and in the former the commonly used numerical notation also. The *radius* divides dichotomously into the first *radial* and the common trunk of the second, third, fourth, and fifth *radials*, which is known in

other orders as the *radial sector*. This again divides into (a) the common stalk of the second and third *radials*, and (b) the common stalk of the fourth and fifth. The latter is of such importance in the *Lepidoptera* that it is necessary to give it a special name, and I have termed it the *chorda*. It is noteworthy that, although the original dichotomy is often obscured, the second and third *radials*, that is, veins 10 and 9, always arise by a common stalk. The enclosed space, completed by a bar or anastomosis between 9 and 8, is identified by Mr. Tillyard with the *discoidal cell*, but as that term has been used with a different sense in the *Lepidoptera*, I have thought it wiser to retain for it the

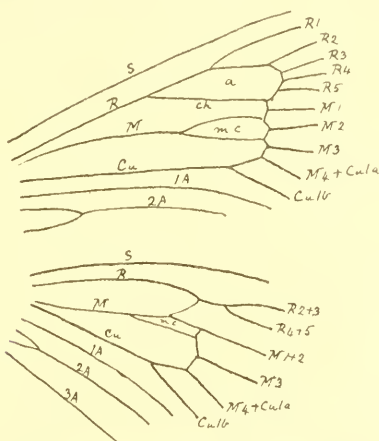


FIG. 22.—*Macrocystura expressa*, Luc.

name *areole*. When *areole* and *cell* coalesce to form what I will call an *areocel*, it is evident that the original staking of 9 and 10 is obscured, so that they appear to arise separately from the *areocel* as in fig. 23. The *media* divides into (a) the common stalk of the first and second median, and (b) the common stalk of the third and fourth median; between them is the median cell. Mr. Tillyard has shown (*l. c.*, p. 169) that the fourth *median* has coalesced with the first *cubital*, thus closing the *lepidopterous cell*, which has hitherto been known incorrectly as the *discoidal cell*, but may be conveniently spoken of as the *cell*; it of course includes the median cell when that is present.

While the *Comstock-Needham* system is, so far as our

present knowledge extends, morphologically correct, and is the only notation which permits of comparison between the *Lepidoptera* and other orders, I am strongly of opinion that the numerical notation * should be retained for morphological comparisons *within the order*, and for these reasons: (1) it is much simpler and at the same time absolutely unambiguous, while possessing the advantage of extreme conciseness; (2) it is free from morphological theories or assumptions, which however well established may be liable to future modification. In using it I would recommend that the origin of the numbered veins be always given as from the *cell* or *areole*, the *chorda* and *media*, when present, being separately described. In considering the serial morphology of the two wings there is no doubt as to their correspondence as far as vein 4, but the morphology of veins 5, 6, 7, and 8 of the hind-wings is a matter of interpretation, and subject to correction. It is, of course, obvious that 8 of the hind-wing does not correspond to 8 of the fore-wing (a fact that involves no difficulty if the numerical notation be regarded as a convenient form of shorthand). Mr. Tillyard considers 8 of the hind-wing to be the first *radial*; I consider it the *subcostal*, and identify the first radial with the short vein marked *a* on several of my diagrams. I think Mr. Tillyard has probably made the mistake of identifying as the subcostal a precostal basal spur which is sometimes present but does not represent any vein, being merely an accessory process of recent development for the support of a precostal basal expansion of the hind-wing.

The *lepidopterous cell* is usually spoken of as closed by the *discocellulars*, upper and lower, their junction being at the median notch. This may be convenient, but it must be recognised that morphologically the discocellulars are of complex origin. Their complexity is clearly indicated in their angulated outline in *Culama* and other primitive genera. For instance, in the fore-wing the *cell* is closed (1) by a short bar connecting the *areole* with the first *median*; (2) by the diverging bases of the first and second *median*; (3) by a short bar connecting the second and third *median* and closing the *median cell*; (4) by the diverging bases of the third and fourth *median*; and (5) by

* Sir George Hampson informs me that this was invented by Herrich-Schäffer.

the base of the first *cubital* before it coalesces with the fourth *median*.

Tortricidae.—At first sight the neuration of the fore-wing of *Tortrix*, a closed cell from which ten veins arise separately, appears simple and primitive, and in marked contrast with the more complex neuration of the *Cossidae*. Nevertheless, if the principles just enunciated are correct,

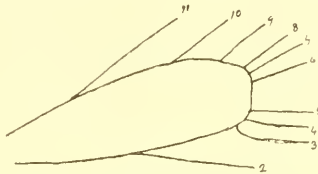


FIG. 23.—*Tortrix viridana*, Linn.

this simplicity is not primitive but acquired; it originated from a more complex scheme by a process of loss or asthenogenesis. It needs but little research to confirm the accuracy of this anticipation. In many genera both chorda and median vein are developed, certainly very slenderly but quite distinctly. The areole is usually narrow, the chorda running from a little before 10 to just above 7 in *Eucosma*, or just opposite 7 in *Carpocapsa*. The media is unbranched,

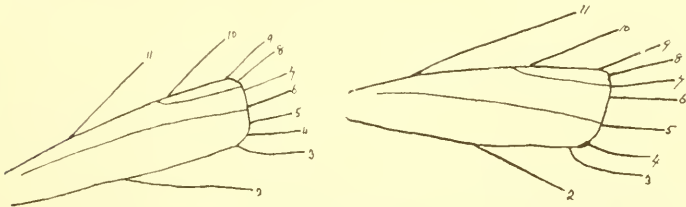


FIG. 24.—*Eucosma variegana*, Hb. FIG. 25.—*Carpocapsa pomonella*, Linn.

its exact course through the cell varies, it terminates between 5 and 6 in *Eucosma*, just opposite 5 in *Carpocapsa*. The media is more rarely distinguishable in the hind-wing, but a branched media is plainly to be seen in that wing of *Isotrias*. In this genus the areole is larger than usual, the chorda arising shortly after 11 and ending opposite 6, while the media ends opposite 4. I have not observed a branched media in the fore-wing in any of the *Tortricidae*

that I have examined. It will be noted that the cell of *Tortrix* really represents a compound structure, the combined areole and cell, and I propose to call it an *areocel*.

Mr. Meyrick in his "British Lepidoptera" has noted

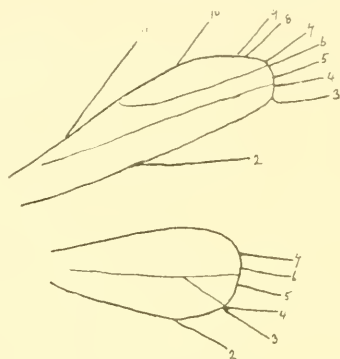


FIG. 26.—*Isotrias hybridana*, Hb.

and figured the occasional occurrence of chorda and media in the *Tortricidae*. He declares them to be inconstant and valueless in defining the genera. This may be so, but they are exceedingly valuable in indicating the true relationship of the family.

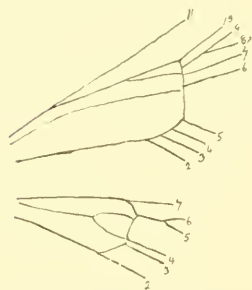


FIG. 27.—*Nemophora swammerdamella*, Linn

Tineidae.—In this great family asthenogenesis among the *Lepidoptera* runs to its extreme. In many of the more minute forms the neuration is so degraded as not to be recognisable as of the lepidopterous type, were it not that they are linked to the more typical forms by intermediate gradations. These aberrant forms need not concern us in this essay, for they are certainly derivative, and the affinities of a family are entirely determined by those of its most primitive genera. The genus *Nemophora*, with its five-jointed maxillary palpi and long antennae is certainly a primitive type, and in spite of its small size preserves a primitive neuration. In the fore-wing both sector and media are present, while the hind-wing has a branched

media. *Cerostoma* has an even more primitive neuration in the fore-wing, the media being branched; but less so in the hind-wing, the media, although well marked, being

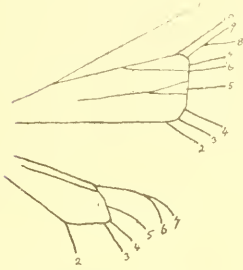


FIG. 28.—*Cerostoma radiatella*, Don.

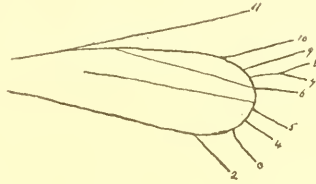


FIG. 29.—*Chimabacche jagella*, Fab.

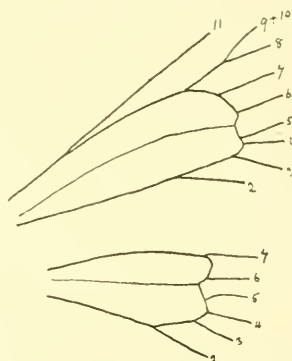
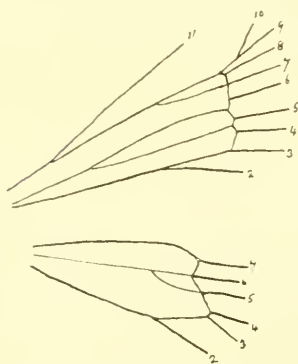
single and running near the costal edge of the cell. Evidently in this instance it is the lower branch of the media that is undeveloped. In *Chimabacche* the areole is large, the chorda and media are, however, extremely feeble, though traceable. A little further obsolescence would have resulted in an apparently simple areocel. The most cossid neuration that I have found among the *Tineidae* occurs in *Titanomis*, Meyr.,* a rather large form from New Zealand, to which my attention was directed by Mr. J. H. Durrant. It is evidently of an early undifferentiated type with all the veins present and separate. If we ask ourselves by what



FIG. 30.—*Titanomis sisyrota*, Meyr.

* *Nosymna*, an equally large form from Borneo, has somewhat similar neuration with large areole and strongly developed chorda, but the media is unbranched in both wings. It has smooth posterior tibiae as in the *Hyponomeutinae*, but those of *Titanomis* are densely hairy. *Incurvaria pectinea*, Haw., has nearly the same structure as *Titanomis*, but the chorda and branched media of fore-wings are very slender, almost vestigial.

structural points this genus can be differentiated from the *Cossidae*, we can only reply that the chorda and median veins, though present, are very slenderly developed, and that there is a well-developed tongue, with distinct though rudimentary maxillary palpi. In fact, the affinities of the *Cossidae* with the *Microlepidoptera* are so close that they must be included among them, if the latter term has any scientific meaning, although the former include the largest known *Lepidoptera*, if body bulk is estimated, for some Australian species of *Xyleutes* are about as big as a sparrow. It would be better to acknowledge that *Microlepidoptera* is not a scientific term and has no more meaning

FIG. 31.—*Cnissostages oleagina*, Zel.FIG. 32.—*Arrhenophanes perspicilla*, Stoll.

than the word *Microleoptera*. While I am quite unable to accept Mr. Meyrick's division of the *Cossidae* into two families, he is certainly correct in his opinion as to the true affinities of the genus *Cossus*.

The genera *Cnissostages* and *Arrhenophanes*, to which my attention was called by Mr. J. H. Durrant, contain some large Tineids from South America with curiously specialised ♀ antennae. In the former there is a small narrow areole and well-branched median veins in both wings. In the latter, though an allied genus, the neurotation is much less primitive; there is no trace of a chorda, which suggests that it has disappeared by coalescence and not by obsolescence, as usual in this family; 9 and 10 are coincident, and both medians are unbranched.

Castniidae.—Though this and the three following families present structures linking them to the *Zeuzeridae*, the affinity is not so close as in the two families I have just dealt with. In the genus *Castnia* there is a narrow areole, partly projecting beyond the cell, the media with its lower branch is strongly developed, while the upper branch is completely absent. In the hind-wing the upper median branch is absent together with the discocellulars, except for a short spur arising from the strongly developed lower median branch shortly above the origin of vein 5. This apparently anomalous neurulation is elucidated in the diagram by drawing dotted lines to represent the missing veins. So far as the fore-wing is concerned this explanation is demonstrated to be correct by

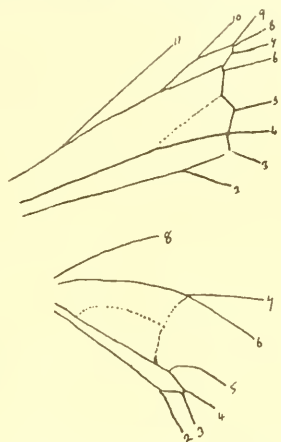


FIG. 33.—*Castnia atymnus*, Fab.

the neurulation of the genus *Gazera*, which has a larger areole, and a media with two long branches. In the genus *Synemon* the neurulation of the hind-wing agrees with that of *Castnia*; the media in the fore-wing is of the primitive type, but the areole has disappeared,

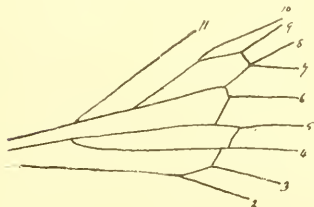


FIG. 34.—*Gazera linus*, Cram.

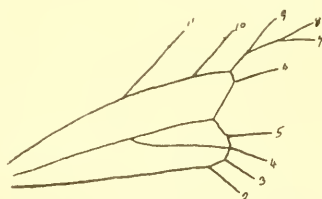


FIG. 35.—*Synemon sophia*, White.

probably by coalescence of the chorda with the margin of the cell, so producing the type of neurulation characteristic of the next three families. Before passing on to them I will draw attention to a peculiarity in the neurulation of *Gazera*. In the fore-wing of this genus vein 10, which is rather weakly developed, becomes closely approximated to vein 9.

Had these two veins anastomosed they would have formed a new cell, which might be called a secondary areole. The importance of this point will become evident later.

Zygaenidae.—In *Cyclosia*, as in all the genera of this

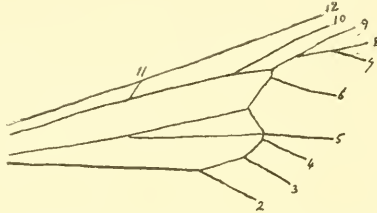


FIG. 36.—*Cyclosia panthona*, Cram.

family that I have examined or seen figured, the areole has disappeared as in *Synemon*. There is a long-branched media in the fore-wing, and vein 11 runs into 12, but in

the hind-wing the media is single as in *Chalcosia*. Sir George Hampson figures *Chelura* with a branched media in the hind-wing in his "Moths of India," but I found it to be unbranched in all the examples of this genus examined. I conjecture that Sir George Hampson may have figured an abnormal specimen. *Chalcosia* has vein 11 free, and the median cell is very small in the fore-wings. In the hind-wings the media is unbranched, and there is a short oblique vein connecting the cell with 8.

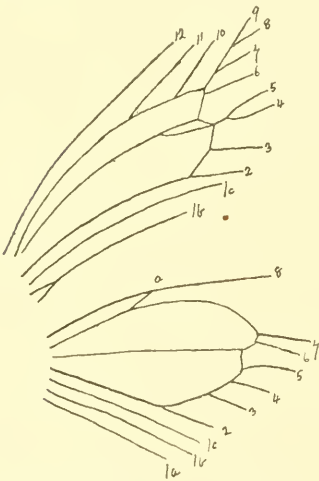


FIG. 37.—*Chalcosia affinis*, Guer.

Comparing this with the fore-wing of *Cyclosia*, we can hardly doubt that this connection represents one of the missing branches of the radial in the hind-wing, probably the first radial. The same vein is present in *Zygaena*, which has the media unbranched in both wings, the median cell having been

apparently extinguished by coalescence. In this genus, as in *Procris*, the median veins are developed feebly.

From this analysis it will be evident that the *Zygaenidae* are less primitive in their neuration than the *Cossidae*, and

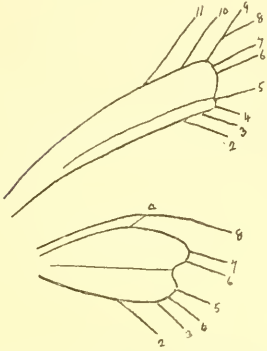


FIG. 38.—*Zygaena filipendulæ*, Linn.

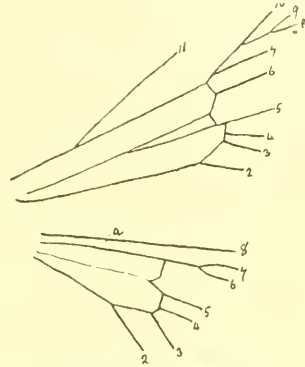


FIG. 39.—*Susica (Miresa) coronæ*, Fab.

that it is quite impossible that the latter family should have originated from the former, as maintained by Sir George Hampson in his "Catalogue of the Lepidoptera Phalaena" (i, p. 12). This conclusion is strengthened, although such confirmation is unnecessary, by the absence of tibial spurs in the former family.

Limacodidae.—That this family is structurally closely allied to the *Zygaenidae* is sufficiently shown by the accompanying figure of the neuration of *Susica*, which in the absence of the areole and the structure of the media of fore- and hind-wings and in other points agrees closely with *Chalcia*.

As a less primitive genus I have figured *Apoda*, in which the median cell has been lost in both wings. The short vein *a* present in *Susica*, which I believe to represent the first radial, is here replaced by a short anastomosis.

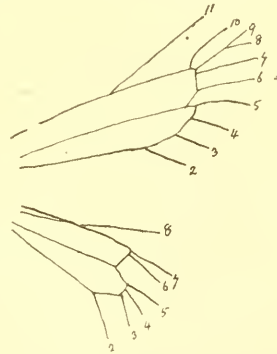


FIG. 40.—*Apoda avellana*, Linn.

Hmps., which is represented in the British Museum by two solitary types, *P. parva*, Hmps., ♂, from Ceylon, and *P. furcata*, Hmps., ♀, from Pegu. They are of somewhat peculiar facies and very similar, but the former has short porrect palpi, and the latter longer palpi curved upwards in front of the frons. The tongue is absent. The antennae in the ♂ are shortly bipectinate to the apex, in the ♀ simple, and the posterior tibiae have two pairs of spurs. The neuration shows no areole, an unbranched media in both wings, and 7, 8, 9, 10 of fore-wings stalked. Though this is structurally different from any known *Cossidae*, I

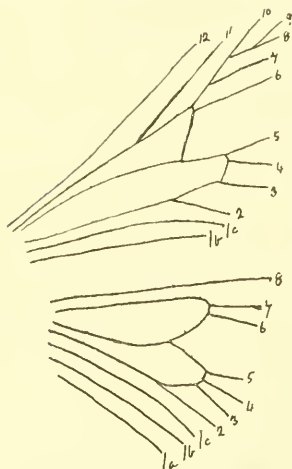


FIG. 41.—*Paracossus parva*,
Hmps.

will not say that it may not be an aberrant genus of that family. In *Stygia* and *Ingurimorpha* the media is unbranched in both wings, and in *Lentagena* the areole is so small that a very small change would bring about its absence, and in *Acyttara* this has actually happened. But these genera are connected to the typical *Cossidae* by allied intermediate forms, the first belonging to a small Palaearctic, the remainder to a Neotropical group, while the Oriental *Paracossus* stands isolated. Again, staking of 10 with 7, 8, 9 does not occur elsewhere in the family. On the other hand, the neuration of *Paracossus* agrees well with that of the *Limacodidae* in the unbranched median veins as in *Apoda*, and in the staking of 7, 8, 9, 10 as in *Susica*.

Psychidae.—This family is related to the Zygaenid group by the absence of an areole and the development of a median vein in both wings, as shown in the figure of the neuration of *Clania*, which has a branched media with narrow median cell in both wings. But it also presents peculiar features in the anal veins of the fore-wing, 1c anastomosing with 1b, and 1a being apparently present. In the hind-wing there is a short vein emitted from 8 on its costal side. Whether these are peculiarities developed in the family, or whether they represent some ancestral

features, are points on which I am not prepared to express an opinion without further study.

Pyralidae.—This family need not detain us long. It is a dominant group of more modern origin than the preceding families. In spite of the frequent presence of maxillary palpi and the three anal veins in the hind-wings, the neuration is of a modern type without any areole and usually without any median veins. In *Schoenobius* I have observed unbranched median veins slenderly developed in both wings, and probably they would be found in some other genera if careful search were made.

We now pass on to the numerous families which have only two anal veins in the hind-wings and one in the fore-wings. I cannot do more than deal with a few of these, and that in a summary fashion.

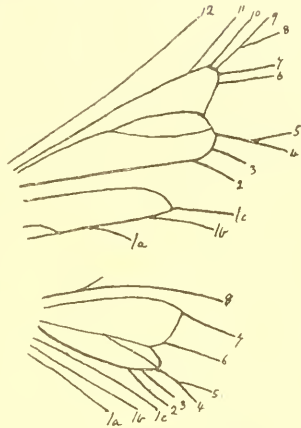


FIG. 42.—*Clania variegata*, Snell.

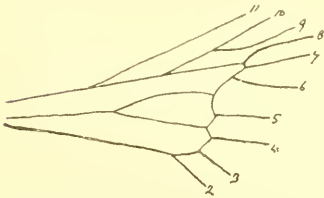


FIG. 43.—*Dudgeona actinias*, Turn. Abnormal neuration. Compare Fig. 2.

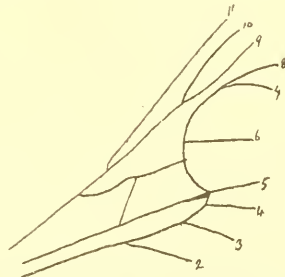


FIG. 44.—*Phragmatoccia castanear*, Hb. Abnormal neuration. Compare Fig. 11.

Lasiocampidae.—This family, however, deserves rather fuller treatment. I have already pointed out that the areole may be lost in two ways, by obsolescence of the chorda, or by coalescence of the chorda with the common stalk of the second and third radials. There is yet a third way. As already mentioned in one example of *Dudgeona*

actinias (fig. 43), the bar between 8 and 9 which completes the areole is undeveloped. Similarly in an example of *Phragmatoecia castaneae* (fig. 44) the usual anastomosis between 8 and 9 is absent. In both these instances the areole has coalesced with the discal area outside the lepidopterous cell. These abnormalities illustrate, I believe, the normal structure of the *Lasiocampidae*. In the figure of *Lasiocampa* the letters *ar* mark the site of the undeveloped areole. There is a small cell with a slenderly developed unbranched media, and this cell is, I believe, the primitive lepidopterous cell, not an areocel, as in all the preceding

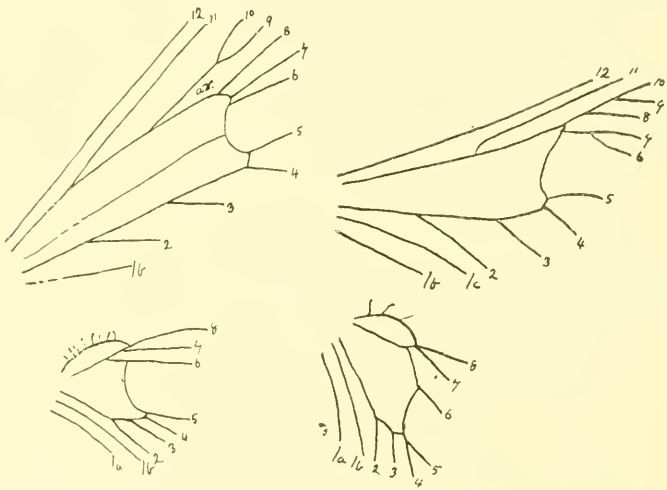


FIG. 45.—*Lasiocampa quercus*, Linn. FIG. 46.—*Bhima undulosa*, Wlk.

families which lack an areole. This separation of 8 and 9 of course leaves the veins 9 and 10 stalked. But when an areocel is formed, as may be seen at a glance at any of the figures up to fig. 42, 9 and 10 are left arising separately from it. Usually 9 is attracted to 8, the instances in which it becomes again stalked with 10 are rare and exceptional; but in the *Lasiocampidae* 9 and 10 are *invariably* stalked. In the Indian genus *Bhima* the ancient structure is obscured by the stalking of 8, 9, 10, but this is a rare and late modification; in the great majority of genera 8 is separate or stalked with 7. But *Bhima* has one primitive character in the retention of 1c of the fore-wings. The hind-wings of the *Lasiocampidae* usually differ very much

from those of the other families dealt with in this paper. The cell is small, without any media, 7 arises from its costal edge rather near the base and is connected with 8 by a short oblique vein *a* as in *Lasiocampa*, or by an anastomosis as in *Blima*. I regard the former as more primitive. The offshoots from 8 are not veins, but chitinous thickenings developed to strengthen the precostal expansion of the hind-wing, which compensates for the absence of a frenulum in this family. In an undescribed genus from West Australia, for which I propose the name *Neurochyta*,* the fore-wing differs from *Lasiocampa* only in the stalking of 7 and 8, and the absence of the media. The hind-wings are very exceptional in the family in the origin of 7 from very near the end of the cell, as is usual in other families, and the cell is of the normal lepidopterous form. I regard this as a fortunate discovery in preventing me from attaching too much importance to the peculiarly formed hind-wing cell usual in the *Lasiocampidae*, and as indicating, by the preservation of a more primitive form, how it may have developed. Yet *Neurochyta* has a lasiocampid hind-wing, for 8 anastomoses strongly with the cell near the base, and though the pre-costal cell so formed is very small, it gives rise to two strong branching spurs or pseudoneuria.

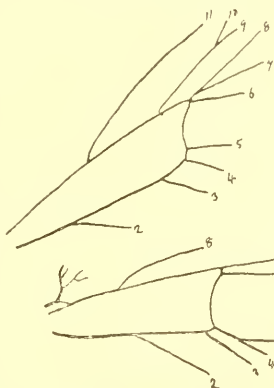
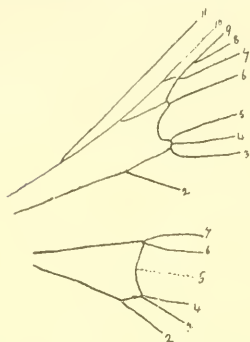
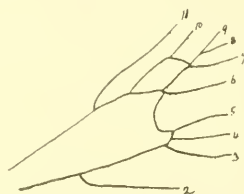


FIG. 47.—*Neurochyta edna*, Swinh.

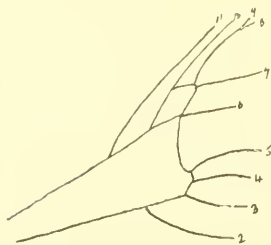
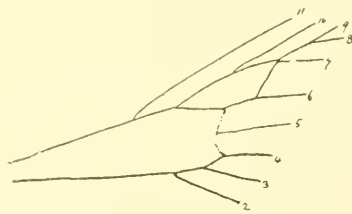
There seems, therefore, no real difficulty in deriving the *Lasiocampidae* from the cossid stem, although it is an isolated and early development from it.

* *Neurochyta*, gen. nov. Palpi moderately long, porrect, reaching beyond frontal tuft, densely hairy. Fore-wings with 2 from $\frac{1}{3}$, 3 from $\frac{2}{3}$, 4 and 5 approximated from angle, 6 from upper angle connate with 7, 8 which are short-stalked, or 6, 7, 8 stalked, 9, 10 stalked, 11 from $\frac{2}{3}$, free, but running close under 12. Hind-wings with 2 from middle of cell, 3 from shortly before angle, 4, 5 stalked from angle, 6 from upper angle, 7 from shortly before angle, 8 anastomosing with cell from near base to $\frac{1}{3}$, precostal cell minute, two precostal pseudoneuria arising together near base and diverging. Type *N. edna*, Swinh.

Noctuidae, Arctiadae, Liparidae, Notodontidae.—We will consider these four families together. I have picked out one genus from each showing a well-marked areole and chorda of typically cossid form. I see no reason to doubt that it is actually a primitive areole. A secondary areole not homologous with the primitive areole is a possibility,

FIG. 48.—*Agrotis pronuba*, Linn.FIG. 49.—*Palucosia bicosta*, Wlk.

as I have pointed out when describing the neuration of *Gazera*, one of the *Castniidae*, and if such a structure was formed in a genus, in which areole and cell had coalesced to form an areocel, it might even be impossible to dis-

FIG. 50.—*Orgyia mendosa*, Hb.FIG. 51.—*Gargetta costigera*, Wlk.

tinguish it by inspection from a primitive areole, although morphologically of different origin. But there are two strong reasons for believing that this has not occurred in the *Noctuidae, Arctiadae, Liparidae*, and *Notodontidae*: (1) in these families there are genera which demonstrate the gradual obliteration of the areole by coalescence, but no genera exist in which there is any approach to the

formation of an areole; (2) the areole exists in the more primitive genera of the four families, and there is good reason for holding that the genera which have no areole have descended from forms which once possessed it. In the *Noctuidae* the neuration is remarkably constant. As Sir George Hampson informs me, the typical noctuid neuration, as illustrated in *Agrotis*, is present in the vast majority of the genera, and in those that do not possess it

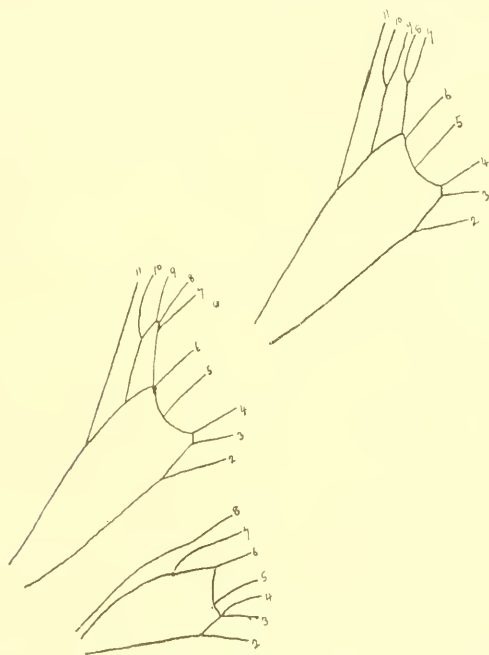


FIG. 52.—*Thyatira batis*, Linn.

it has been lost* (see Introduction to "Cat. Lep. Phal.," vols. iv and x). In the other three families there is more variability, and it would take a much more lengthy examination than I can afford at present to prove that the forms which possess an areole are the more primitive. I can only express my belief that it is so.

While in the *Zygaenidae*, *Limacodidae*, and *Psychidae*

* The primitive genus *Hyblaea* which possesses maxillary palpi has, however, lost the areole and cannot therefore be in the primitive noctuid stem, but must be an early branch from it,

the cossid areole and chorda have been lost, but the media has been retained, in the *Noctuidae*, *Arctiidae*, *Liparidae*, and *Notodontidae* the former have been retained and the latter lost. It follows that the descent of the second group of families from the first is an impossibility; they have developed from the cossid stem by a separate branch. How far this applies to those families which have lost both structures I will not inquire at present. It is advisable, however, to note that although the media is not developed as a vein, which occurs rarely in the higher families, it is frequently represented, either branched or unbranched, by

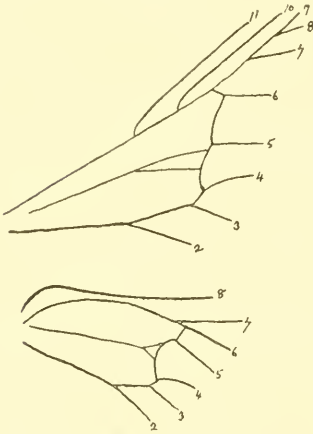


FIG. 53.—*Monoctenia falernaria*,
Gn.

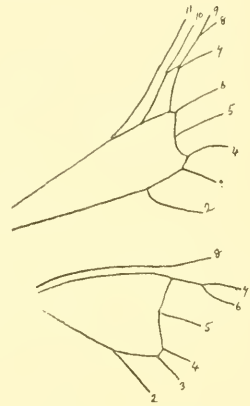


FIG. 54.—*Diceratucha*
xeropsis, Low.

a fold in the wing-membrane. These folds I have not reproduced in my diagrams.

Thyatiridae (*Cymatophoridae*).—The explanation that I have given as to the fate of the areole in the *Lasiocampidae* is to some extent supported by the analogous structure in the *Thyatiridae*. As Sir George Hampson has pointed out, the areole in this family is frequently not closed, the variation occurring rather frequently in the limits of a single species. There does not appear to be here any instance of the development of a new structure, which would be shown by a gradual change in a series of related genera, but of the loss of part of a structure in a proportion of individuals of a species perhaps owing to the absence of

some Mendelian factor. This curious variation is illustrated in the figure of *Thyatira batis*, Linn. The hind-wing shows some similarity to that of the *Lasiocampidae*, 7 arises from well before the angle of the cell, and, although there is no anastomosis, 8 is approximated to 7, but there is a well-developed frenulum, and I do not think the similarity points to any real community of descent. Whether the areole is really a primary and not a secondary areole in this family is not quite certain, but I think the former is more probable.

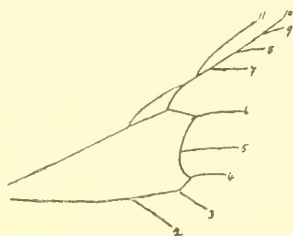
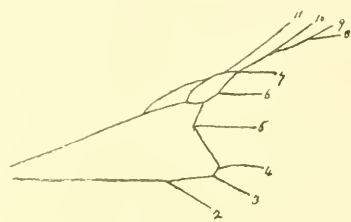
Geometridae.—This large family affords very interesting studies in neurulation. By neurulation alone it may be divided into at least five perfectly natural subfamilies. I have figured two of the most primitive genera in the most primitive subfamily *Monoctenianae*. They show remarkable differences. In *Monoctenia* there is a slender but



FIG. 55.—*Bupalus piniarius*, Linn.

distinct branched media in both wings, the areole being absent. In the three Australian genera *Diceratucha*, *Dirce*, and *Xenogenes* the media has been lost, but a large areole and well-marked chorda retained. These are very primitive genera, and I have no doubt this is a primitive areole, which in most of the family has been lost. It so happens that veins 10 and 11, which arise from the areocel separately and remain free in *Monoctenia*, often vary remarkably, not only in allied genera but in the same genus, and often in different individuals of the same species. This is especially the case in the subfamily *Boarmianae*. Here 10 and 11 may be separate or stalked at origin, and there is a strong tendency for 11 to anastomose with 12 and 10 with 9. In *Bupalus* 11 runs into 12 and 10 anastomoses with 9 to form a secondary areole, which has no relationship to the areole present in *Diceratucha*. In the *Geometrinae* 10 is usually stalked with 9 and there is a tendency for 11 to anastomose first with 12 and then with 10, but

an areole is never formed. In the *Acidalianae*, on the other hand, an areole is present in most genera, and those that do not possess it have lost it, the stages of its loss being often still preserved. The *Acidalianae* are a specialised, not a primitive subfamily, and their areole is evidently a secondary one. Similarly the *Larentianae* have nearly always a secondary areole, originally double, but with its internal partition often not developed, formed by an anastomosis of 11 with 10, and of 10 with 9.*

FIG. 56.—*Eois aversata*, Linn.FIG. 57.—*Hydrionema dotata*, Linn.

CONCLUSION.

To sum up the results obtained by this inquiry. All the *Lepidoptera Heteroneura* are descended from a group with cossid neuration, to which, for convenience, I will give the name *Protocossidae*. The *Protocossidae* possessed a spiral proboscis or tongue with at least rudimentary maxillary palpi;† it had well-developed labial palpi, porrect or ascending; the tibial spurs were long and all present. The neuration of the fore-wing was that of *Zeuzera*, except that all the veins from the areole arose separately as in *Macroclytara*. The neuration of the hind-wing was that of *Xylentes*, except that a short oblique vein connected the cell with 8 as in *Xystus*. Perhaps the nearest living genus to the *Protocossidae* is *Titanomis*, a primitive Tineid, and from a form resembling this have descended the *Tortricidae* and a very large proportion, if not all,‡ of the *Tineidae*. From the *Protocossidae* arose

* These conclusions may possibly be modified by a more exhaustive study of the family than I am able to give to it at present.

† Either the *Protocossidae* had five-jointed maxillary palpi, or those *Tineidae* which possess them, together with their immediate allies, descended from the heteroneurous trunk by a separate stem at an earlier level, and the *Tineidae* contain the descendants of two separate lines of descent approximated by convergence,

also (1) the *Castniidae* by a separate stem; (2) the *Zygaenidae*, *Limacodidae*, *Psychidae*, and *Pyralidae*, the first two from a common stem, the exact relationship of the last two being less certain; (3) the *Lasiocampidae* by a very distinct stem; (4) by yet another stem the *Noctuidae*, *Arctiidae*, *Liparidae*, and *Notodontidae*, together probably with the *Geometridae* and *Thyatiridae*. If so much be admitted, we have already a classification in outline of the *Heteroneura*. The assignment of the other families of this great assemblage to their positions within this outline must be reserved for another occasion.

It is apparent that this phylogeny is based mainly on the neurcation. No one is more anxious than I to consider all the characters of all the stages of the Lepidoptera, but the value of all the characters must be carefully weighed. The great problem of phylogeny is the distinguishing of resemblances due to community of descent from those due to evolution in a common direction usually but perhaps not always under the influence of the environment, that is to say, to adaptation to common conditions. Or, as my old teacher, Prof. Ray

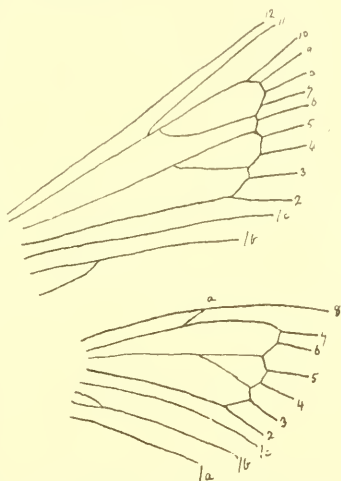


FIG. 58.—Neurcation of the hypothetical family *Protocossidae*.

Lankester, used to say in his lectures, we must distinguish *homogeneity* from *homoplasny*. No better illustration of homoplastic resemblances can be found than among the larvae of Lepidoptera, for instance, in the resemblance of some Noctuid larvae to those of the *Geometridae*, of other Noctuid larvae to those of the *Bombycine* families. Lepidopterous larvae are peculiarly exposed to adaptational modification. They are in no sense embryonic forms, that is to say, forms recapitulating the phylogeny of the insect, but secondary adaptations to a phytophagous existence departing more widely from the primitive insect than do the imagoes, and morphologically much degraded. Their

characters within the various families have sometimes considerable phylogenetic value, but little value in indicating the true relationship between the families. To attempt a classification of the Lepidoptera from the relative position of the tubercles on the larval skin, as has been done by Mr. Dyar, seems to me as profitless as it would be to classify the whole order by the form of the palpi, or the shape of the outlines of the wings in the perfect insect.

The pupal and oval characters advanced by Dr. Chapman appear to me to stand on a better foundation. I am quite ready to admit that forms with a greater number of movable pupal rings, his *Incompletæ*, are more primitive than those with fewer movable rings, his *Oblectæ*; but this does not carry us far. It seems probable also that the distinction between forms with vertical eggs having a central micropyle from those with flat eggs in which the micropyle is on the side may have important phylogenetic significance. In the former group are the four families *Arctiidae* (from which arose the *Syntomidae*), *Noctuidæ*, *Liparidæ* (with which I associate the *Hypsidae*) and *Notodontidæ*, families which, it will be observed, I have associated on neurational characters. The only other family with upright eggs, excepting those usually known as *Rhopalocera*, whose origin I am not at present prepared to discuss, are the *Castniidae*, and these I regard as an isolated group. In the *Cossidæ* the oval characters appear to have remained in a fluid state, for Dr. Chapman states (Trans. Ent. Soc. 1896, p. 579) that while *Cossus* has a vertical egg, that of *Zeuzera* is flat. If this is so it is admissible to assume that the same held true of the *Protocossidæ*, and that these have given origin not only to the above-mentioned families with vertical eggs, but to other families in which the eggs are always flat.

The neuration is by far the best guide to lepidopterous phylogeny that we possess: it is a hidden structure protected from the direct action of outside influences to a large extent, rarely affected by directly adaptational changes, and, in short, the best field in which to search for *homogeny* unobscured by *homoplasy*. Yet even here *homoplastic* influences are at work, and cautious interpretation is necessary, for there is a widespread tendency in many different families towards a simplification of the neuration, which often proceeds along parallel lines.

The *Lepidoptera* have specialised in colour and wing-pattern, not in structure. The great achievement of the order in structure was the development from the maxillae of the spiral proboscis, and this happened long since. Among existing families structural evolution has had but trivial results, consisting (I am writing, of course, of the imagos) of little more than secondary sexual characters.* On the other hand, there has been a strong tendency in nearly all the families to progressive reduction in structural complexity, to a progressive simplification by structural loss, on parallel lines. Unless this is fully recognised no progress will be attained in the true phylogeny of the different groups. I will enumerate some of these lines, and point out how remarkably they have been followed even within the very ancient and primitive *Cossidae*.

(1) The proboscis and maxillary palpi have been lost in the *Cossidae*, *Psychidae* (only the ♂ can be brought into comparison, the ♀ being degraded to an extreme degree), *Limacodidae*, *Lasiocampidae*, *Liparidae*, and in other whole families, as well as in many isolated genera.

(2) The labial palpi have been lost in some genera of *Cossidae* and quite independently in many genera of other families.

(3) The tibial spurs have been lost or much reduced in most *Cossidae*, in the *Zygaenidae*, *Psychidae* ♂, and in other instances.

(4) The frenulum has become shortened and non-functional in a few *Cossidae*, wholly lost in all the *Lasiocampidae*, *Endromidae*, *Uranianae*, and in some genera of the *Drepanidae*, and *Bombycidae* and the *Geometrinae* subfamily of the *Geometridae*; in the last instance every grade between full development and complete loss can still be traced.

(5) The median vein is always present in the *Cossidae*, but in a few genera, the first step in its obsolescence, the obliteration of the median cell has taken place. It is completely lost or merely vestigial in most *Lepidoptera*.

(6) The areole and chorda are lost in at least one genus of *Cossidae*, in all genera of most other families, and in those families that retain it, it has been lost in some, if not

* I leave out of consideration the basal abdominal cavities, as to which I have no precise knowledge.

most, of the genera. This is a striking instance of parallel involution in independent groups.

(7) The peripheral veins are partly or wholly coalesced to some extent in nearly all families. In the *Cossidae* this does not proceed beyond partial coalescence (stalking).

Other instances might be mentioned, but these are sufficient.

- X. *The charina Group of Pinacopteryx.* By F. A. DIXEY, M.A., M.D., F.R.S., Subwarden of Wadham College, Oxford.

[Read May 1st, 1918.]

THE assemblage of Pierine species including *cebron* and *capricornus*, Ward, *pigea* and *charina*, Boisd., with others nearly related to them, forms a natural group which may either be considered as a separate genus under the name of *Pinacopteryx*, or as a section of *Pieris* in the wide sense; the latter course being taken by Trimen in "South African Butterflies," vol. iii, p. 39; and by Aurivillius in Seitz's "Macrolepidoptera: Ethiopian Region," Eng. trans., p. 45.

In Proc. Ent. Soc. Lond., 1912, pp. ex-exiv, it was remarked that the group headed by *P. charina* was distinct in several particulars from the remainder of the section or genus, and in the same "Proceedings" for 1909, pp. cix, cx, some account was given of the peculiarities of the scent-scales which characterise this *charina* group; an outline figure being added of the curious plume-scale of *P. liliana*, Gr. Smith (*Ibid.*, Pl. E, fig. 10). I now propose to deal in somewhat greater detail with the members of this section, as regards which there has been a certain amount of confusion.

The *charina* group, as has been pointed out by Aurivillius,* is distinguished from the remaining species of *Pinacopteryx*, which may be called for convenience the *pigea* group, by the possession on the lower discocellular vein of both wings, or at least of one wing, of a black spot or dot beneath, often occurring on the upper surface also. This, though in practice a useful distinction, does not invariably hold good; for in one or two forms of the *pigea* section a dot may be present in the assigned situation, and in one form at least of the *charina* section both surfaces of both wings may be devoid of any such marking.

A more constant distinction, so far as the males are concerned, is afforded by the genitalia.† In all the species

* *Op. cit.*, p. 46.

† This, I believe, was first observed by my friend Dr. H. Eltringham.

of the *pigea* group. the clasper ends posteriorly in two spinous prolongations, one placed dorsally to the other (fig. 1). These are usually very well marked; but in one species, viz. *P. spilleri*, Stdgr., they are exceptionally short, though still easily visible. In the *charina* group the clasper is furnished posteriorly with only one spine instead of two (fig. 2).

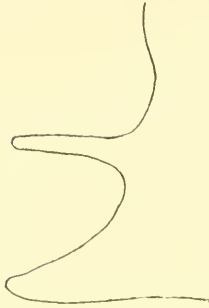


FIG. 1.—*P. orbona*, Hübn. Doubled spine of clasper $\times 54$.

The members of this latter group are probably best regarded as a single species including several geographical forms of subspecific rank. The form which is most distinctly marked off from the rest would seem to be *charina* itself. This was described by Boissudval from males and females captured in Kaffraria. Aurivillius in Seitz, *loc. cit.*, gives the distribution of *charina* as "South Africa to German East Africa," but I have not seen any specimens of this southern subspecies from further north than the Transvaal. Another form which seems to be easily distinguishable is that described by Grose Smith * as *Belenois*

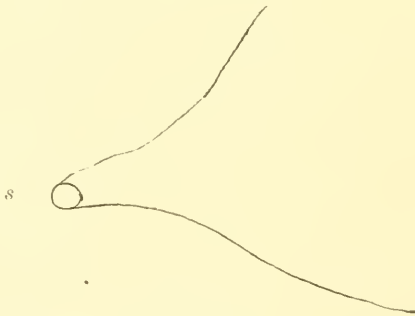


FIG. 2.—*P. charina*, Boisd. Single spine of clasper $\times 54$.

liliana, and figured by Grose Smith and Kirby † as *Pinacopteryx liliana*. The locality given by the describer is Mombasa, and the same form is found in the surrounding region at least as far to the west and north as Taveta and

* Ann. Mag. Nat. Hist., Series 6, vol. 3, p. 122 (1889).

† Rhop. Exot., *Pinacopteryx*, Pl. 1, figs. 7, 8 (♂), 9 (♀).

Machakos. *Pinacopteryx gerda*, figured and described by Grose Smith and Kirby (*loc. cit.*, figs. 10, 11), also from Mombasa, is probably a male of *P. liliana* somewhat smaller than the average and less heavily marked with black. Specimens from the Voi River, the Tana River and Mlegwa, all in British East Africa, correspond in appearance with *Pinacopteryx gerda*.

There remain certain forms, allied to the foregoing and to each other, which have been known under the names of *P. doxo*, Godt., *P. simana*, Hopff., and *P. venata*, Butl. *P. doxo* was the first member to be noticed of the whole *charina* group. It was described by Godart* in 1819 as *Pieris doxo*. Godart's type is in the Dufresne Collection, now at Edinburgh, and has been figured by Mr. P. Grimshaw in *Trans. Roy. Soc. Edin.*, vol. xxxix, Pl. I, fig. 6 (1900). It is a female in somewhat poor condition. The locality is left blank by Godart; but Boisduval,† who reproduces Godart's description, says, "Afrique probablement." A careful examination of the type specimen makes it tolerably clear that it is a *Pinacopteryx* of the group at present under discussion, though it is by no means easy to assign it to its proper place among the forms included in that section. On the whole I should be disposed to agree with Aurivillius (*loc. cit.*, p. 46) that it belongs to the form afterwards described by Hopffer as *Pieris simana* (types from Mozambique), were it not improbable that any of Dufresne's collection came from that region. As the case stands, I suspect that Godart's type may be really a somewhat unusual example of the wet-season form of *P. charina* from the region of the Cape. It is, however, not exactly like any *Pinacopteryx* that I have ever seen, and it differs considerably from the figure of "*doxo* ♀" in Seitz, *op. cit.*, Pl. XIV, e. This figure, indeed, probably represents a dry-season female of Grose Smith's *liliana*, and was certainly not drawn from Godart's type.

The type of *P. doxo* thus being a battered female of unknown locality, its determination is so uncertain a matter that I venture to think it best to drop the name altogether as a specific or subspecific designation. The next question to arise is that of the relation of *P. simana* to *P. venata*. Butler's type of *P. venata*, a female, came from the White Nile; it was described and figured by him

* *Enc. Méth.*, ix, p. 123, n. 15.

† *Sp. Gén.*, I, p. 527, n. 130 (1836).

in Trans. Ent. Soc. Lond., 1871, p. 169. Pl. VII. fig. 7, as *Ixias venatus*. The male of this form was unknown until 1902, when Mr. Loat captured one at Gondokoro; this was described in Trans. Ent. Soc. Lond., 1903, p. 152. The male type and a female from Shambî on the White Nile were well figured by Dr. Longstaff.* *P. simana*, as already stated, was described by Hopffer from Mozambique. Both sexes are figured by Peters.† The name *venata* is not inappropriate to Butler's type, which is somewhat heavily marked, and has the veins accentuated with black. In many other female specimens (probably of the dry season), and in all the males with which I am acquainted, the black veining is absent from the upper surface. In *P. simana*, on the other hand, although the females vary in this respect, probably, like those of *P. venata*, according

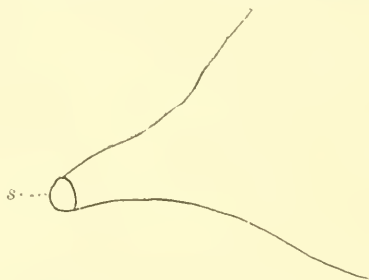


FIG. 3.—*P. liliana*, Gr. Smith. Spine of clasper $\times 54$.

to season, the males appear always to have the veins on the upper surface more or less marked out with black. On these and other grounds presently to be mentioned, I think that *simana* and *venata*, though no doubt closely allied, are separable as subspecies.

It may then be said, at least provisionally, that there are four, or perhaps five, subspecies which can be ranked under the head of *Pinacopteryx charina*. It will be of interest to see what light can be thrown on the mutual relations of these forms by an examination of structural details.

(1) *The Male Genitalia*.—As already remarked, the clasper in all these forms ends posteriorly in a single spinous projection. This in a specimen of *P. liliana* from Mombasa is long and slender (fig. 3). In an example of

* Trans. Ent. Soc. Lond., 1913, Pl. II, figs. 1, 2, 3.

† *Reise nach Mossambique*, Taf. XXIII, figs. 3-6.

P. charina from Weenen, Natal (fig. 2), it is also long, but markedly less so than in *P. liliana*. The terminal spine in a *P. simana* from Gazaland (fig. 4) and a *P. venata* from Gondokoro, White Nile (fig. 5), is short; it is somewhat blunter in *simana* than in *venata*. A point to be noted is that, judging from these examples, the clasper of *charina*, a comparatively small form, is not much less in size than that of *liliana*, decidedly a larger insect. The claspers of *simana* and *venata* are much smaller. In all four forms the terminal spine is furnished at its free extremity with a socket from which proceeds a group of chitinous bristles. These are not represented in the figures. The socket is indicated at *s*.

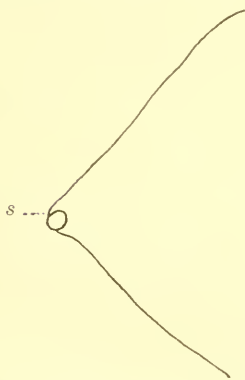


FIG. 4.—*P. simana*, Hopff.
Spine of clasper $\times 54$.

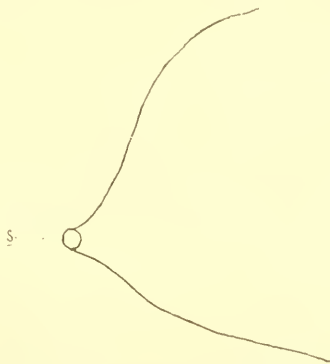


FIG. 5.—*P. venata*, Butl. Spine of
clasper $\times 54$.

There is also a difference to be observed between the two sections of *Pinacopteryx*, in reference to the character of the uncus. This structure in the *charina* group is comparatively slender, and rather sharply pointed. The dorsal margin is slightly sinuous in outline, and the distal portion of the uncus is curved downwards, sometimes so decidedly as to give the organ almost a sickle-shaped character (fig. 7). In the *pigea* group, on the other hand, the dorso-ventral dimension is proportionately greater, the free extremity is comparatively blunt, the dorsal margin is uniformly convex, and the curve of the organ, though present, is less pronounced (fig. 6).

(2) *The Scent-scales*.—These, as elsewhere noted, present

in all the forms the general appearance of an elongated lamina with rounded base and parallel sides. In specimens of *P. liliana* from Mombasa, Taveta, the Dabida Hills, Thiba River and near Machakos, the rounded base is

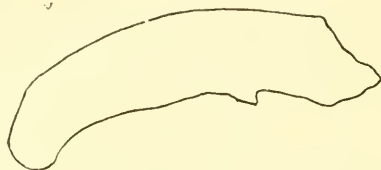


FIG. 6.—*P. pigea*, Boisd. Uncus $\times 54$.

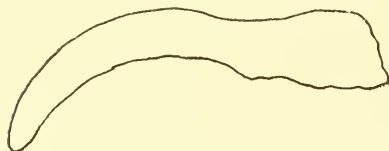


FIG. 7.—*P. gerda*, Gr. Sm. and Kirb. Uncus $\times 54$.

greatly expanded and takes up by far the greater part of the area of the lamina. The outline of the scale thus becomes flask-shaped, the neck of the flask being represented by the portion of the lamina distal to the basal expansion (fig. 8). The scent-scales of a male specimen from Mombasa which corresponds with the description and figure of *P. gerda* by Grose Smith and Kirby, exhibit precisely the same characters as the foregoing. This appears to favour the impression that the only difference between *gerda* and *liliana* is one of season. The specimens above referred to (p. 193) from the Voi River and Mlegwa closely resemble in aspect the "*gerda*" from Mombasa; their scent-

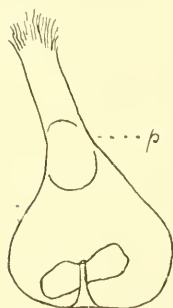


FIG. 8.—*P. liliana*,
Gr. Sm. Scent-
scale $\times 310$.
p, granular patch.

scales, however, present a different appearance, the basal expansion being much reduced (fig. 9). So far as outline goes, they are much like the corresponding structures in *P. simana*, but they possess one character in common with *P. liliana* which is not shared by *simana*; and which, in conjunction with another feature presently to be mentioned, seems to indicate

that these Voi River specimens may be regarded as a slightly divergent form of *P. liliana*. Whether Smith and Kirby's name of *gerda* may properly be applied to them is perhaps open to question. The character of the scent-scale just alluded to is the occurrence, at or near the junction of the neck with the body of the flask, of a rough-looking granular patch, dark by transmitted light, most conspicuous in *liliana* from Mombasa, but easily recognisable in the *gerda*-like specimens above mentioned (figs. 8, 9, *p*). This appearance is not seen in the scent-scales of *charina*, *simana* or *venata*; a diffused shading, but no definite granular patch, being the nearest approach visible in the corresponding situation.



FIG. 9.—*P. gerda*, Gr. Sm. and Kirb. Scent-scale $\times 310$. *p*, granular patch.

When I first investigated the scent-scales in this group, working with somewhat limited material, I formed the opinion that *P. venata* could be easily distinguished from *P. simana* by the shorter and broader character of its scent-scales.* This was the case with the specimens from which my preparations were made; but the examination of additional examples has shown that the distinction does



Fig. 10.



Fig. 11.



Fig. 12.

FIG. 10.—*P. charina*, Boisd. Scent-scale $\times 310$.

FIG. 11.—*P. simana*, Hopff. Scent-scale $\times 310$.

FIG. 12.—*P. venata*, Butl. Scent-scale $\times 310$.

not universally hold good. It occasionally, though rarely, happens that a scent-scale from an undoubted specimen of *P. venata* (as in one from Hagarat in South Kordofan) is as long as an exceptionally short scale from *P. simana*; and similarly, a scale here and there from *P. venata* (as

* Proc. Ent. Soc. Lond., 1912, p. cxiii.

in a specimen from Gondokoro on the White Nile) is narrower in proportion than the usual scale of *P. simana*. But there is no doubt that a comparison of the average dimensions of the scent-scales in the two forms shows the distinction above stated. The scent-scale in *P. charina* is much like that in *P. simana*, but here again it is on the average shorter, though not so short as that of *P. venata* (figs. 10, 11, 12).

It was mentioned on p. 196 that in addition to the dark granular patch of the scent-scale, there was another feature which would seem to indicate that the Voi River and Mlegwa specimens are a form of *liliana* rather than of *simana*. This is the presence of a well-marked dark spot on the upper surface of the fore-wing of the female, situated between the median and submedian veins and usually extending into the space below the submedian. The spot in question is characteristic of the wet-season and intermediate females of *liliana*, including the "gerda" form from Mlegwa and the Voi River, but appears to be always absent, or at most only represented by a very slight powdering of dark scales, in the females of *charina*, *simana* and *venata*. Judged by this criterion, as well as by the evidence of the scent-scales, there appears to be no doubt that the "gerda" forms are rightly associated with *liliana* and not with *simana*.

It may be well here to recapitulate in some detail the chief points that call for notice in regard to these several forms.

(1) *P. charina*, Boisd.—This is the form which is found in Cape Colony, Natal, Zululand, and (probably) the Transvaal. Both males and females are without black veining. The male is nearly always without any discocellular spot on the upper surface, but possesses one on the lower surface of the hind-wing, and occasionally of the fore-wing; the latter, if present, being minute. On the upper surface of the fore-wing of the female the discocellular spot may be present or absent; it appears to be always absent from the hind-wing. Beneath, in the female, it is constantly present in the hind-wing and often visible on the fore-wing as well. The upper surface of the male may be entirely immaculate; but on the fore-wing there is usually a dark streak bounding the costa, and a marginal series of dots on the hind border, which are often discrete, but may be merged into a dark band

never very broad. A similar marginal band in the female is usually broader and better marked, but may be almost obsolete. The female has a chain of subapical spots on the fore-wing, reaching from the costa to the space below the first radial branch; a larger spot occupies the space between the second and third median; this is usually isolated, but a minute spot sometimes occurs below the second radial, completing the chain. Both sexes show a pearly lustre at the base of the wings on the upper surface; this extends over a larger area in the female than in the male. The under surface of the hind-wing and apical area of the fore-wing are pale yellow, marked in the dry-season form of both sexes with a rich irroration of dark specks or blotches; the submarginal spots of the female are visible beneath, being more or less assimilated to the irroration. The male has occasionally on the underside an indication of the costal end of a corresponding submarginal chain; but from this sex the spot between the second and third branches of the median is nearly always absent, though it may be present in the wet-season form as a small dot. In the wet season also the irroration becomes reduced to a series of small submarginal spots, sometimes very faintly marked. In both sexes the veins of the hind-wings on the upper surface and both wings of the lower surface may possess minute marginal dark dots. These may be present at all seasons. The male clasper in a specimen from Natal is larger than in *P. simana* and *P. venata*; it resembles that of *P. liliana* in size and in the length of the single posterior spine (fig. 2), which is nearly as long as in that subspecies. The uncus (fig. 13) is small relatively to the size of the clasper. The lamina of the scent-scale has parallel sides and an expanded and rounded base. In size it is intermediate between those of *P. simana* and *P. venata*.

(2) *P. simana*, Hopff. This is the form found in Portuguese and German East Africa, Rhodesia, British Central Africa, Uganda and British East Africa with the exception of the coast region about Mombasa, where it is replaced by *P. liliana* and *P. gerda*. In this subspecies the male is invariably veined on the upper surface, more distinctly so in the wet than in the dry season. In both sexes the dark border of the fore-wing is continuous, showing little tendency to break up, as in *charina*, into a series of marginal spots. In both wet- and dry-season phases of the female

there is a strong tendency for the apical portion of the dark border to fuse with the submarginal series of dark spots, thus forming a well-marked apical patch. A small discocellular spot may be present on the fore-wing of the male, especially in specimens from west of Lake Victoria Nyanza, but only in rare instances on the hind-wing. A similar discocellular spot is always present on the fore-wing of the female, and in the wet-season form on the hind-wing as well. Very rarely there may be in the female a slight indication of a dark spot in the space between the median and submedian veins of the fore-wing; this is shown in the figure of the type in Peters' *Reise*.* Beneath, the general surface of both wings in the wet-season male is white with more or less dark veining; this veining in a series of males from west of the Victoria Nyanza is extremely well marked, especially on the hind-wing. A submarginal series of spots is more or less visible on both fore- and hind-wing. These in the series last referred to are highly developed, and are frequently united into a conspicuous submarginal band, which, however, in the fore-wing does not extend further backward than the space between the second and third median branches. The discocellular spots are always present on both fore- and hind-wings. The underside of the wet-season female varies a good deal according to locality. The hind-wing and apex of fore-wing are usually yellow; the remainder of the fore-wing, white. The submarginal spot between the second and third median is always conspicuous, the rest of the submarginal series may disappear. There is, however, nearly always a submarginal chain visible on the hind-wing, and in females from west of the Victoria Nyanza the submarginal band is as well developed on both wings as that of the males from the same region. The discocellular spots are always present, as in the male. In the dry season the hind-wing and apical area of the fore-wing in both sexes become over-spread by a brownish irroration, with which the dark markings become assimilated. The powdering is usually more blurred and of a paler brown than in *charina*; the discocellular spots, as above noted, are present in both sexes. The clasper in a male from Gazaland is small; its posterior spine (fig. 4) is blunt, not prolonged as in

* *Reise nach Mossambique*, Taf. XXIII, figs. 5, 6.

charina. The uncus (fig. 14) is abruptly curved at its distal end. It bears some resemblance in outline to the upper mandible of the beak of a gull. The scent-scale (fig. 11) is like that of *charina*, but generally longer.

(3) *P. liliana*, Grose Smith.—This is a well-marked subspecies from Mombasa and the adjacent region, including Taveta and Machakos. It is on the average considerably larger than any of the other forms of the *charina* group. The wet-season male is veined with black on the upper surface, and is somewhat heavily marked with grey on the inner half of the costa of the fore-wing and the base of both wings. The apex and posterior margin of the fore-wing are margined with black. There are no discocellular spots on either wing. The wet-season female may be either white or yellow on the upper surface; it has a broad dark

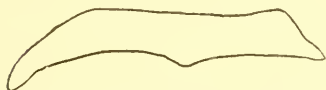


FIG. 13.—*P. charina*, Boisd.
Uncus \times 54.

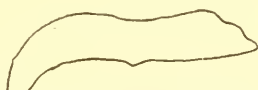


FIG. 14.—*P. simana*, Hopff.
Uncus \times 54.



FIG. 15.—*P. venata*, Butl. Uncus \times 54.

border to the fore-wing, with which the costal part of a submarginal chain is usually merged. The hind-wing is bordered by a series of large dark spots, sometimes fused together. The submarginal spot between the second and third median branches is very large and conspicuous; and there is always visible a spot, belonging to the same series, in the space between the median and submedian, usually passing the boundary of the latter vein. A submarginal band or row of spots is sometimes visible on the hind-wing. A discocellular spot is always present on the fore-wing, and usually on the hind-wing also. Beneath, the wet-season male is white with small dark marginal dots and a chain of submarginal brownish spots, more or less developed, on both fore- and hind-wings. Discocellular spots are present on both wings, and there is a large and conspicuous submarginal spot between the second and third median

branches, occupying the same position as in the female. In the wet-season female the costa and apex of the fore-wing and the whole of the hind-wing are usually yellowish beneath. The submarginal chain of spots is present on both wings; the spot on the fore-wing between the second and third median being large and conspicuous, as on the upper surface. Discocellular spots are present on both wings. In the dry season the male may show above little or no trace of dark veining. The dark markings of the female are also much reduced, but the large spot between the second and third median branches is still present and conspicuous on the fore-wing; the hind-wing may be spotless, though there is usually a marginal series of dark spots. A discocellular spot is generally present on the

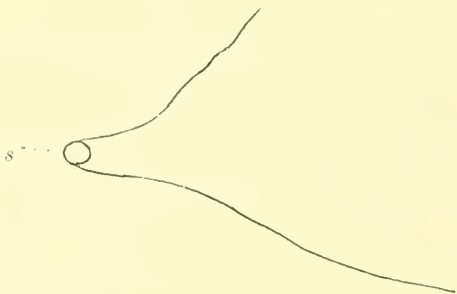


FIG. 16.—*P. liliana*, Gr. Smith. Spine of clasper $\times 54$.

fore-wing, but not on the hind-wing. Beneath, the male may be spotless but for the large median spot, which persists. The female often shows a slight mottling on the hind-wing and apex of the fore-wing, to which the submarginal spots are assimilated. This mottling is comparatively pale, and the powdering specks are usually more sparsely distributed than in most specimens of *P. charina*. Discocellular spots are present on both wings, but may be very faint. The clasper in a male from Mombasa is large, like that of *P. charina*; and ends posteriorly in a long spur (fig. 3), still longer than the corresponding structure in that subspecies. The clasper of another Mombasa specimen, which corresponds in appearance with Grose Smith and Kirby's *P. gerda*, is of the same *liliana* character, but with a somewhat shorter spine (fig. 16). The uncus of the first-named Mombasa specimen (fig. 17)

is long and slender, shaped like a surgeon's curved bistoury. That of the *gerda*-like specimen (fig. 18) is of similar character, but slightly sharper at the tip. The scent-scale is of the remarkable shape described on p. 196, and is characterised by the presence of a dark granular patch at the junction of the narrow portion of the lamina with its expanded base (fig. 8, *p*).

(4) *P. gerda*, Grose Smith and Kirby.—The type described and figured under this name,* from Mombasa, is probably a dry-season male of *P. liliana*; but there is a form, as

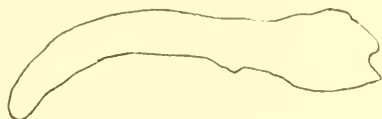


FIG. 17.—*P. liliana*, Gr. Smith. Uncus $\times 54$.

already mentioned, occurring at Voi, Mlegwa and Maranga (all in British East Africa), the male of which is identical in appearance with *gerda* as figured and described, and to which the same name may perhaps be applied, at all events provisionally. The upperside of the male in this form appears to be always free from dark veining, and the dark margin of the fore-wing is somewhat further prolonged

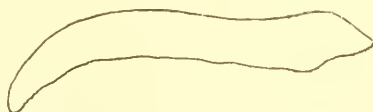


FIG. 18.—*P. liliana*, Gr. Smith. Uncus $\times 54$.

towards the anal angle than in *P. liliana* ♂. There is usually an indication of a discocellular spot on the fore-wing, but not on the hind-wing. Beneath, the general surface of both wings may be white, as in a specimen from Mlegwa (January) and one from Voi (May); or the hind-wing and apex of fore-wing may be yellow; pale, as in another specimen from Voi (May), or deeper, as in two from Voi (October). The discocellular spots are present on both wings, but very faint on the hind-wing in both

* Rhop. Exot., *Pinacopteryx*, Pl. 1, figs. 10, 11.

specimens captured in October. The large median spot is always present, and there may be an indication of a submarginal series on the hind-wing. The female is like a wet-season or intermediate female of *P. liliana*, though usually smaller. It always possesses on both surfaces the

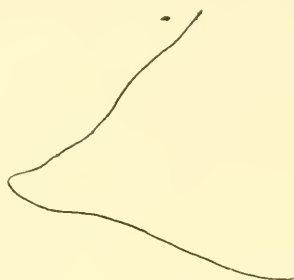


FIG. 19.—*P. gerda*, Gr. Sm. and Kirb. Spine of left clasper $\times 54$.

spot between the median and submedian of the fore-wing, as in those forms, and the disco-cellular spots on fore- and hind-wing. The claspers in a male from Voi (figs. 19, 20) are curiously unsymmetrical; the right valve ending posteriorly in a sharp spine like that of *liliana* from Mombasa,

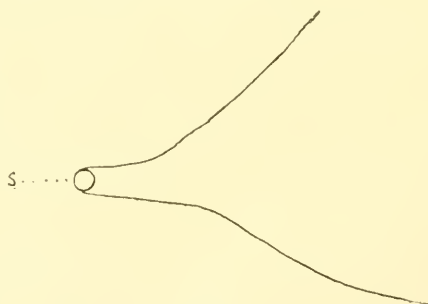


FIG. 20.—*P. gerda*, Gr. Sm. and Kirb. Spine of right clasper $\times 54$.

and furnished, as in that form, with a terminal socket from which protrudes a group of large chitinous bristles; the left valve also ends in a spine, but this, besides being shorter and broader, is entirely destitute of a terminal socket. The uncus of the same specimen (fig. 7), though like that of *P. liliana*, is more deeply curved. It may be

called sickle-shaped. The scent-scales in two males from the Voi River (fig. 9) and one from Mlegwa are of the *liliana* rather than of the *simana* type. The basal expansion takes up more of the lamina and is more rounded than in *simana*, but is much smaller and less rounded than in *liliana*. Like the corresponding structure in the latter form, the lamina shows a dark, granular, circular or oval patch at the junction of neck with body (fig. 9, *p*).

(5) *P. venata*, Butl.—This is the form which is found in the White Nile region, Abyssinia (Lake Rudolph Expedition), Southern Kordofan and the Southern Sûdân at least as far west as the Shari-Tchad Protectorate. It is generally smaller than *P. simana*, and, especially in the dry season, is sharper-winged in both sexes than that insect. The upper surface of the male differs also from that of *P. simana* in showing no dark veining; it may possess in the wet season a few black scales in the situation of the discocellular spot of the fore-wing, but is generally destitute of all traces of these spots except a slight discoloration showing through from beneath. The fore-wing possesses a dark apical patch passing into a hind-marginal band; this patch and band in the dry season may become pale and may almost disappear. There is also on the hind-wing a row of marginal spots, often absent in the dry season. Beneath, the male is white; in the wet season the submarginal series is very often absent, but may be indicated by a more or less complete chain of dark spots. In the dry season the submarginal chain is usually better developed; it is paler in colour, and on the hind-wing frequently forms a festooned linear band. A slightly-marked brownish irroration may be present on the hind-wing and the apex of the fore-wing. There is generally some dark veining on the apex of the fore-wing and outer portion of the hind-wing at both wet and dry seasons. The discocellular spots are always present; a marginal row may also occur, especially in the wet season. On the upper surface of the female the dark apical patch is broader than in the male; as in that sex, it passes into a continuous hind-marginal band, darker and more pronounced in the wet season than in the dry. In the wet season the dark veining of both wings is usually well marked, as in Mr. Butler's type; the hind-wing also carries a series of large dark marginal spots. The submarginal chain of the

fore-wing ends in a large spot between the second and third median branches; there is no spot below the median, such as occurs in *P. liliana*. A discocellular spot is present on both wings in the wet season; in the dry season it is often absent from the hind-wing, and sometimes from both. Beneath, the hind-wing and apex of the fore-wing are yellow, varying in degree of intensity; the remaining area of the fore-wing is white, often with a yellowish shade at the base. The veins of the hind-wing and of the apex of the fore-wing are marked with dark lines, paler in the dry season; at which period the same areas may also show a slight reddish-brown irroration. Except in the extreme dry-season form, a marginal row of spots is generally to be found on the hind-wing. The submarginal series of spots is usually present at both seasons, on the hind-wing taking the form of a more or less continuous festooned line; on the fore-wing it may be very slightly developed, but always includes the characteristic spot between the second and third median. As on the upper surface, there is no spot posterior to the median. Discocellular spots appear to be always present on both wings. It may be observed that the dry-season specimens from the White Nile are sharper-winged than the generality of examples from Kordofan, and are also more conspicuously marked. It is especially noticeable in the latter assemblage that all the markings of the female on both surfaces are in the dry season of the same reddish-sandy tint. In the wet season the corresponding markings are dark brown or black. The clasper of a male from Gondokoro ends posteriorly in a spine (fig. 5) which is much blunter than that of *P. charina*, *liliana* or *gerda*, but is slightly less blunt than that of a *P. simana* from Gazaland. The uncus (fig. 15) is like that of *P. simana*, but is still more sharply bent downwards at the tip. The scent-scale (fig. 12) is somewhat variable; but on the average is shorter, and broader in proportion than that of *P. simana*, which it otherwise resembles.

P. simana and *P. venata* are no doubt closely related, though typical specimens are easily distinguished. They may perhaps intergrade in Uganda.

The chief points of distinction between *Pinacopteryx* of the *charina* group may be summarised in tabular form as follows:—

	Distribution.	Dark venation (♂)	Submedian Spot.	Spine of Clasper.	Uncus.	Scent-scale. Average length of lamina.
<i>P. charina</i> , Boisd.	Cape Colony, Natal, Zululand, Transvaal.	Absent.	Absent.	Long.	Moderately long; slightly curved.	0.086 mm.
<i>P. simana</i> , Hopf.	Portuguese and "German" East Africa, Rhodesia, British Central and East Africa (except the neigh- bourhood of Mombasa), Uganda.	Present.	Rarely a faint indi- cation in ♀.	Short; very blunt.	Short; sharply curved.	0.098 "
<i>P. liliana</i> , Grose Smith.	Mombasa and neighbourhood.	Present in ♂, Absent in ♀.	Present in ♂ and ♀.	Long.	Long; slightly curved.	0.115 "
<i>P. gerda</i> , Grose Smith and Kirby.	Voi River, Maranga, Mlegwa (Br. E. Africa).	Absent.	Present in ♀.	Long.	Long; sharply curved.	0.092 "
<i>P. venata</i> , Butl.	White Nile, Abyssinia, South- ern Kordofan, Southern Sûdân.	Absent.	Absent.	Short; blunt.	Short; sharply curved.	0.076 "

Before closing this paper, I should wish to say that I am far from supposing that the statements and conclusions therein contained are necessarily final. It is quite possible that a more minute examination of existing specimens, or an accession of fresh collections from the above and other districts, might render necessary a modification of the present results. I can only claim to have done my best with the material at my command; this comprises the series in the National Collection at the British Museum and the Hopè Collection at Oxford, the latter containing the very valuable consignments from Capt. R. S. Wilson (Southern Kordofan), Mr. W. S. Loat and Dr. G. B. Longstaff (White Nile), the Rev. K. St. A. Rogers (British East Africa), Mr. C. A. Wiggins (Uganda), Dr. G. D. H. Carpenter ("German" East Africa), Mr. S. A. Neave (Rhodesia), Dr. Longstaff and Mr. G. A. K. Marshall (Cape Colony, Natal, Gazaland and Mashonaland), with others. The care taken by all these gentlemen to furnish their specimens with exact and ample data as to locality and time of capture calls for grateful recognition on the part of those to whom belongs the task of working out and co-ordinating the material provided by their several collections. It is impossible to overestimate the value, for bionomic purposes, of accurate notes of this description.

To Dr. Eltringham I am indebted for the preparation of a long series of genitalia, from which most of the outline figures which accompany this paper have been drawn. My special thanks are due to him for this and other help which has always been most cordially given.

XI. *Studies in Rhynchophora.* IV. *A preliminary note on the male genitalia.* By DAVID SHARP, M.A., F.R.S.

[Read June 5th, 1918.]

PLATE IX.

IN its Transactions for 1912 the Entomological Society of London published a paper by F. Muir and myself on the male genital tube of *Coleoptera*. That memoir was intended to give an idea of the variety of structure of this part that exists in the Order. It should evidently be followed by a study of considerable extent of some one of the divisions of *Coleoptera*, so as to gain a knowledge of the constancy of the particular type of structure throughout that division.

In 1911 and 1912 Professor Nüsslin contributed to the *Zeitschr. wiss. Insektenbiol.* a paper entitled "Phylogenie und System der Borkenkäfer," in which he considers the male genital structures of the European *Scolytidae*. It is an excellent piece of work, but it is too limited to serve the purpose of instructing us as to the constancy of type of these structures in a large Family of the *Coleoptera*. The *Scolytidae* are a division of the *Rhynchophora*, and Nüsslin found the division to be highly polyphyletic; a view which I believe to be correct.

Some three years ago I commenced a study of the genital tube in *Rhynchophora*, but I have found it so long a task that I think it desirable to publish a preliminary note on the subject.

The *Rhynchophora* are probably the most extensive natural group of species existing in the animal kingdom. In the Munich Catalogue of *Coleoptera* 11,591 species of the group are listed. This was in 1871, and since then the number of described species has more than doubled. No general catalogue of the group of later date has yet appeared, but fragments have been dealt with in the Schenkling publication. One of these, the *Apioninae* (Col. Cat. Berlin, 1910), by H. Wagner, includes 1060 species, while the Munich Catalogue had less than 400. The other divisions of *Rhynchophora* show a similar increase, and yet there are large numbers of undescribed species in collections and fresh ones are constantly arriving, so that we may

conclude that 200,000 is a minimum number for the existing species, of which about 25,000 are described.

Hence it is not a matter of surprise that I have not yet been able to obtain a sufficient knowledge to enable me to speak positively as to the objects of my work. I am, in fact, unable to demonstrate the value of the male structures for taxonomic purpose, yet I have done enough to convince myself that they are probably of great value. But I fear the task I have undertaken is likely to prove too much for me to accomplish, and I therefore publish this preliminary note in the hope that it may help to remove certain misconceptions that are prevalent, and may be of use to other students.

The morphology of the male genital tube is really very simple. It may be reduced to an elongate continuous tube, which is made to appear shorter and more complicated by a system of invaginations, in some respects comparable to an old-fashioned telescope.

Certain of the parts have received names from previous writers, and, as I shall have to refer to these, I will here mention the more important, viz. :

1. Lindeman, Vergleichend-anatomische Untersuchung über das männliche Begattungsglied der Borkenkäfer. Bull. Soc. Imp. Moscow, vol. 49, 1875, pp. 196-252, 5 pls.
2. Verhoeff, in Abdominal segmente und Copulationsorgane, etc. Deutsche ent. Zeitschr. 1893, p. 156. pl. iv, figs. 126-140.
3. Verhoeff, Ueber das Abdomen der Scolytiden. Arch. f. Naturgesch. 62, 1896, 1, pp. 110-141, 2 pls.
4. Hopkins, on the genus *Pissodes*. U.S. Dep. Agric. Ent. Techn. Ser. 20, part 1, 1911.
5. Nüsslin, as already referred to on the foregoing page.

Nos. 1, 3 and 5 refer to *Scolytidae*, a very exceptional and difficult group of *Rhynchophora*; while No. 2 is but brief, and comparative with other *Coleoptera*, and, again, No. 4 relates only to one genus. Hence the information as to the genitalia of the great division is very small.

In figs. 1 and 2 I give a scheme of the arrangement of the tube in *Rhynchophora*. These two figures are purely diagrammatic, and in some ways do not convey an accurate

idea: the membranous part that connects with the body is not exerted naturally; thus the symmetry is never so complete as they lead one to suppose, and it is also greatly interfered with by the museles, as well as by constrictions, folds and pleats, and the alternations of very hard parts with delicate membranes. In some forms (such as *Cionus*) the tube can, however, be extended into a form comparatively more elongate than in fig. 2.

In these diagrams the hard (chitinised) parts are represented by thick lines, the thin lines being membrane. The features shown by these diagrams are constantly present in all *Rhyuchophora*, except that the spiculum is absent in one division of the *Calandridae* and in *Platypidae*; and that in the group last named there are no true median struts, the basal prolongations of the median lobe being there projections with membrane between them.

THE ABDOMEN.

The genitalia in *Coleoptera* are withdrawn into the abdomen and completely concealed. Although the abdomen is not morphologically a part of the genitalia, yet the two are so intimately connected functionally that neither can be comprehended fully without a knowledge of the other. There are, indeed, some who consider that the genitalia in whole or in great part are really modified parts of the abdomen, and Verhoeff entitles his paper on the genitalia of *Scolytidae*, a study of the comparative anatomy of the abdomen.

In *Rhyuchophora* the abdomen is greatly modified at the base of the ventral aspect in coadaptation with the metasternum and hind coxae. On inspection five ventral plates are seen, and these in descriptions are called the first (basal) and so on to the fifth. There is membrane concealed at the point of junction with the sternum, and also a hard more or less perpendicular part or phragma. These parts (which are not visible except by taking off the abdomen) are considered to represent the sternites of two segments. This is rendered in the highest degree probable by the fact that the corresponding dorsal portion of the abdomen has seven plates in place of the five ventral ones.

In addition to the seven easily recognised segments there is an eighth one, the dorsal part of which is usually large, while its ventral plate is small; the ventral plate

is usually membranous in the middle so as to be two distinct plates, but sometimes it is entire, and this is a character of much taxonomic importance. This last ventral may be called the eighth, or the true last ventral, so that in the ordinary course of counting, we pass at once from five to eight. The two missing sternites are, as explained above, really to be found at the base. Lindeman did not recognize this, and started the idea that one of these apparently missing plates was to be found in the genital tube in the form of the spiculum gastrale. If that view be adopted, we have really nine abdominal sternites and only eight tergites.

One of the complications in counting the abdominal segments is found in the case of the family *Belidae*, where there are superficially visible only seven dorsal plates. This, however, is due not to any real deficiency, but arises from the eighth segment being of very peculiar form, and telescoped into the segment preceding it.

In the Australian *Belidae* the concealed terminal segment can be easily pushed out, and is then found to be of very extraordinary shape, the dorsal plate being bent so as to have as great a surface on the ventral aspect as on the dorsal, and thus there is the simulation of an additional sternite. In the North American *Ithyercus* (which is only a subfamily of *Belidae*) the terminal segment is constructed as in *Belus*, but is exposed and not telescoped into the preceding segment. In this case there were, therefore, considered to be six (instead of the usual five) externally visible ventral plates; the error was, however, corrected by Dr. G. H. Horn many years ago (*cf.* Leconte, "Rhynch. of North America," p. 121).

The last dorsal is not of so great taxonomical importance as the last ventral; but it is subject to considerable modifications, one of which deceived Kolbe into describing it as the aedeagus. This error has been pointed out and corrected by Verhoeff. It is one that may be easily made in that particular case (*Rhynchophorus*), and it has unfortunately been copied in Packard's text-book; but it may be mentioned as showing the necessity of examining the tip of the abdomen when we are studying the genitalia.

THE SPICULUM GASTRALE.

Close together, at the tip of the abdomen, we find to investigate the ventral and dorsal plates of the last segment, the termination of the alimentary canal, the junction

of the genital tube with the body wall, and a peculiar structure the spiculum gastrale. All these have origin from a membranous area at the tip of the abdomen, and this small and irregularly shaped membrane must be treated as common to all the structures. On severing this membrane so as to free the genital tube from the other parts, we expose the tegminal layer of the genital tube (the Paramerenrohr of Nüsslin). As this is the commencement of the genital tube it is well to remark that the posterior part of the tube is functionally its anterior part, as shown in fig. 2. This complication as to the orientation renders it desirable to use the terms basal and apical instead of anterior and posterior; basal being nearer to the centre of the body than apical is.

The spiculum gastrale is at once seen; it is the "Stengel" of Lindeman, the "fork" according to Hopkins, the "spiculum" of Verhoeff and Nüsslin. It is present in the great majority of *Rhynchophora*, but is absent in some of the *Calandridae*, especially in those of very large size, and it is also wanting in *Platypidae*. It is a curved or sinuate rod, connected at the apical area, mentioned above, with the tube at or near the base of the latter when extended; it is of variable size according to the species, and extends basally, its sinuation adapting it to some extent to keep close to the tube, its musculature is great. At its apex it forms a sort of fork with widely separated, short prongs; but there are various forms in which this structure is peculiar (cf. *Naupactus* and to a less extent *Episomus*). This part is closely connected with the true last ventral plate, and this connection appears to be not always a simple one. This structure is much in need of investigation, especially as some anatomists consider the spiculum to be a modified ventral plate (the 9th). At the other (or basal) extremity the spiculum is generally somewhat expanded and more abruptly curved, and sometimes greatly so. The spiculum diverges from the tegminal layer, of which I consider it to be a part, just as the strut of the tegmen is a part of the tegmen.

THE TEGMINAL LAYER.

This part of the tube connects with the apex of the abdomen. It does not reverse or extend when the organ is functioning, but is held in place by its connections, including the spiculum and the true last ventral, so that

it forms a tube through which the median lobe protrudes. It includes basally the tegmen, but the apical part is entirely membranous and transparent, and is usually omitted in figures, though the tegmen itself is nearly always represented. In the paper by Muir and myself this membranous part is called the second connecting membrane, but we now consider it better to call this membranous area the first, and in the figures it is marked *im1*.

A very interesting feature is found in the Rhynchophorid group of the *Calandridae*, inasmuch as this membranous area is more or less strongly and completely chitinised, thus becoming to some extent similar to the "body" of the median lobe. In certain forms, referred at present to the group *Sphenophorides*, the spiculum proceeds from this chitinised part, and the structure then appears to resemble the tegmen. This condition is figured in the Transactions of the Society (1912, pl. 76, fig. 221a).^{*} This condition is instructive, as it shows that a part of the tube that is usually membranous can become chitinised, and that chitinisation is secondary to the membranous condition; a fact that should not be lost sight of. The term "connecting membranes" is itself objectionable, as it tends to convey the idea that they are of secondary importance, and merely connect the hard parts, while the fact is the integrity of the tube is the primary object of the whole mechanism.

Proceeding basally along the tube we come to a chitinous structure of a more or less transverse nature, but differing greatly in the various forms of *Rhynchophora*; sometimes it forms a simple ring, at others an incomplete ring, but it is usually provided ventrally with a single strut projecting basad. This hard part of the circumference of the tegminal layer is the "tegmen" (Sharp and Muir), the "Gabel" of Lindeman, Verhoeff and Nüsslin. It is of great taxonomic importance, especially in the families of *Rhynchophora* that are separated from the *Curculionidae*; the part that is dorsal taking on there a great development (*Anthribidae*, *Brenthidae*, *Rhynchitidae*, *Microceridae*, *Brachyceridae*, *Belidae*, *Apionidae*, *Attelabidae*), all of which have a large "cap-piece," differing in form according to the family. In various forms of *Curculionidae* there is no cap-piece, this being, of course, the

^{*} In the explanation of the plate this part is said to be the tegmen, which is an error; for "teguen" read there "pseudo-teguen."

case in the forms I have mentioned as having the tegmen in the shape of an incomplete ring.

Although I wish to avoid at present all points of ultra-morphology, yet I think it is only proper to remark that the functions of the tegmen as part of a mechanism are complex, and until they are ascertained—at any rate to a certain extent—we must merely make use of the fact of constancy or inconstancy, for taxonomical purposes. Verhoeff (Arch. f. Naturges, 62) treats the “Gabel” as “Paramerenreste.”

So much doubt exists as to the ultra-morphology of “parameres” in *Coleoptera*, that the term has been altogether abandoned by Muir and myself. And this not because the term is a bad one, but because of the great amount of theory that is associated with it. As an instance of this I may mention that Verhoeff in the memoir cited states (p. 139) that “the parameres of male *Coleoptera* are the true genital appendages.” From what follows it appears that he means by this that the median lobe is the equivalent of a body segment, or somite, and that parameres are the equivalents of appendages of a somite (*i. e.* of legs, or of palpi). Such a view is almost or quite metaphysical, and I hope that I may be doing an injustice to Verhoeff in believing that is what he is promulgating.

In *Rhynchophora* the structure of the tegmen and the condition of the membranous areas immediately adjoining it are complex and varied, so that a special memoir on this part will have to be prepared. I am not able to give any information of a thorough nature on the matter, and in some forms where the tegmen is complex (*Brachycerus*, *Microcerus*, *Anthribidae*, and others) I anticipate that a knowledge of the development will be essential, for there appear in some cases to be folds that have become solidified by chitinous exudation.

The tegmen is placed at a part of the tube where, according to observations of F. Muir, a primary invagination occurs in development. This of itself must give rise to folding or doubling of the walls of the tube at this spot, and this is probably the real starting-point of the tegminal complications.

THE MEDIAN LOBE.

Near or at the tegmen there exists a turn down of the membrane, which results in the connection of the mem-

brane with the body of the median lobe; this intervening membrane has been called by Muir and myself first connecting membrane, but I here call it the second. This lies within the tegminal layer, and is, in fact, a continuation turning apicad thereof. It may be called the median lobe layer. This layer is mentioned by Nüsslin, who calls it "Penisrohr," but he does not mention that it is continuous with the other layer, being an invagination thereof, the tegmen being chitinised at or near the line of invagination. It must not be supposed that this point can be at once settled by a slight examination; for the doubling is usually complex, and accompanied by creases, as the folding of the dorsal part of the circumference may not be at the same transverse line as the ventral folding, and may be accompanied by a tuck or overlap. Moreover, this part of the tube is the subject of considerable variation in length according to whether the tegmen is drawn back or pushed forwards, or the median lobe extended; this membrane is often very crumpled up. Our fig. 2 shows it in an imaginary simple form, and it can in some forms, such as *Cionus*, be actually extended into something like that.*

This intervening membranous area—in 2—is really common to the tegminal layer and to the median lobe layer; in repose it is crumpled up under the protection of the tegmen, but when the median lobe is extended as in fig. 4 the crumpling disappears.

The median lobe is called by Lindeman the "Körper," by Hopkins the "stem," by Verhoeff and Nüsslin the "penis." It differs so much in form that it is difficult to give a general description of it; for our present purpose we may merely say that in some forms (*Naupactus sulphurifer*, *Erythropion*, etc.) it is a long slender hard tube, while in other cases it is more or less membranous along the dorsal surface except at the sides, and this form, which is very common, is shown in our fig. 3, and is well exhibited by Hopkins' plate xi of the "stems" of *Pissoles*, though his figures do not convey any indication of the fact that this trough-like structure is really a tube, the sides of the trough being connected by membrane.

Whatever the shape of the median lobe it always possesses in *Rhynchophora* basally a pair of projections which

* My daughter prepared for me a series of drawings to illustrate the elongation of the tube in *Cionus*; but as a whole plate would be required for it, publication must be deferred to a more favourable time,

we call the struts of the median lobe; Lindeman and Nüsslin call them "Füsschen," Verhoeff and Hopkins "femora": in Latin diagnostic I call them "temones."

These struts are present in all *Rhynchophora*;* and though wonderfully constant in the same species, they display much variety in the different forms. They are certainly of considerable taxonomic importance. Sometimes they are so short (*Liridae*) that they escape notice if a short portion of *cm* is left on the preparation. In other cases they are very long (in *Cycloterinus forcatus*, Kolbe, they extend far into the prothorax and are so slender that the aedeagus can only be extracted with great care). The form of the struts is also very constant in the same species. They are definitely elongations of the membrane, tubular, and filled with chitin: in certain cases this structure is evident; in some forms they appear to be disconnected from the body, but there is always a membranous connection, though the chitin may be deficient for a brief space. Such cases occur when the struts come off with a great elbow from the lobe (cf. *Sitones*). The struts are sometimes quite short, and assume the form of callipers; but so far as I know this is only the case in *Liridae*.† The struts, besides being areas for muscular insertion, seem to be, to a certain extent, a protection to the invaginated sac when this extends basally beyond the body of the lobe. When the sac is elongate the struts are sure to be long. The composition of the body of the lobe shows important distinctions that are, I have no doubt, of taxonomic importance; see as to this *Calandridae*, *Brenthidae*, *Rhina*, etc.

The median lobe does not enter into the genital tube of the female, but only opens its terminal cloaca (not the internal cavity called by Stein the cloaca). On the dorsal surface of the median lobe, more or less close to the apex of the lobe (sometimes at the apex, as in fig. 3), there will be seen an area evidently different from the contiguous parts: this is the place where the evagination of the sac occurs, and has been called the median orifice, but is not an orifice, but only the spot where the sac is invaginated, or, as the case may be, inverted.

* They are not present in *Platypus*; the projections there found being of a different nature, as I have previously stated.

† In Hopkins' figures of *Pissodes* the struts are depicted as amalgamated at their termination: this is a mistake, nothing of the sort occurs in any *Rhynchophoron*,

THE SAC.

The more intimate part of the copulatory mechanism is the sac (called by some "praeputial sac," though the name is a misnomer). This structure is predominately membranous though it has various chitinous bodies in its walls. This is the structure that enters the genital tube of the female, one of the functions of the median lobe being to bring this male structure into such a position that it can enter the female parts notwithstanding its membranous texture. It is protean in form, and exhibits the most wonderful diversities of shape. A comparatively simple form is shown in fig. 4, a more voluminous and complex one in figs. 7 and 8. In repose the sac is packed away inside the median lobe, but most frequently the apex of the sac projects more or less from the base of the median lobe, where it can be seen with the duct entering it. The sac has a variety of structures in addition to its marvellous development of lobes; these structures form the armature of spines and thorns, as well as of minute papillae, etc. In addition to this armature, there is an adjunct of the duct of an important nature, placed in the wall of the sac where the duct enters. In fact, this structure is the completion of the copulatory mechanism. The duct enters it, and when the sac is everted the apparatus is carried with it and becomes the apical part of the sac; the functional orifice is seated on this little mechanism, and it is at this spot that the sperm leaves the male part of the genital conduit and becomes the appurtenance of the female. I call this the transfer apparatus. It differs greatly in various *Rhyuchophora*. Our fig. 5 shows it in *Polycleis plumbeus* (a South African Otiorrhynchid), and fig. 6 exhibits it more highly magnified. It is seen to consist of a median structure, into the base of which the duct enters, terminating at its apex; the frame part is subsidiary. A structure more or less like the median portion of the apparatus (fig. 6) is very common, and the form may be considered as a vase-like flagellum; sometimes by great elongation it becomes a slender or whip-like flagellum, which may be several times as long as the whole insect; but usually the flagellum is shorter than this. I have examined this structure in a series of species of the genus *Holonychus*, where it varies very greatly in development, being in some larger than the flagellum of *Polycleis* (fig. 6), while in other species it is minute and difficult to detect.

As the sac is the part of the coleopterous genital tube that has been hitherto least investigated, I shall venture to say a little more about it than my knowledge really justifies; for its study is much more difficult than that of any other part, so that it has been too often passed over entirely, or without a word as to its being the essential organ of intromission, to which the other parts of the mechanism are merely accessory. The membranous part of the sac—its walls and lobes and any chitinous armature borne thereon must be considered as conveyers of the transfer apparatus to the spot where it can be effective. The functional orifice appears to be always minute even when the other parts of the apparatus are voluminous. In the case of the very long whip-like flagellum it is most difficult to actually see the aperture, for the structure cannot be set on end, but the long and slender apparatus may be said to be as fine as it is possible for a chitinous duct to be. Now, though there can be no doubt that in many *Rhynchophora* the sac to be functional must be fully extended, for the sessile—or even very minute (in *Holonychus deflexus* and *H. gracilis*, spp. n.) transfer apparatus is situate at its extremity, we may nevertheless doubt whether in other cases anything more than a slight or partial eversion occurs. From this point of view the Otiorrhynchid forms assigned to the *Celenthetides* are very interesting, for in some of them the length and tenuity of the sac render a total eversion of the structure very improbable. Fig. 9 (*Trigonops*, or *Heteroglymma*, sp. n.?, New Guinea) shows one of the longest and most slender of these sacs; it contains a rather long curvate flagellum, attached to the wall of the sac only at the base where it is a little swollen and notched. It will be noticed that there exists also in the interior of the body of the lobe another structure which has all the appearance of being a tube (fig. 9*y*) through which the slender flagellum may be thrust and would then protrude sufficiently for intromission. All that appears necessary in this case is for the sac to be everted (or perhaps moved apically without eversion) so that the flagellum passes into the director and protrudes; possibly the director may then itself move apically to a greater or less extent.

The transfer apparatus of the sac reaches its greatest complexity in the *Scolytidae*. Hence it attracted the attention of Lindeman, who called the whole of the pieces

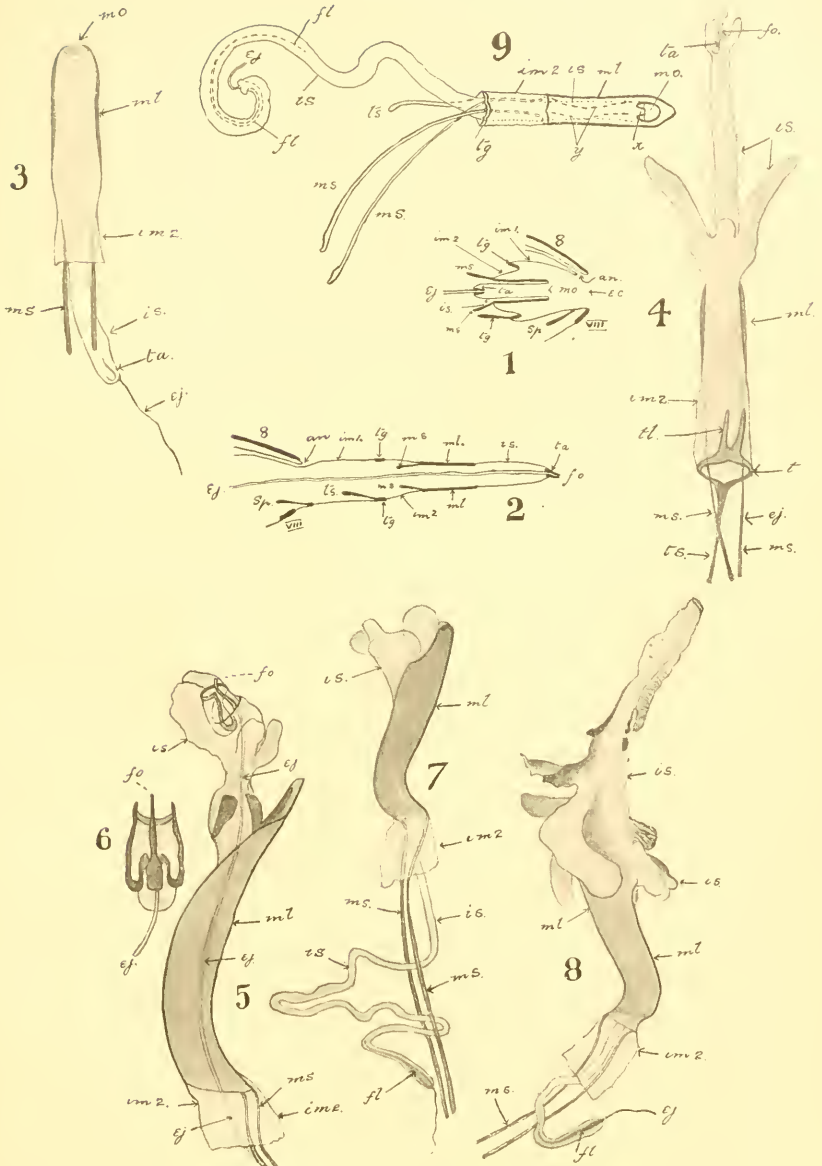
“Aufsatz,” while Nüsslin prefers to call them the “accessory parts.” Attempts have been made to homologise them, but sufficient is not known of their functions at present. The part on which the functional orifice is situate should be some guide, but this has hitherto been too much neglected. As to the other “accessory parts” little can be considered as settled. There are great differences in the inner structures of the tube in *Scolytidae*. The subject has been discussed at length by both Verhoeff and Nüsslin in their considerations of Lindeman's views. I can at present add nothing, though I may be permitted to say that it is not clear that the sac functions in all the groups in the same manner. As regards the variety in the “accessory parts” of the *Scolytidae* reference may be made to Lindeman's plates, and to Nüsslin's discussion of the point (*Z. w. Insbiol.*, 1912, pp. 81-4). The necessity of caution in homologising from simple inspection is evident from the fact that Nüsslin considers the thirty-four genera of *Scolytidae* found in Germany to belong to at least twelve distinct subfamilies (*loc. cit.*, p. 206).

THE DUCT.

This is another part that needs special investigation, having been hitherto much neglected. It is sometimes extremely long. Of course if a very long sac has to be everted, there must be also a long duct, as this is carried as far as the sac is extended. Usually the duct is very easily seen, as it is surrounded by a very thick muscular coating, but this disappears on maceration and the canal is then fragile and difficult to detect. For the few particulars as to its course in *Scolytidae* refer to Nüsslin (*loc. cit.*, p. 20).

METHODS.

The means of making a rapid examination of these parts are: have the insect to be dissected thoroughly penetrated by water, keeping it at or near the boiling point for a minute or two if small, for a quarter of an hour or more if large. Take off the abdomen and place it in a strong solution of caustic potash, having previously opened the abdomen at one side, so that the macerating fluid shall enter in readily everywhere. Leave it in the potash for a time varying according to the size and delicacy of the specimen, from a few minutes to several hours. Take it out and put



MALE GENITALIA OF RHYNCHOPHORA.

it in water, and wash away the macerated portions, and when this is well completed attempt the eversion of the sac. This is a delicate operation and requires experience and patience to obtain success. Make a minute hook by turning the point of a fine needle, and then blunt this so that it will catch the wall of the sac and enable a pull to be made on it without penetrating or tearing the sac. The difficulty is to hold the specimen without compressing it; this is best done under water with the aid of a little cotton-wool. Then tease the sac out little by little from the median orifice, and when it is everted take a very finely pointed pipette and inject it with the water. When it is restored to its natural form, it should be placed under the microscope and drawn with the camera lucida at once, for there is no way known to me of fully preserving the shape after mounting. In the case of small specimens the chances of success are much reduced, and if the median lobe is a long, slender, hard tube the sac cannot be artificially everted. It can be cut out by splitting the median lobe, but this is of comparatively little service as it shows only the wrong side of the sac. Any one who can invent methods of overcoming the difficulties will be rendering a great service to entomology. Specimens that have been killed and preserved in spirit are not suitable for examination of the sac, as it never regains pliability thoroughly. The time occupied by maceration can be greatly reduced by heating the fluid, but without caution and experience, this is likely to result in spoiling the specimen.

I must not conclude without thanking Mr. and Mrs. F. Muir for their assistance, as it is to them that the illustrations are due.

DESCRIPTION OF PLATE IX.

Lettering of all the figures :—

8 = eighth tergite or dorsal plate.

viii = eighth sternite or ventral plate = true last ventral.

an = orifice of alimentary canal.

cm (or im) = connecting or membranous area, between (1) tegmen and apex of body, and (2) between tegmen and median lobe.

ec = external cloaca.

ej = duct proceeding from the testes (in fig. 4 the duct has disappeared owing to reduction of the drawing).

fl = flagellum = transfer apparatus or a part thereof.

fo = functional orifice.

im, see *cm*.

is = sac, usually concealed in median lobe.

ml = median lobe.

mo = orifice of median lobe = spot from which the sac is exerted.

ms. = struts of median lobe.

sp = spiculum gastrale.

ta = transfer apparatus or a part of such : see *fl* as above, and *x*, *y*, below.

tg = tegmen and

ts = tegminal strut.

x and *y* = parts of accessory apparatus, presumed to be portions of transfer apparatus.

FIG. 1. Diagram of the arrangement of the genital tube in repose ;
see p. 210.

2. The same fully extended. The lettering is the same as in the other figures.
3. *Otiorrhynchus difficilis* (from Piedmont), median lobe.
4. *O. difficilis*, sac extended and tegmen in situ : this is a fair average of the Otiorrhynchid aedeagus, except that the sac is longer than usual.
5. *Polycleis plumbeus* (Pretoria), lateral view with sac imperfectly extended and duct still visible in it, tegmen cut away : the pieces at the base of the sac assist in the eversion thereof, and may correspond to the "Endplatten" (Lindeman).
6. *Polycleis plumbeus* (another specimen, from Cape Good Hope), transfer apparatus.
7. *Isomerinthus*, sp. n. (Amboina, F. Muir). Profile : enormous development of sac, which can scarcely be compressed into the median lobe which is enlarged towards the apex ; tegmen taken off.
8. Another specimen of the same species (Amboina, F. Muir) with the sac partially everted, and injected.
9. *Trigonops* (? *Heteroglymma*), sp. (New Guinea). Another Otiorrhynchid allied to fig. 8, but sac not extended and probably very different, the median lobe being differently shaped, probably conformably with the difference in the sacs : *x* and *y* are seen through the wall of the median lobe, and one or both are probably accessory parts of the transfer apparatus, which is in this species very slender at the tip, an intermediate between a "whip-flagellum" and a sessile transfer apparatus (shown in fig. 6).

XII. *Notes on the Ontogeny and Morphology of the male genital tube in Coleoptera.* By FREDERICK MUIR, F.E.S.

[Read June 5th, 1918]

PLATE X.

IN a former paper* I described some stages in the development of the male genitalia of some species of Coleoptera. Since then I have filled in a few more stages of the same species, but I have not been able to extend my observations to other forms. I would not consider it of any use to repeat what I have said elsewhere were it not that some of the leading authorities on insect morphology have failed to understand the structure of the organ, and most workers repeat their statements without any qualifications. Kolbe † in describing the male genitalia of *Rhynchophorus phoenicis* has mistaken the eighth abdominal segment for the aedeagus, and the rectum for the ejaculatory duct. Several writers have stated that the median lobe and the tegmen are composed of amalgamated paired lobes or parameres, and others have stated that certain segments, or parts of segments, of the abdomen are included in the structure. As an extreme exponent of this latter view I may quote Hopkins, ‡ who has tried to homologise the armature on the internal sac with parts of the tenth abdominal segment. I can find no evidence to support these views either in development or comparative morphology.

DEVELOPMENT.

In the early stages of *Rhabdocnemis obscura* (Boisd.) the testes are connected by a Y-shape thread to a median point between the ninth and tenth abdominal sternites. During the development of the pupa the area where the thread is attached to the body wall invaginates and forms the *genital invagination*. The bottom of this invagination

* Psyche 22 (1915), pp. 147-152, pl. XII.

† "Einführung in die Kenntnis der Insekten," 1893, p. 322, figs. 225, 226, 227.

‡ "On the genus *Pissodes*," U. S. Dep. Agric. Ent. Tech. Ser. 20, 1, 1911.

grows out or evaginates, and eventually forms the eurazygos, the stenazygos being formed by an invagination at the apex of the eurazygos. The first differentiation of the eurazygos is a constriction near the base, differentiating the tegmen from the median lobe. This I call the *tegminal fold*, and it is of great morphological importance; from it are developed the tegminal lobes as two evaginations, and the tegminal strut as a single invagination. In *R. obscura* (Boisd.) there are no tegminal lobes, but there is a large strut, the origin of which as an invagination eventually becoming thickly chitinised is quite plain. The portion of the eurazygos distad of the tegminal fold develops into the median lobe and the internal sac; at first there is no differentiation between these two, but at a later stage the basal portion becomes chitinised and differentiated as the median lobe, while the distal portion remains membranous and as it increases in size it crumples up and ultimately it is withdrawn into the median lobe, but not until the beetle is fully developed and has left the pupal skin. In *R. obscura* (Boisd.) there is a pseudo-tegmen formed by the chitinisation of the connecting membrane between the tegmen and the wall of the abdomen, and in this species the spiculum gastrale arises as an invagination from the pseudo-tegmen.

The male genitalia of *Coccinella repanda* arise in a similar manner from the same position between the ninth and tenth sternites. Soon after the tegminal fold is developed two broad, flat processes grow out from it, and a small invagination takes place on the opposite aspect of the fold; the former are the tegminal lobes and the latter is the tegminal strut. The tegminal fold beneath (or at the base of) the tegminal lobes grows outward carrying the tegminal lobes with it, and eventually forms the median "cap-piece." The median lobe elongates and muscles connect its base with the tegminal strut, and as it lengthens and grows inward it becomes curved. The spiculum is formed by an invagination near the base of the ninth sternite.

Carpophilus humeralis also follows a similar line of development, the tegminal lobes first appearing as broad, rounded outgrowths of the tegminal fold, the tegminal strut being very small. The apical portion of the eurazygos is invaginated at an early stage and grows inward to a great length, an evagination takes place at the junction of the eurazygos and stenazygos which lengthens into the fine,

long flagellum. At a later stage the median lobe is differentiated, but the basal portion of the internal sac is not withdrawn into the short median lobe until the insect is mature. The median strut arises as an invagination at the base of the median lobe. At first both the median and tegminal struts are simple, tubular invaginations, but at a later stage the former becomes dilated at the apex, and the latter broad and thin.

COMPARATIVE MORPHOLOGY.

If we examine the abdomen of a generalised trilobe coleopteron nine or even ten tergites and nine sternites can be easily discerned (in *Enarsus bakewelli* there is a distinct tenth sternite lying between the anus and the aedeagus). In the Dermestid figured* there are nine complete abdominal segments, the anus opening on a small membranous tube below the ninth tergite, the aedeagus lying between the anus and the ninth sternite. The ninth segment forms a complete ring, and is prolonged into the abdomen as a strut on the ventral aspect. In *Rhynchophorus ferrugineus* only eight abdominal segments can be traced; the eighth tergite is large, boatshaped, deeply cleft at the base and slightly so at the apex, with the eighth spiracle on the pleural area; the eighth sternite is small and lies across the ventral aspect of the eighth tergite, and together they form a tube through which the aedeagus plays; the anus lies beneath the eighth tergite, between the eighth tergite and the aedeagus. The cloaca so formed is closed by the meeting of the posterior edges of the seventh tergite and seventh sternite. In *Rhabdocnemis obscura* (Boisd.) a similar condition prevails. In both these forms the connecting membrane is chitinised and forms a pseudotegmen; in *Rhynchophorus* there is no spiculum. In *Acantholophus* and *Ithycerus* the cloaca is closed by the meeting together of the posterior edges of the eighth tergite and seventh sternite, the eighth sternite is small and, together with the eighth tergite, forms a tube through which the aedeagus plays. In the former there is a large spiculum arising some distance from the base of the connecting membrane, in the latter there is a distinct spiculum and also a strut from the basal edge of the eighth sternite; the

* This is a common species in Honolulu, but I have no name for it at present, and no specimens in England.

eighth spiracle is plainly discernible in both these genera. In *Hylesinus crenatus* there is no chitinised eighth sternite, and the spiculum is highly developed and serves in the place of the sternite as part of the tube through which the aedeagus plays. In some allied forms the eighth sternite is represented in various states of dechitinisation (or degeneration). The anal opening in these forms is situated on the membrane between the eighth tergite and the aedeagus (on the dorso-basal portion of the connecting membrane).

CONCLUSIONS.

The evidence derived from observations on the development of the male genital tube in Coleoptera indicates that it is a tubular organ arising in a median position from the connecting membrane between the ninth and tenth sternites. There is no evidence whatever to indicate that it is composed of amalgamated paired organs (called parameres by some authors). The tegminal lobes, cap-piece and tegminal strut are secondary outgrowths from the tegminal fold.

The comparative study of the morphology does not indicate that any abdominal segment or sternite is incorporated into the tube. In certain forms we find that ten tergites and ten sternites are actually present, or ten tergites and nine sternites, and the aedeagus consists of complete tegmen with tegminal lobes and basal piece and complete median lobe; in other forms some of the segments or parts of segments are dechitinised and withdrawn into the cloaca, but the aedeagus in these forms only contains the same parts as do those forms in which the segments are chitinised and therefore demonstrable. It is therefore illogical to consider the missing segments as incorporated into the genital tube. In fact the evidence points the other way, as in those forms in which the abdominal segments are reduced there is generally a great reduction in the tegmen. As the spiculum is an invaginated secondary tube which becomes highly chitinised it is difficult to understand how it can represent a sternite, and the most we can say is that it arises from, or near to the position of the ninth sternite, in the same manner as the false spiculum, or strut, in *Ithycerus* and *Belus* arises from the edge of the eighth sternite. Apodemes similar to the spiculum in origin (invaginations of the ectoderm) arise in various parts of the body in insects and do not represent a sternite or a tergite, and occur in positions

where the surface of the body wall does not allow a large enough surface for the attachment of muscles. In *Rhabdocnemis obscura* (Boisd.) the spiculum arises from the side of the pseudo-tegmen some distance from the opening of the cloaca, and, as already stated, in *Rhynchophorus* there is no spiculum. In *Platypus* also the spiculum is absent. It is probable that the spicula in different groups are not homologous.

The theory of the origin of the genital tube by the amalgamation of paired organs finds its chief support in the analogy drawn from such forms as the Dermaptera. In that order there is a Y-shaped organ consisting of a single basal piece with a pair of parameres. In one group (Protodermaptera) there are two penes, one arising from each paramere; in another group (Eudermaptera) there is only a single median penis. This latter form is similar in construction to the trilobe form of Coleoptera. I can find no evidence to show that the single basal portion of the organ is formed by the amalgamation of two parameres, and it is quite possible, and even probable, that the parameres are secondary developments, the same as the tegminal lobes in Coleoptera. The formation of the single median penis of the Eudermaptera is not by the amalgamation of the two, but *by the suppression of one penis and the increased growth of the other*. Thus the analogy from Dermaptera gives no support to the theory of the paired origin of the tegmen, and refutes the theory of such an origin of the median lobe.

It may be thought (though there is no evidence to indicate it, and it is very improbable) that Coleoptera had paired genital openings, or that Protocoleoptera possessed them. The time when the ancestors of the order could have been in that condition is so remote that it can have no bearing upon the question. It is probable that the immediate preceding stage to the Coleoptera or Protocoleoptera was such as is found to-day in Zoraptera Silvestri, where there is a single duct opening in a median position, a portion of which is most probably protruded during copulation. It is the telescoping and chitinisation of this eversible portion of the duct that has constituted the organ as we now know it.

In the Anoplura and Mallophaga we have an arrangement of parts in the male genitalia similar to those in the trilobe forms of Coleoptera, with similar lines of development in both groups. That these are cases of parallel development

and have no phylogenetic significance no entomologist of any standing will deny.

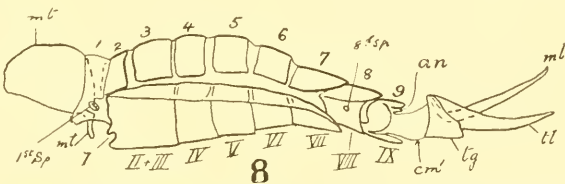
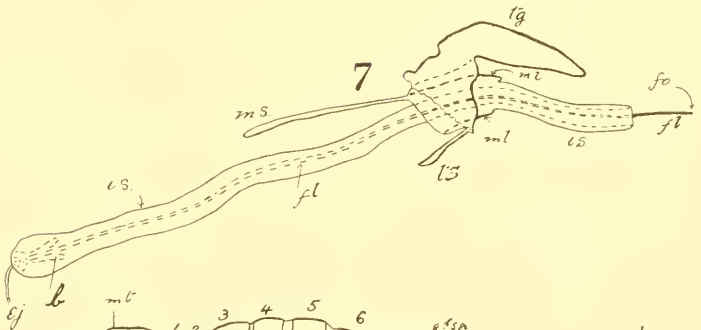
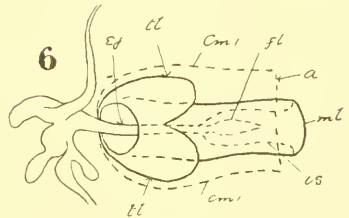
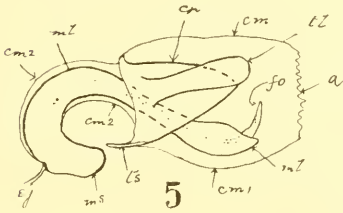
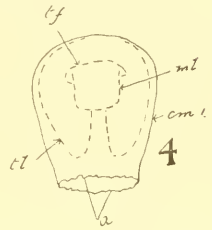
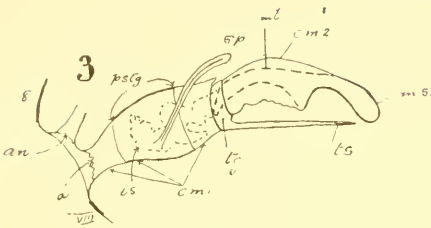
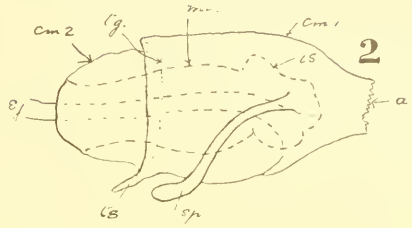
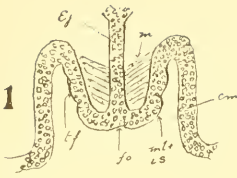
Whilst recognising the great interest and value of much of the work in comparative morphology of recent years, I cannot help entering a protest against the methods of some of the workers who have made a fetish of homology. Having selected what they consider to be a generalised form they proceed to delineate and name each sclerite, and then set themselves to discover similar sclerites in other more specialised types. It is under the influence of this idea that certain workers profess to find portions of the tenth tergite and sternite in the armature and chitinisations on the internal sac. If they would remember that an insect is a double membranous tube with a number of invaginations and evaginations, certain areas of which become more or less stiffened by the deposition of chitin, and that the male genitalia of Coleoptera is a tubular evagination arising from a median position between the ninth and tenth abdominal sternites, they might recognise the improbability, or even the impossibility, of a tergite or portion of a tergite becoming attached to the apex of a tubular organ in such a situation.

My thanks are due to Dr. David Sharp for much interesting information, and for placing at my disposal his large collection of dissections made since we published our joint paper on this subject in 1912.

EXPLANATION OF PLATE X.

FIGURES.

- No. 1. *Rhabdocnemis obscura* (Boisd.).—Early stage of male genitalia in the pupa. *cm*, wall of the genital invagination; *tf*, tegminal fold; *ml + is*, median lobe and internal sac; *fo*, the functional orifice will eventually open here; *ej*, ejaculatory duct; *m*, embryonic muscles between the eurazygos and the stenazygos.
- No. 2. The same about half developed.
- No. 3. The same fully developed or nearly so.
- No. 4. *Coccinella repanda*.—Early stage of male genitalia in the pupa.
- No. 5. The same three-fourths developed.
- No. 6. *Carpophilus humeralis*.—Early stage of male genitalia in the pupa.
- No. 7. The same nearly fully developed.
- o. 8. *Dermestis*, sp., showing the nine abdominal segments and N the aedeagus.



DEVELOPMENT OF MALE GENITALIA. COLEOPTERA.

LETTERING.

a, broken edge of connecting membrane.

an, anus.

b, armature at base of flagellum.

cm 1, membrane connecting the tegmen with abdomen.

cm 2, membrane connecting the tegmen with the median lobe.

cp, cap-piece, or median extension of the edge of the tegminal fold.

ej, ejaculatory duct.

fl, flagellum.

fo, functional orifice.

is, internal sac.

ml, median lobe.

ms, median strut.

pstg, pseudo-tegmen.

sp, spiculum.

tf, tegminal fold.

tg, tegmen.

ts, tegminal strut.

DECEMBER 31, 1918.

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XIII. *New species of Staphylinidae from Singapore.* Part
 II. By MALCOLM CAMERON, M.B., R.N., F.E.S.

(Continued from p. 90.)

[Read June 5th, 1918.]

THE Groups *Megarthropsi* (n.), *Tachyporini*, *Adinopsini* (n.), *Gymnusini*, *Myllaenini*, *Pronomacini* and *Diglottini* are enumerated in this second instalment of my paper. The types are contained in my own collection.

MEGARTHROPSINI, n. group.

MEGARTHROPSIS, n. gen.

Remarkable by the build of the head and thorax resembling to a considerable extent that of the genus *Megarthrus*, but in the structure of the prosternum, coxae and the sexual characters appears undoubtedly to be closely related to the *Tachyporini*.

Head subtriangular, produced, narrowed, and rounded in front of the eyes, limited by a fine raised line; eyes large and prominent; temples represented by a small obtuse angle. Labrum transverse, broadly emarginate, setose. Mandibles rather stout, simple, sharply pointed at the apex. Maxillary palpi elongate, the 1st joint small, the 2nd elongate, the 3rd half the length of the 2nd, the 4th longer than the 3rd, fusiform. Mentum (pars antica) transverse, corneous, quadrilateral, the anterior margin narrower than the posterior. Labium transverse, partly corneous, broadly emarginate anteriorly; tongue broad, membranous, obtusely emarginate in front. Labial palpi short, the 2nd joint shorter than the 1st and 3rd, the latter truncate. Paraglossae strongly pectinate, not extending beyond the tongue. Inner and outer lobes of the maxilla densely ciliated at the apex, the outer lobe also ciliated along the outer border. Thorax with the side-margins broadly explanate; prosternal process short and pointed; anterior coxal cavities widely open behind, the episterna not nearly meeting, the epimera wanting; mesosternum finely grooved between the middle coxae which, like the rest, are approximate. Elytra scarcely extending beyond the metasternum, the dorsal surface separated from the epipleura by a raised line, the latter complete, and with a raised line parallel and close to the inner border. Winged. Abdomen pointed, the sides narrowly bordered, the first

TRANS. ENT. SOC. LOND. 1919.—PARTS III, IV. (MAR.) R

ventral segment keeled. Legs moderate; tarsi short, 5-jointed, the anterior pair with the first three joints shortly triangular, the 1st of them considerably broader than those following, the 3rd narrower than the 2nd, the 4th small, semicircular, the 5th elongate, as long as the three preceding joints together; middle tarsi with the first two joints broader than those following, the 1st longer than the 2nd, the 3rd and 4th smaller, about as long as broad, the 5th as long as the three preceding together; posterior tarsi with the 1st joint a little longer and stouter than the 2nd, the 2nd and 3rd subequal a little longer than broad, the 4th as long as broad, the 5th as long as the preceding three together. All the claws simple; tibiae feebly setose. Appears to be related to the *Trichophyini* and *Tachyporini*.

45. *Megarthropsis decorata*, n. sp.

Elongate, fusiform, moderately shining, black, the sides and posterior half of the thorax, abdomen and legs reddish-testaceous. Antennae long, slender obscure testaceous, the middle joints infusate. Length 4 mm.

Head black, transverse, subtriangular, produced in front, gradually narrowed, and rounded, and finely bordered; eyes large and prominent; temples very small, forming an obtuse tooth; coarsely and rugosely punctured, the front smooth and shining. Antennae long, slender reaching the posterior margin of the elytra, the 1st joint cylindrical as long as the 3rd, the 2nd much shorter, 3rd and 4th joints subequal, 5th, 6th and 7th subequal, each a little shorter than the 4th; 8th, 9th and 10th slightly decreasing in length, much longer than broad, 11th elongate, pointed, as long as the 10th. Thorax strongly transverse, broader than the elytra, widest at the middle, from thence equally narrowed and strongly rounded in front and behind, slightly emarginate behind the anterior angles, which are rounded and produced, minutely notched in front of the posterior angles, which are rectangular; anterior border broadly emarginate, the sides broadly explanate; sculpture coarse and rugose. Scutellum reddish-testaceous, coarsely punctured. Elytra more than half as long again as the thorax, square, coarsely and closely punctured, the sides with very short, stout setae. Abdomen elongate, pointed, reddish-testaceous, the 4th and 5th (visible) segments a little infusate, finely, indistinctly and moderately closely punctured, ground-sculpture indistinct, coriaceous; lateral setae wanting.

5. Eighth dorsal segment divided by three narrow triangular excisions into four pointed, triangular processes, of which the central pair are a little longer than the lateral, these latter furnished at the

apex with a very long seta, the central pair with a short seta at the apex; eighth ventral segment divided by a flask-shaped excision into two pointed lobes the apex of each furnished with a long seta, the side-margins of the segment with a small tooth bearing a long seta; seventh ventral segment with broad emargination limited by a seta on either side at the posterior margin, the surface in front with a triangular impression (the base corresponding to the emargination) extending the whole length of the segment, the posterior part of which is studded with minute granules. Sixth and fifth segments impressed in the middle line.

♀. Eighth dorsal segment cut into four pointed processes, the lateral being a little longer than the median pair, and each with a long seta at the apex and a small tooth on the external margin also carrying a long seta; central processes each with a short seta; the lateral excisions deeper and narrower than the median one: eighth ventral segment with six processes, the lateral much shorter than the rest which are of equal length, the central pair broader and rounded at the apex and furnished with a bunch of short yellow setae, the others each with a long seta; the three central excisions are moderately broad and rounded at the apex of each.

Hab. Mandai, in wet rotting leaves on the edge of a jungle stream. Three examples.

TACHYPORINI.

46. *Conosoma robustum*, n. sp.

Robust, convex, black, moderately shining; the abdomen rather densely clothed with short golden pubescence. Antennae long and slender, the first four joints and the last testaceous. Legs reddish testaceous, the outer margin of the anterior tibiae closely set with short black pectinations. Length 5 mm. (in well-extended examples).

Build of *C. bipustulatum*, Grav., but more robust, broader, and more convex. Head very finely and sparingly punctured, with scanty cinereous pubescence, and without ground-sculpture. Antennae slender, reaching a little beyond the posterior angles of the thorax, the 1st and 3rd joints elongate, of equal length, the 2nd half the length of the 3rd, the 3rd and 4th subequal, the 5th to 10th each longer than broad, subequal and compressed, 11th elongate, oval, longer than the 10th. Thorax broader than the elytra, scarcely transverse, the posterior angles rounded, the posterior margin narrowly and obscurely ferruginous; very finely and rather closely punctured, and covered with a short fine griseous pubescence. Elytra as long as the thorax, slightly narrowed behind, with punctur-

ation and pubescence much as on the thorax; ground-sculpture very fine, transversely strigose; the sides without setae. Abdomen pointed, the posterior margins of the segments narrowly and obscurely reddish; puncturation very fine and rather close, pubescence fine, golden; sides and apex with long black setae.

♂. Eighth dorsal segment divided by a deep excision into two lobes, furnished with long black setae.

♀. Eighth dorsal segment divided into four blunt lobes, of which the central pair are a little longer than the lateral and the median triangular excision not so deep as the lateral ones.

Hab. Woodlands, in old logs.

47. *Conosoma rufobrunneum*, n. sp.

Reddish brown, rather shining, elytra darker, posterior margins of the anterior and the whole of the last two abdominal segments clear reddish-testaceous. Antennae scarcely extending beyond the posterior angles of the thorax, slightly thickened towards the apex, testaceous, the middle joints a little infusate. Legs reddish-testaceous. Length 3 mm.

Build of *C. breve* Fauv., but smaller and differently coloured. Head dark reddish brown exceedingly finely and rather sparingly punctured; pubescence fine and golden. Antennae with all the joints longer than broad, the 2nd shorter than the 3rd, 4th to the 10th laterally compressed, gradually decreasing in length, 11th elongate, twice the length of the 10th. Thorax but slightly broader than the elytra, not so dark as the head, very finely and moderately closely punctured; pubescence fine and golden. Elytra more or less infusate on the disc, rather more closely punctured and pubescent than the thorax, slightly shorter. Abdomen very finely punctured throughout, pubescence golden (owing to the colour of the abdomen and the golden pubescence it appears in certain light to have a red-gold iridescence); lateral and apical setae strong, black.

Hab. Mandai, in decaying logs.

48. *Conosoma flavogattatum*, n. sp.

Pitchy-brown, the posterior angles of the thorax, a round spot at the base of each elytron, the posterior margins of the abdominal segments (except the last), the first four and the last joints of the antennae and the legs, testaceous yellow. Length 3.5 mm.

In build somewhat resembling *C. fusculum*, Er., but a little longer and broader. Head exceedingly finely and very sparingly punctured; pubescence yellow, fine, and sparing. Antennae extending

a little beyond the posterior angles of the thorax, all the joints longer than broad, the penultimate compressed laterally, the 2nd joint shorter than the 3rd, the 3rd and 4th of equal length, the 5th to the 10th gradually decreasing in length, the 11th long oval, longer than the 10th. Thorax pitchy-brown, the posterior angles testaceous yellow, very finely and moderately closely punctured; pubescence fine, griseous. Elytra a little shorter than the thorax, pitchy-brown, with a large round yellow spot at the middle of the base of each; puncturation similar to that of the thorax, the pubescence golden yellow on the spots, otherwise griseous. Abdomen pitchy-brown, shining; the posterior margins of the segments testaceous, except the last which is pitchy: puncturation and pubescence very fine and close; lateral and apical setae black; eighth dorsal segment divided into four long triangular processes by three triangular excisions.

Hab. Bukit Timah, in rotten logs. Two specimens.

49. **Conosoma abdominale**, n. sp.

Black, shining, the abdomen ferruginous red; the first four joints of the antennae and the apical half of the last and the legs, testaceous yellow. Length 2·8 mm.

A shining, sparingly pubescent species, somewhat resembling in build *C. immaculatum*, Steph., but much more shining, blacker, rather broader and more convex, and with much longer antennae. Head black, shining, with a few scarcely visible punctures, almost glabrous. Antennae extending a little beyond the posterior angles of the thorax, the 2nd, 3rd and 4th joints elongate, subequal, the 5th to the 10th compressed, the first of them a little longer than broad, the rest subequal, scarcely longer than broad, the 11th oval oblong, nearly as long as the two preceding together. Thorax black and shining, the posterior margin narrowly ferruginous (by transparency); puncturation very fine and not close, and in addition there are a very few larger, superficial punctures visible; pubescence sparing, griseous, very short and fine. Elytra transverse, as long as the thorax; puncturation and pubescence as on the latter, and with a few larger superficial punctures of irregular distribution; ground-sculpture fine and imbricate; sides without long setae. Abdomen ferruginous, the anterior segments with similar puncturation, ground-sculpture and pubescence to that of the elytra, the posterior segments much less distinctly punctured; sides and apex with long black setae; eighth dorsal segment with a deep, nearly parallel-sided excision.

Hab. Mandai, in débris. One specimen.

50. *Conosoma championi*, n. sp.

Black, moderately shining, the posterior border of the thorax, the elytra near the suture and the posterior margins of the first three abdominal segments more or less obscurely reddish. Antennae long and slender, much longer than the head and thorax, the first four joints and the last testaceous, the rest infusate. Legs reddish-testaceous. Length 3.5 mm.

Stature of *C. binotatum*, Grav., but the elytra much shorter. Head very finely and sparingly punctured and pubescent. Antennae long and slender, extending beyond the posterior angles of the thorax, all the joints considerably longer than broad, the 2nd half the length of the 3rd, the 3rd to the 5th subequal, the 6th to the 10th very gradually decreasing in length, the 11th long, oval, longer than the 10th. Thorax very finely and moderately closely punctured, pubescence short, greyish; the posterior border obscurely and indeterminately reddish. Elytra transverse, scarcely longer than the thorax, obscurely reddish about the suture and the posterior margins, the puncturation as on the thorax, but a little more distinct; the pubescence as on the thorax; sides without setae. Abdomen with the posterior margins of the first three segments more or less reddish; puncturation very fine and close in front, more sparing posteriorly; sides with long black setae.

♀. Eighth dorsal segment cut into four pointed processes by three excisions, the lateral ones a little deeper than the central; the processes furnished with long black setae.

Hab. Bukit Timah.

51. *Conosoma walkeri*, n. sp.

Black moderately shining, the posterior angles of the thorax, the posterior third of the elytra obscurely, and the posterior margins of the abdominal segments rufo-testaceous. Antennae not much longer than the head and thorax, the first four joints and the last yellow testaceous, the rest infusate. Legs reddish-testaceous. Length 3 mm.

In build and colour so similar to the preceding, that it will be sufficient to give the differential characters, which are as follows: Smaller and less robust, with much shorter antennae, which are a little thickened towards the apex, the 3rd joint scarcely longer than the 2nd, the 4th a little longer than the 3rd, the 5th to the 10th gradually decreasing in length, conical, 8th to 10th only slightly longer than broad, 11th ovoid, longer than the 10th.

Hab. Woodlands, Bukit Panjang and Bukit Timah, in old logs.

52. **Conosoma perplexum**, n. sp.

Reddish-testaceous, shining; the antennae pale testaceous, the 5th to the 10th joints infuscate; the elytra obscurely infuscate posteriorly. Legs pale reddish-testaceous. Length 2.3 mm.

Of the build of *C. suave*, Fauv., but a trifle larger, the antennae distinctly longer and differently coloured, the thorax without markings. Antennae extending a little beyond the posterior angles of the thorax, the 2nd and 3rd joints elongate, of equal length, the 4th a little shorter than the 3rd, 5th to 10th subtriangular, compressed laterally, subequal, scarcely longer than broad, the 11th long, oval, considerably longer than the 10th. Thorax very finely and not very closely punctured; pubescence fine and yellow. Elytra a little longer than the thorax, slightly narrowed behind, with puncturation and pubescence as on the thorax; ground-sculpture very fine, feebly imbricate; towards the apex (but not reaching the posterior border), an indeterminate fuscous cloud is perceptible in certain lights. Abdomen exceedingly finely and sparingly punctured, especially posteriorly; ground-sculpture exceedingly fine and feebly imbricate; sides and apex setose; eighth dorsal segment divided into four triangular processes by three triangular excisions.

Hab. Bukit Panjang, in rotten wood. One specimen.

53. **Conosoma nigromaculatum**, n. sp.

Reddish-testaceous, shining, a subtriangular spot on either side of the middle of the base of the thorax, a transverse patch nearly reaching the lateral margins of the elytra externally, and the suture internally, and the 6th to 10th joints of the antennae black. Sides of the elytra each with six long setae. Length 2 mm.

Exactly of the build, and almost of the colour, of *C. suave*, Fauv., the head, however, is clear reddish-testaceous, the antennae are shorter and differently coloured, with the 7th to 10th joints distinctly transverse, the elytra are rather longer than the thorax, and furnished with long setae at the sides, and the 5th abdominal segment is scarcely infuscate. The antennae do not extend to the posterior angles of the thorax, the 3rd joint is shorter than the 2nd, the 4th scarcely longer than broad, the 5th as long as broad, stouter than the 4th, the 6th scarcely transverse, the 7th to the 10th distinctly transverse, 11th, stout, short, oval. Thorax very finely and not very closely punctured; pubescence fine golden yellow; on either side of the middle line at the base is an indeterminate, more

or less triangular dark spot. Elytra each with a transverse black patch placed much nearer to the posterior than to the anterior borders, and almost reaching the lateral margins externally and the suture internally; puncturation and pubescence much as on the thorax, the sides with six long black setae. Abdomen strongly pointed, very finely and sparingly punctured, strongly setose. Legs pale reddish-testaceous.

Hab. Woodlands and Bukit Timah, in old logs.

54. *Conosoma rufotestaceum*, n. sp.

Reddish testaceous, shining; sides of the elytra strongly setose; the first four and the last joints of the antennae and the legs yellow testaceous. Length 4.5 mm.

Build somewhat resembling that of *C. monticola*, Woll., but smaller and with the sides of the elytra furnished with strong setae. Head shining, reddish-testaceous, scarcely visibly punctured; pubescence sparing, yellow, rather coarse. Antennae barely extending beyond the posterior angles of the thorax, the 2nd and 3rd joints of equal length, the 4th to the 6th a little longer than broad, gradually decreasing in length, the 7th as long as broad, the 8th to the 10th distinctly transverse, the 11th short, oval. Thorax more than half as broad again as long, clear reddish-testaceous, very finely and sparingly punctured; pubescence yellow and rather coarse; the sides without setae. Elytra distinctly longer than the thorax, as long as broad, gradually narrowed posteriorly, the puncturation and pubescence similar to that of the thorax; the sides each with six long black setae, and the posterior margins narrowly and obscurely infusate. Abdomen strongly pointed, obscurely infusate at the base, puncturation very fine and sparing, the sides and apex strongly setose.

Hab. Woodlands, in old logs.

55. *Coproporus ruliventris*, n. sp.

Pitchy, shining; the head, margins of the thorax, lateral and apical borders of the elytra very narrowly, and the abdomen, red; antennae with the first four joints, and the apex of the last, testaceous yellow; legs reddish-testaceous. Length 4.5 mm.

Rather broad, moderately convex, and, with the exception of the abdomen, impunctate; the latter considerably narrower at the base than the elytra, elongate, and rather strongly narrowed posteriorly; of the build of *C. brunneicollis*, Motsch., but larger than that species.

Head transverse, pentagonal, ferruginous red, a narrow line between the bases of the antennae and a short one in the middle of the front portion of the vertex which joins the preceding, pitchy, the eyes rather large and prominent, the temples converging posteriorly; glabrous, without trace of puncturation, very finely and transversely strigose. Antennae rather short, the 2nd and 3rd joints subequal, the 4th obconical, shorter than the 3rd, the 5th to the 7th cylindrical, a little longer than broad, the 8th to the 10th as long as broad, the 11th rather stout, oval, as long as the two preceding joints together. Thorax strongly transverse, widest at the posterior fourth, from thence strongly rounded and narrowed in front to the rectangular and prominent anterior angles, less strongly narrowed backwards to the gently rounded posterior angles; anterior border broadly emarginate, posterior border sinuate on either side; sides and borders narrowly but distinctly ferruginous red; the whole surface glabrous and impunctate, very finely, and transversely strigose. Scutellum impunctate, ferruginous. Elytra one-third as long again as the thorax and of equal breadth, transverse; the sides feebly impressed, the impression nearer the posterior angles; the suture and lateral and posterior margins very narrowly ferruginous; surface glabrous, impunctate, finely transversely coriaceous. Abdomen ferruginous red, very finely and sparingly punctured, with short, fine, sparing, yellow pubescence; ground-sculpture fine, coriaceous; 8th dorsal segment in both sexes divided into four long triangular processes (of which the central pair are a little longer than the lateral) by three deep excisions, the apices of which are rounded.

♂. Eighth ventral segment with a broad, deep, triangular excision of the posterior margin.

♀. Eighth ventral segment divided into five processes by four deep excisions; the central process broad, narrowed a little towards the apex, which is truncate with a small central notch; the lateral pairs narrow and elongate, the most external of them a little shorter than the rest, which are of equal length.

Hab. Bukit Timah and Mandai, in old logs.

56. *Coproporus flavipennis*, n. sp.

Black, shining, depressed; the first three joints of the antennae and the extremity of the last, elytra, and legs testaceous. Length 2 mm.

Of about the size of the average *C. melanarius*, Er., but rather more depressed, with much finer puncturation and differently coloured elytra. Head formed as in *melanarius*, exceedingly finely

and by no means closely punctured; ground-sculpture fine, transverse, wavy. Antennae moderately long, longer than the head and thorax, the 3rd joint as long as the 2nd, the 4th to the 10th not much decreased in length, the 11th rather long, oval. Thorax built as in *melanarius*, the posterior margin narrowly and obscurely testaceous, the puncturation and ground-sculpture similar to that of the head. Scutellum black, scarcely perceptibly punctured, finely strigose transversely. Elytra yellow testaceous, about half as long again as the thorax, very narrowly impressed along the lateral margins, exceedingly finely and by no means closely punctured and without trace of ground-sculpture, except some faint traces of longitudinal striae towards the posterior margins. Abdomen very finely (but more distinctly) and sparingly punctured; ground-sculpture distinct, transverse, strigose; sides setose; eighth dorsal segment divided into four triangular processes (of which the median pair are longer than the lateral) by three narrow triangular excisions.

♀ (?). Sixth ventral segment with a broad, deep, oval excision posteriorly.

Hab. Bukit Panjang, under bark. A single specimen.

57. *Coproporus parvulus*, n. sp.

Obscure rufo-testaceous, shining; the head, and the base and more or less of the disc of the elytra, darker; first three joints of the antennae and legs testaceous, the rest of the antennae scarcely infusate. Length 1.75 mm.

Of the build of *C. minimus*, Motsch., but smaller and narrower, with the head and thorax impunctate and the elytra much less distinctly punctured. Head pitchy-red, shining, impunctate. Antennae not reaching the posterior angles of the thorax, and not thickened after the 5th joint, the 3rd joint obconical, smaller and a little shorter than the 2nd, the 4th slightly longer than broad, the 5th as long as broad, the 6th to the 10th gradually shorter, the 11th conical. Thorax glabrous and impunctate. Elytra about one-third longer than the thorax, narrowed posteriorly, the sides distinctly impressed from the postero-external angle to near the antero-external angle; puncturation very fine and indistinct, evanescent posteriorly. Abdomen rufo-testaceous, exceedingly finely and sparingly punctured, pubescence short, yellow, sparing; sides and apex with long black setae.

Hab. Woodlands.

MIMOCYPTUS, n. gen.

Minute, strongly convex, contractile, in facies very similar to *Hypocyptus*. Head transverse, deeply inserted in the thorax. Antennae 11-jointed. Mandibles short and stout, obscurely serrate towards the apex of their inner margin. Inner lobe of the maxilla narrow, with pectinate inner margin; outer lobe broad, obtriangular, furnished with long setae on the distal margin. Maxillary palpi with the 1st joint very small, the 2nd curved, much larger and stouter, the 3rd a little longer than the 2nd, enlarged towards the apex, the 4th as long as, but narrower than the 3rd, conical. Mentum (pars antica) transverse, quadrangular, narrower at the anterior than at the posterior border, which are both truncate. Labium transverse, narrower in front, quadrate. Labial palpi 3-jointed, the 1st joint short and stout, broader than long, the 2nd smaller and shorter than the 1st, broader than long, the 3rd much narrower than the preceding, as long as the first two joints together, almost cylindrical. Tongue broad, membranous, rounded, deeply and triangularly emarginate in front, almost bilobed. Paraglossae distinct, pectinate, extending slightly beyond the anterior margin of the tongue. Thorax strongly transverse, convex, overlapping the elytra when the insect is extended; the anterior margin broadly emarginate, the sides strongly rounded, passing insensibly into the base, the anterior angles obtusely rounded. Prosternum small, the episterna much abbreviated, the epimera free, elongate as in *Tachinus*. Anterior coxae contiguous, as long as and larger than the femora. Mesosternum broadly and deeply emarginate in front; the middle coxal cavities completely separated by a very narrow mesosternal process. Metasternum bisinuate at the posterior margin, the posterior coxae contiguous. Elytra extending beyond the metasternum, finely bordered at the sides; the epipleura incomplete and quite invisible when viewed from the side.

Tibiae setose. Tarsi all 5-jointed; the anterior pair with the first four joints short, triangular, emarginate at the distal margins, the 4th joint smaller than the preceding; the middle pair with the 1st joint elongate as long as the two following joints together, the 2nd and 3rd of equal length, each a little longer than broad, the 4th smaller than the 3rd, the 5th elongate, nearly as long as the three preceding together; the posterior pair similarly formed to the intermediate; the claws all simple. Abdomen short, conical, retractile, narrowly margined.

58. *Mimocyplus globulus*, n. sp.

Strongly convex, shining, ferruginous red, the fore-parts impunctate, the abdomen scarcely perceptibly punctured, very finely and

sparingly pubescent; antennae with the first four joints and the apex of the 11th, the mouth-parts, and legs testaceous. Length 1.2 mm. (in well-extended examples).

Head large and transverse, ensconced in the thorax, the eyes large and rather prominent; entirely impunctate, and without ground-sculpture, practically glabrous (under a high magnification a few very fine short hairs are visible). Antennae with the first two joints rather stout, the 2nd joint a little longer and not so thick as the 1st, the 3rd joint as long as the 2nd, the 4th, 5th and 6th each a little shorter, the 7th to 10th transverse, 7th to 11th forming a club, 11th oval, as long as the two preceding together. The thorax has been sufficiently noticed in the generic characters give above: it is broader than the elytra, the base of which it overlaps, and like the head is impunctate and practically glabrous. Elytra longer than the thorax and about as broad as long, a little narrowed behind and truncate, and like the head and thorax almost glabrous and impunctate. Abdomen short, conical, finely bordered, retractile, scarcely perceptibly punctured, with short, fine, and sparing yellow pubescence, and scarcely visible transverse ground-sculpture; the sides and apex furnished with long black setae.

♂. Eighth dorsal segment simple; 6th ventral segment with a rather deep triangular excision of the posterior margin.

♀. Eighth dorsal segment divided into four pointed triangular processes by three triangular excisions, of which the lateral ones are a little deeper than the others, the middle processes each with a short yellow seta, the lateral ones each with a long black seta.

Hab. Keppel Harbour, in débris.

ADINOPSINI, n. group.

ADINOPSIS, n. gen.

Antennae with the 11th joint furnished with a slender, subulate, accessory joint nearly as long as itself. All the tarsi 2-jointed (?).

I am unable to give more details of this remarkable genus owing to lack of material. The species on which it is founded has the facies, puncturation, pubescence, and labial palpi of *Dinopsis*, but I believe that all the tarsi are composed of two joints only. The characters given would appear to necessitate the erection of a new group, the "Adinopsini."

59. *Adinopsis rufobrunnea*, n. sp.

Minute, obscure reddish brown, the elytra (in one specimen) and the first four visible segments of the abdomen blackish; densely and finely punctured and pubescent throughout, scarcely shining; antennae, mouth-parts and legs testaceous. Length 1.4 mm.

Similar in scheme of coloration to *D. cinnamomea*, Kr., from Ceylon, but much smaller and narrower. Head transverse, convex, the eyes small, the temples passing insensibly into the base; puncturation exceedingly fine and close, pubescence very fine. Antennae long and slender, the 1st and 2nd joints of about equal length, stouter than the following, the 3rd shorter than the 2nd, the 4th longer than the 3rd, the 4th to the 11th all elongate and differing but little in length, the 12th slender, subulate, almost as long as the 11th. Thorax transverse, convex, widest posteriorly at the rectangular posterior angles, from thence gently rounded and narrowed to the obtuse anterior angles; posterior margin bisinuate, making the hind angles a little prominent; puncturation close, fine, but rather rough, pubescent fine, yellowish. Scutellum concealed. Elytra about as long as, but narrower than, the thorax, transverse, pretty deeply emarginate internal to the postero-external angles, from thence obliquely truncate to the suture; puncturation and pubescence similar to that of the thorax. Abdomen pointed, margined, the first four visible segments blackish, the last two reddish-testaceous; puncturation dense and fine, more sparing on the last two segments; pubescence dense and fine, almost sericeous; anal styles of equal length, the lateral stouter than the median. Sides of the abdomen and tibiae not setose.

Hab. Sembawang, in flood débris. Two examples.

GYMNUSINI.

60. *Leucocraspedum nigrum*, n. sp.

Black, convex, pointed posteriorly, shining, finely and closely pubescent; antennae short, testaceous yellow, the last two joints infuscate; legs pitchy-testaceous. Length scarcely 3 mm.

Head transverse, deflexed, shining, scarcely visibly punctured; eyes rather large. Antennae short, the 1st and 2nd joints of equal length, the 3rd shorter and narrower than the 2nd, the 4th and 5th decreasing in length, a little longer than broad, the 6th to the 10th gradually more strongly transverse, the 11th elongate, nearly equal to the three preceding together. Palpi testaceous. Thorax transverse, considerably narrowed in front, the sides passing insen-

sibly into the convex anterior margin, widened behind, the posterior angles a little prominent, rectangular, the base bisinuate; puncturation very fine and close; pubescence fine and close, greyish; scutellum concealed by the thorax, which overlaps the base of the elytra. Elytra shorter than the thorax (measured along the suture), transverse, a little emarginate internal to the postero-external angles, obliquely truncate to the suture; puncturation very fine and close, but not so fine as that of the thorax; pubescence fine and close. Abdomen elongate, strongly pointed posteriorly, uniformly punctured similarly to the elytra and with similar pubescence; the sides and apex with long black setae, the dorsal surface with a row of erect setae on either side.

Hab. Bukit Panjang, in rotten logs.

MYLLAENINI.

61. *Myllaena faberensis*, n. sp.

Narrow, elongate, acuminate, blackish, the thorax, elytra, posterior margins of the first four visible and the whole of the 7th and 8th segments reddish-testaceous; antennae, mouth-parts, and legs clear testaceous. Length 3·4 mm.

In build and structure of the antennae similar to *M. tenuicornis*, Fauv., of Europe. Head blackish, very finely punctured and pubescent, moderately shining. Antennae slender with all the joints elongate, the 2nd longer than the 1st and 3rd, the 3rd to the 6th of equal length and breadth, the 7th to the 9th a little shorter, equal to each other, the 10th a little shorter than the 9th, the 11th elongate, pointed, a little longer than the 10th. Thorax feebly transverse, broadest about the middle, from thence the sides gently rounded and narrowed to the anterior angles, very slightly narrowed and scarcely at all rounded to the rectangular posterior angles, the base lightly bisinuate; puncturation exceedingly dense and fine; pubescence fine, short, dense and yellowish. Elytra transverse, scarcely as wide as, and a little shorter (measured along the suture) than, the thorax; posterior margins obliquely truncate from the postero-external angles, which are emarginate internally; puncturation and pubescence exceedingly dense and fine as on the thorax. Abdomen elongate, pointed, exceedingly densely punctured and pubescent, sericeous; sides and apex with moderately long black setae. Middle tibiae with a short weak seta at the middle of the outer border.

Hab. Mount Faber.

PRONOMAEINI.

62. *Pronomaea leontopolitana*, n. sp.

Chestnut-brown, rather shining, the fore-parts finely and closely punctured; antennae fuscous, the first two joints, palpi, and legs testaceous. Length 3 mm.

More robust than *P. rostrata*, Er., with stouter antennae, closer puncturation, and thorax more contracted at the base. Head round, the eyes large; closely and finely punctured and pubescent. Antennae long and stout, the 1st and 2nd joints of equal length, the 3rd longer than the 2nd, the 4th a little longer than broad, the 5th as long as broad, the 6th to the 10th transverse, but not strongly so and not increasing appreciably in width, the 11th shorter than the two preceding together. Thorax transverse, broadest at the middle, the sides from here gently rounded and converging to the anterior angles, and posteriorly more strongly retracted in a straight line to the obtuse posterior angles; the disc in the middle line before the base with a well-marked impression and between this and the posterior angles is a rounded fovea; puncturation fine and rather close; finely pubescent. Elytra broader than, and as long as, the thorax, transverse, strongly emarginate internal to the postero-external angles, finely and rather closely punctured and pubescent. Abdomen shining, finely and very sparingly punctured and pubescent.

Hab. Mandai, Bukit Timah, in damp débris.

DIGLOTTINI.

63. *Diglotta testaceipennis*, n. sp.

Linear, pitchy, abdomen black, scarcely shining, densely and finely pubescent; antennae, elytra, legs, and last abdominal segment, testaceous. Length 1.5 mm.

Head large, round, depressed, impressed on the vertex; the eyes small, the temples large; sculpture exceedingly fine and close; no definite puncturation visible. Antennae with the 1st and 2nd joints of equal length, the 3rd much shorter, the 4th, 5th, and 6th cylindrical, a little longer than broad, the 7th to the 10th as long as broad, the 11th oval, pointed. Thorax scarcely transverse, a little broader than the head, widest just behind the anterior angles, from thence lightly rounded and narrowed anteriorly, contracted posteriorly in a nearly straight line to the obtuse posterior angles; the disc lightly and broadly impressed along the middle; exceedingly finely and closely sculptured, finely pubescent. Elytra as broad as,

and one-third longer than, the thorax, parallel, longer than broad, densely and finely sculptured and pubescent. Abdomen black, the apex reddish-testaceous, parallel, very finely and closely punctured and pubescent throughout.

Hab. Pasir Panjang. Two examples on the beach, one under a stone below high-water mark, the other in a rotting pine-apple.

XIV. *Notes on Australian Sawflies, especially the "Authors' Types" and other specimens in the British Museum of Natural History and the Hope Collections of the Oxford University Museum; with diagnostic Synopses of the Genera and Species, and photographs illustrating their structural characters.* By the Rev. FRANCIS DAVID MORICE, M.A., F.Z.S.

[Read October 2nd, 1918.]

PLATES XI—XV.

INTRODUCTORY.

THIS paper—the first in which I have ventured to treat of other than Palaearctic insects—is the result of an opportunity so exceptional that it seems almost a duty to make use of it. For a considerable time this year I have had continuous access in the British Museum of Natural History (*a*) to the entire "literature" of my subject, and (*b*) to very nearly the entire material on which that literature is based. The first Sawflies described from Australia were *Pterygophorus cinctus* and *interruptus* of Klug (1812), and the Types of these—presumably still at Berlin—were, of course, inaccessible to me. But almost all Australian genera or species since described were founded on specimens still preserved either in the Museum above mentioned (which shall hereinafter be denoted by the initials B.M.), or in the Hope Collections of the Oxford University Museum: and, through the kind assent of Professor Poulton to an application which I made to him, all specimens of Australian Sawflies in the latter Collections were temporarily entrusted to me for study and comparison with the material already before me in B.M.

This means that I have been able to examine at leisure and with every facility that could assist me at hand (*a*) the original author's Types (and sometimes also Co-types) of all forms described by Leach in 1817, Westwood in *Arcana Entomologica* (1811) and *Proc. Zool. Soc. Lond.* (1880), W. F. Kirby in his *British Museum List* and various later "Separata" (1881 to 1894), Gilbert Turner in *Proc. Linn.*

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Soc. N. S. Wales, (1900), and S. A. Rohwer* in *Ent. News, Philadelphia* (1910). The B.M. Coll. contains also specimens of the remarkable genera *Philomastix* and *Phylacteophaga*, Froggatt (*Proc. Linn. Soc. N. S. Wales*, 1890 and 1899). These are not actually Types, but were all either determined by the author, or received from the same source as his Types.† Other interesting material which I have examined in B.M. includes many specimens of new or little-known Australian forms presented by Mr. Rowland Turner, and a *Pterygophorus* received early in the present year (1918) from Mr. Froggatt, which is evidently the *bifasciatus* of Brullé, and the only example of that remarkable species that has occurred since the original Type was described more than seventy years ago. In spite of Konow's *a priori* reasonings to the contrary, this species is most certainly a *Pterygophorus* and one of the most beautiful representatives of that beautiful genus.‡

Besides the above Australian material I have been able to examine in the B.M. and Oxford Collections many Types of exotic genera and species described by Westwood, F. Smith, W. F. Kirby, Cameron, etc., some of which, though not belonging to the Australian Fauna, seem allied to certain of its genera by the possession of several very abnormal and even paradoxical characters. Most of these insects are from South or Central America, a circumstance which will require consideration presently.

Apart from this great advantage of access to so many

* Mr. Rohwer kindly communicated to me, while these Notes were still in MS., a type-written copy of a Paper which has since appeared in *Ann. and Mag. Nat. Hist.* (Nov. 1918), containing descriptions of a new genus (*Zenarge*) and three new species. The Types of these are still in America, having been sent there from B.M. for determination by Mr. Rohwer in 1915. Duplicates, however, except in one or possibly (?) two cases, were retained in the Museum; and I had already dealt with these in my Tables, and given them names for which I now substitute those published by Mr. Rohwer.

† The Type-species of *Philomastix* (*glabra*) is figured and described by Westwood as "*Perga* (sic) *macleayi*," from two ♀ specimens at Oxford, both of which had lost their antennae before Westwood saw them. Otherwise he would, of course, have seen that the species could not be a *Perga*. This insect must in future, I suppose, be called *Philomastix macleayi*, Westw.

‡ The vessel conveying this precious specimen was torpedoed *en route*! But the insect, though literally drenched with a mixture of sea-water and naphthaline, is still perfectly recognisable, and for practical purposes little the worse for its adventures.

Types, the want of which access has greatly impaired the value of much recent work * on Australian forms, I have been singularly fortunate in being occupied on these investigations exactly when and where I could at once take counsel on any difficulty that might arise with a colleague who, of all men, was perhaps the best qualified to assist me. Mr. Rowland E. Turner, well known to all Hymenopterists as the author of many important memoirs on various groups of exotic Aculeates, had long devoted himself to voluntary work in arranging and augmenting the B.M. collections of Hymenoptera, and had lately received a formal appointment as an honorary member of the Museum Staff. He had previously resided for twenty years in North Queensland, and both there and in other parts of Australia (Swan River, Tasmania, the neighbourhood of Sydney, etc.) made large entomological collections, all which he has now presented to B.M. Though more specially interested in other groups, he had by no means neglected the Sawflies—in fact, several Australian species and at least two genera are known to me only through his captures. Being myself almost entirely ignorant of “exotic” insects, Hymenopterous or otherwise, and having only the vaguest ideas about the geography, physical features, climate, seasons, etc., etc., of the Australian “Realm,” I naturally seized every opportunity of profiting by Mr. Turner’s familiarity with all these subjects, and though I cannot regret that I have done so, I am conscience-stricken when I think how unscrupulously I have exploited his good nature.

I have also to thank an American colleague, Mr. S. A. Rohwer of Washington, for several very kind and encouraging letters, and for communicating to me unpublished notes of his own on some of the specimens which I have examined, as well as for copies of many of his Separata, especially his *Classification of the Suborder Chalastogastra* (Proc. Ent. Soc. Washington, 1911) and *Genotypes of the Sawflies and Woodwasps* (U.S. Dep. Agric., Technical Series No. 20. Part II. Washington 1911).

The Figures illustrating this paper are reproductions

* *E. g.* Konow’s attempts to classify the known species of *Perga* and *Pterygophorus*. Having in most cases only old and inadequate diagnoses and figures to guide him, he naturally made many mistakes both in identifying species, and in deciding where to place them in his Tables.

of photographs (or in a very few cases of drawings) taken by myself from B.M. or Hope Coll. specimens, the parts figured having nearly always been prepared by Mr. A. Cant, F.E.S., in the Museum "Setting-room" by the kind permission of Dr. Gahan or Professor Poulton. I am greatly indebted to Mr. Cant for the invaluable assistance I have received from him in this matter, and am glad to think that his preparations will henceforth be a part (and, I think, a very useful part) of the Collections at Oxford and South Kensington. The photographs representing details of saws in the various species of *Perga* and *Xyloperga* were all taken at the same magnification, but this is not the case with the other figures. It will be noticed that in some of those representing antennae the two short basal joints are missing, but these joints are not particularly characteristic, and their omission is therefore of little consequence.

When these notes were commenced, and even after considerable progress had been made with them, they were intended merely as materials for a revision of the Genus *Perga*. But I afterwards resolved to adopt a suggestion made to me by Mr. Turner that they should include also some account of such other Australian Sawflies as were represented in the Collections to which I had access. The materials available for this part of my work were quite insufficient for the clearing up of many questions, which, as long as they remain unsettled, will render the production of anything that deserves to be called a "Monograph" impossible. Still, as I have seen all the Types of described species in some genera, and either Types or specimens which I have reason to believe are correctly named in all but one of the others, it seems worth while to indicate in tabular form the characters by which they seem most easily distinguishable in the specimens before me, even when I cannot be sure that these characters are of specific value.

Accordingly I have prepared dichotomic Tabulations or Synopses, first of the genera, and afterwards of the species in each genus of which more than a single species is known. Except in the cases of *Perga* and *Pterygophorus*, where some trouble has been taken to make the order in which the species are arranged correspond to my idea of their natural affinities, I have aimed in these Synopses at nothing more than to facilitate the naming by collectors of their specimens, and have employed indifferently whatever characters, whether of structure or merely of colora-

tion, seemed likely to be recognised most easily. It is quite possible that some of these characters are merely "individual," but of this there is always a chance when attempts are made to diagnose the characters of a species from a single specimen.

I will now give my Synopses of Genera and Species, and these will be followed by a few detached Notes, or "Excursuses," dealing with various questions which came up for consideration as my work proceeded. These are mere *Tentamina*, and probably very crude, for they often touch on subjects with which my acquaintance is very recent. But it has interested me to write them, and I hope no harm will be done by publishing them in their present shape.

SYNOPSIS OF THE GENERA.

(Genera marked thus † cannot be considered as indigenous.)

1. Antennae (see Figures in Plate XII, Figs. 1, 2) inserted close to the mandibles—lower down in the face than the lowest part of the eyes.* On each side of the head above (very near each eye) runs a series of little tubercles. Middle and hind tibiae denticulate along their hind-margins (Pl. XII, Fig. 18). The ♀ hypopygium appears as a sort of compressed longitudinal carina (in the middle of the 5th ventral segment). In the lateral view it is tooth-like (subtriangular); and beyond it is seen the exposed part of the paradoxically long and slender "terebra" or boring-organ (a modified ovipositor), resembling merely a fine hair, unless really highly magnified, when the apices of its paired "spicula" are seen to be armed with a very few minute teeth. (Its structure and attachments are very like those of the corresponding organ in a *Cynipid!*) Cf. Figs. 1, 2, 3 in Pl. XIII. In the ♂ the apex of the abdomen is simply convex above and below. The labial palpi are short, 3-jointed; the maxillary palpi much longer, 5-jointed. Each fore-leg has *one* calcar only; each posterior leg has *two*, but one of them is so short that it may easily be overlooked. Neuration of wings very incomplete. The antennae have 12 joints in the ♀, 11 in the ♂.

(Family ORYSSIDÆ.) Genus 1. *Ophrynopus*, Konow.

* Hartig and others say "below the clypeus," but what they take for the clypeus is in this case really a part of the abnormally developed "frons." The true clypeus is to be found lower down, between the insertions of the antennae and the mouth-parts, as in all Hymenoptera (I believe) without exception!

[The only Australian species is *O. sericatus*, Mocsary, described in *Term. Füz.* (Feb. 1900) from New South Wales. In the same year but some months later Mr. Gilbert Turner described the same species from Mackay, North Queensland, under the name *Oryssus queenslandensis*. The Type of *queenslandensis*, G. Turner (and many other specimens ♂ and ♀ from Kuranda, N. Queensland),* are in B.M., but not the Type of *sericatus*, Mocs. In this species the fore-wing of the ♀ is crossed by two conspicuous dark clouds, in the ♂ wing these are scarcely indicated (Pl. XI, Figs. 1 and 2).]

— Insertions of antennae *between* the eyes, never *below* them, and separated from the mouth-parts by a visible "clypeus." Top of head with no lateral rows of tubercles. Neuration of wings more or less complete, always with at least 3 closed cubital cells in each fore-wing. 2.

2. Front tibiae with only one apical spine or "calcar." Antennae many-jointed, long, slender, and filiform, with simply cylindrical joints (none of them dilated, pectinated, bifurcated or otherwise paradoxically developed in either sex). The dorsal apex of the abdomen is generally more or less acuminate, and in the ♀ the ovipositor projects from below it (looking like a stout needle with a blunt point). The scutellum is not distinctly separated from the rest of the mesonotum.

(Family SIRICIDAE). 3.

- Front tibiae with two calcaria. Antennae with the joints seldom quite simple. (Often they are clavate, capitate, pectinate, serrate on one side, pilose, etc., etc., see Pl. XII, Fig. 1 to 11.) Ovipositor of ♀ usually concealed within a bivalved chitinous sheath, which is always visible from beneath, and may (or may not) project slightly beyond the dorsal apex of the abdomen. Scutellum always distinctly separated from the rest of the mesonotum . . . (Family TENTHREDINIDAE). 4.

3. Costal area of fore-wing (*i. e.* the space between the costa and subcosta) divided by a longitudinal "vein," but with no "nerve" crossing it transversely. Last dorsal plate of the abdomen in the ♀ deeply foveated before its apex, which is compressed and drawn out into a straight nail-like process, from beneath which the ovipositor may be seen projecting. The latter is much stouter than that of *Ophryuopus*, but the structure in both cases is essentially the same.

* These specimens were all taken by Mr. R. E. Turner emerging from holes apparently made by beetles in a dead *Eucalyptus* tree in June or July!

The only species recorded from Australia (*australis*, W. F. Kirby = *jurencus*, L. !) is certainly a mere accidental importation from the Northern Hemisphere, and no part of the true indigenous Fauna. The ♀ is chalybeous (blue with green and purple reflections). The ♂ has a shining testaceous abdomen, and the legs are mostly black, while those of the ♀ are mostly yellowish. In both sexes the bases of the antennae are testaceous. (The Type of "*australis*"—a ♀—is in B.M.)

†2. SIREX, L. (= PAURURUS, KÜW.).

— Costal area of fore-wing crossed by a transverse "nerve," but without a longitudinal "vein."

Mr. Rohwer has described in *Ann. and Mag. Nat. Hist.* (Nov. 1918) a new species of this genus from North Queensland (*obtusiventris*, Rohw. ♀). I have not seen the unique Type, but it is described as black with antennae and legs ferruginous; 8 mm. long; with the abdomen "rounded not tapering apically," this being a very unusual character in a *Xiphydria*. (As the species does not seem to have occurred elsewhere it is presumably indigenous.) For a full account of its other characters see the author's description (*l.c.*). 3. XIPHYDRIA, Latr.

- 4. Middle and hind tibiae with calcar-like spines *before* as well as *at* their apices (Pl. XII, Fig. 19, Pl. XV, Fig. 19) 5.
- Middle and hind tibiae with no spines other than the apical calcaria. 12.
- 5. Antennae apparently only 3-jointed (all joints beyond the two short basal ones being fused together and not distinguishable). Fore-wings with a distinct "lanceolate cell" (Pl. XI, Fig. 3). (Subfamily *Arginae*). 6.
- Antennae with at least 5 distinct joints. Fore-wings without a lanceolate cell, the humeral nerve being undeveloped. (Mr. Rohwer divides the genera of this section between two of his "Families"—the *Perreyiidae* and the *Pergidae*, placing *Philomastix* and *Phylacteophaga* in the former, *Perga*, *Xyloperga* and *Cerealces* in the latter, but for certain reasons I hesitate at present to take this view, and prefer to leave their precise affinities undecided. 8.
- 6. Lanceolate cell crossed obliquely by a transverse nerve.* Hind-

* This character does not occur in any other genus of the *Arginae*!

wings with only one closed cell, a cubital. Middle tibiae (Pl. XII, Fig. 19) with *two* (!) spines before their apices, hind tibiae with only one. Antennae of the ♂ simple (not furcate) and scarcely if at all more pilose than in the ♀ (see Pl. XII, Fig. 4), and for a full description of the only species (*turneri*, Rohw n. sp.) cf. the author's account of it in *Ann. and Mag. N. H.* (l.c.) 4. ZENARGE, Rohwer, nov. gen.

— Lanceolate cell "contracted" as in *Arge*, Schrank (= *Hylotoma*, Auctt.) Hind-wings with *two* closed cells, a cubital and a medial. Antennae of ♂ much more pilose than those of the ♀. 7.

7. Only 3 complete cubital cells in the fore-wing (the 1st cubital nerve being absent or represented by a mere rudiment). In the hind-wing the recurrent nerve lies *beyond* the cubital (*i. e.* nearer to the margin of the wing). The last joint of the ♂ antennae is furcate (Pl. XII, Fig. 3).

5. TRICHORHACHUS, W. F. Kirby.

[For Synopsis of the species see p. 259.]

— Four complete cubital cells in the fore-wing. In the hind-wing the recurrent and cubital nerves are "interstitial" (Pl. XI, Fig. 4). The last joint of the ♂ antenna is not furcate.

6. ANTARGIDIUM, n. g.

The only known species of this genus (*apicule*, W. F. Kirby) was described by its author (*Ann. and Mag. N. H.*, July 1894) as a "*Hylotoma*" (*i. e.* *Arge*!). But I venture to think that it is better to treat it as a new and distinct genus. Not only is it very much smaller than any of the other forms at present referred to *Arge*, but it differs from all other *Arginae* in the neuration of the hind-wing. In none of these are the recurrent and cubital nerves interstitial; and in all (except *Trichorhachus*) the cubital lies beyond the recurrent, and so is nearer to the margin of the wing!

8. (5) Antennae never with more than 7 distinctly separated joints, usually with less, and either "clavate" from the 3rd joint to the apex (Pl. XV, Fig. 18), or "capitate," *i. e.* with the *apical joint only* swollen into a club (Pl. XV, Fig. 20). Apex of scutellum angled at each side and somewhat reflexed, the angles usually forming little lobate (knob-like or tooth-like) projections (= the "scutellar lobes"). 9.

— Antennae with more than 7 distinct joints, neither capitate nor clavate, but with the apices of all joints except the two

first and the last lobately produced in the ♂♂ and angularly projecting ("subserrate") in the ♀♀ 10.

9. Antennae always capitate, with six joints preceding the club, all distinctly separated from it and from one another. Labial palpi with 4 joints, maxillary with 6, the former much thicker than the latter.

7. XYLOPERGA, Shipp = HEPTACOLA, KONOW.

[For Synopsis of the species see p. 265.]

- Antennae either capitate, or (in Kirby's Section II of the genus) clavate from the third joint to the apex. In both cases only 5 joints at most (in one species only 4) precede the apical joint. Labial palpi with only 3 joints, maxillary with only 4, the latter scarcely differing in thickness from the former 8. PERGA, Leach.

[For Synopsis of the species see p. 265.]

10. Antennae 8-jointed, long and slender; joints 4 to 7 produced at their apices in the ♂ into pointed lobes; in the ♀ they are nearly simple. Palpi as in *Perga* (labial 3-jointed, maxillary 4-jointed). In the fore-wings the 1st recurrent nerve is sharply (angularly) bent in the middle, and runs very obliquely into the cubital vein half-way between the 1st and 2nd cubital nerves; the 2nd recurrent is straight, and nearly interstitial with the 2nd cubital nerve. 9. PHYLACTEOPHAGA, Froggatt.

[The only known species of *Phylacteophaga* is *eucalypti*, Froggatt, described in *Proc. Linn. Soc. N. S. W.*, Vol. 14 (1899).]

- Antennae with at least 10 joints. Both recurrent nerves are straight and neither is interstitial 11.

11. Antennae in the ♂ (the other sex is unknown) 10- to 12-jointed, the intermediate joints short and stout with dilated apices. Scutellum coarsely and rugosely punctured, dull, bisected by a sharply-defined longitudinal narrow sulcation, its apex produced into lobes as in *Perga* and *Xyloperga*, but here the lobes are proportionately longer and more sharply pointed.

10. CEREALCES, W. F. Kirby.

[For Synopsis of the species see p. 287.]

- Antennae with at least 15 joints, these in the ♂ resembling those of *Cerealces scutellata*. In the ♀ the antennae are considerably longer than in the ♂, the post-basal joints are slender and elongate, but those following become shorter and broader as they approach the apex. The scutellum is somewhat shining, its disc in certain aspects appears bituberculate, but it is not (as in *Cerealces*) divided by a sharp central

furrow, its apex is simply rounded with no projecting "lobes." Fore-wings with the 1st cubital cell very short and not completely closed, the very oblique 1st cubital n. breaking off short without reaching the cubitus. In the ♀ there is a conspicuous dusky fascia beneath the stigma (Pl. XI, Fig. 13). Labial palpi 3-jointed, maxillary palpi 4-jointed (Pl. XII, Fig. 15). . . 11. PHILOMASTIX, Froggatt.

[For Synopsis of the species see p. 287.]

12. (4) Lanceolate cell absent, as in *Perga*, etc. 13.

— Lanceolate cell present. 14.

13. Antennae only 7-jointed, the intermediate joints all short and dilated towards their apices, forming together with the apical joint a sort of club. Fore-wings with one radial cell and four complete cubital cells, the second and third each receiving a recurrent nerve. Hind-wings with one closed cell (a cubital). Clypeus remarkably short and transverse, with the antennae (as in *Diphamorphus*, *vide infra*) inserted just above it, and therefore low down in the face. Scutellum punctured, subtriangular with a rounded apex and a narrow elevated margin.

12. PERGULA, n.g.

Type *Pergula turneri*, n. sp. [For description see p. 288.]

(I do not know to what Subfamily this little insect should be referred. The specimen is unique, and I have not been able to dissect out the palpi. In certain characters it resembles a very diminutive *Perga*, but the posterior tibiae have no ante-apical spines.)

— Antennae multiarticulate. In all ♂♂ and some ♀♀ they are pectinate (the pectination *single*—not, as in Palaearctic "*Lophyrus*," Auctt., *double*!), but in most of the ♀♀ they are merely serrate. Fore-wing with the 2nd cubital nerve entirely wanting, so that the 2nd and 3rd cubital cells combine to form a single long cell which receives both recurrent nerves.

13. PTERYGOPHORUS, Klug.

(Subfamily?). [For Synopsis of the species see p. 289.]

14. Radial cell divided by a transverse nerve.

The only species having this character yet recorded from Australia is an undoubted alien, imported accidentally along with the fruit-trees (*Pyrus*, etc.) on which it feeds. It is a well-known pest in all parts of Europe and North America. The lanceolate cell is not petiolate, but is crossed by an

oblique nerve. The hind-wing has sometimes two closed cells, sometimes only one †14. CALIROA, Costa
 = *Eriocampa*, Auctt. = *Eriocampoides*, KONOW.

— Radial cell undivided. Lanceolate cell with no nerve crossing it, but "petiolate." Hind-wing never with more than one closed cell (cubital) 15.

15. Antennae pectinated as in *Pterygophorus* but far less closely, the joints (apart from their branches) being longer. In the ♂ of the only described species, viz. *P. atratus*, W. F. Kirby, the antennae are 18-jointed. The ♀ is described by Mr. Rohwer in *Ann. and Mag. N. H.* (l.c.) from a specimen seen by him in B.M., but this, I fear, has since been destroyed or lost, for neither Mr. Turner nor I have been able to find it. Its antennae were broken from the 12th joint onwards, but each of the remaining joints after the second had "a ramus like *Pterygophorus*." Mr. Rohwer places it in his Subfamily "Euriinae," and compares its wing-veining to that of the American genus *Perreyia*. (Kirby also brings *Perreyia*, *Eurys* and *Polyclonus* near together, including them all in the "Subfamily" which he calls *Lophyridinae*.)

15. POLYCLONUS, W. F. Kirby.

— Antennae without pectinations, nearly simple (or, at most, subserrate) in both sexes (Pl. XII, Fig. 11). 16.

16. Antennae inserted low down on the face, just above the short transverse clypeus, and so not far from the labrum. Mandibles long and falcate, not toothed before the apex.

16. DIPHAMORPHOS, Rohwer.

[For Synopsis of the species see p. 294.]

— Insertions of antennae situated normally, *i. e.* considerably above the base of the clypeus, and nearly in the middle of the face 17.

17. In the fore-wing the apex of the obliquely truncated radial cell is separated from the margin of the wing by a distinct (subtriangular) appendicular cell.

17. EURYS, Newman = *Euryopsis*, W. F. Kirby.

The general coloration of all the known forms is metallic (aeneous, cupreous, or chalybeous). The antennae are said to be always 9-jointed, and I have found them to be almost invariably so in ♀ specimens. But out of four

* I do not understand the formation of this word. Did the author, perhaps, mean to write "*Lophyrinae*"?

♂♂ in B.M. Coll. referred by Mr. Rohwer to his "*deceptus*, n. sp." two have them 10-jointed, and I am almost certain that the two ♂♂ with 11-jointed antennae (the Types of *nitens*, W. F. Kirby, and *bella*, Rohwer) on which Kirby founded his "new genus" *Euryopsis*, are really the unidentified ♂♂ of two *Eurys* spp. of which ♀♀ only have been described—probably of *lactus*, Westw., and *nitidus*, W. F. Kirby respectively. I venture therefore to sink the name *Euryopsis* as a synonym of the earlier *Eurys*. (The so-called "*Eurys*" *inconspicua*, W. F. Kirby, is, in my opinion, a *Clarissa*.)

[For Synopsis of the species see p. 294.]

- In the fore-wing the apex of the simply acuminate radial cell is close to the margin of the wing, with at most a very narrow (linear) space, but no real appendicular "cell," separating it from the latter 18.
- 18. Legs (especially the hind coxae and tarsi) very slender and elongate, the tarsi evidently longer than the tibiae. Antennae also long and slender, almost filiform as a whole, most of their joints considerably longer than broad. According to Mr. Rohwer the antennae should be 14-jointed, but in specimens examined by me in B.M. Coll. the number of joints varies from 12 to 15.

Generally the coloration of the body is thoroughly metallic, much as in *Eurys*. But in the ♀♀ of one species the abdomen beneath is testaceous.

18. NEOEURYS, Rohw.

[For Synopsis of the species see p. 297.]

- Legs and also antennae somewhat shorter and stouter than in *Neoeurys*. The antennae can hardly be called filiform; they are rather moniliate, and the intermediate joints are only a little longer than broad. The tarsi seem never to be longer than the tibiae, in most cases they are evidently shorter. The general coloration of the four species seen by me is not metallic, but testaceous and black, except in *atrata*, which is black with white markings. The number of joints in the antennae varies extremely—from 9 in *inconspicua* to 14 in *thoracica*. Of *divergens* I have seen specimens with 10, 11, 12, and 13 joints (all from Queensland). The most usual number of joints in this species (and also in *atrata*) seems to be 11 19. CLARISSA, W. F. Kirby.

[For Synopsis of the species see p. 299.]

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(Imported genera in italics.)

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TRICHORHACHUS, W. F. KIRBY.

SYNOPSIS OF THE SPECIES.

All *Trichorhachus* species, except *nitidus* of which B.M. possesses one ♂ and one ♀, were described from single ♂ specimens, and any tabulation of their characters based on such inadequate material can only be quite provisional, since it is impossible to be certain which of these characters are really specific and constant, and which liable to variation or even merely individual. The Type of one (*australis*, Westw., described as a *Schizocera*) is at Oxford, all the others are in B.M., and all this material, such as it is, I have examined and compared with the original descriptions. But I have seen no other representatives of the genus, nor—so far as I know—has any one else!

Konow's treatment of *Trichorhachus* in his *Genera Insectorum* illustrates the danger of speculating on the affinities of a genus without having seen any representative of it. (It is only fair to say that in this case he expressly acknowledges himself unacquainted with the insects otherwise than in literature; but there are cases in which he has unfortunately been less explicit.) He begins by placing it in his division "*Argides*," which he separates from his "*Schizocerides*" as having an intercostal nerve in the fore-wing. But in fact such a nerve is not present in any specimen of *Trichorhachus*. Yet neither can it belong to the *Schizocerides* as defined by Konow, since its

posterior tibiae are always spined before their apices. Again he separates it from the genera with "contracted" humeral areas (= lanceolate cells) as having this area "petiolated." Really, however, it is not petiolated (though Kirby so describes it), but contracted. *Trichorhachus* is therefore a link between Konow's *Argides* and *Schizocerides*, and either the division between these must be given up, or the definition of one of them must be emended, or a distinct group, *Trichorhachides*, must be established one of whose distinguishing characters will be the peculiar neurotation of the hind-wing (see the *Synopsis of Genera* given above, p. 254). Of these alternatives I should myself prefer the first, for the division of the *Arginae* into *Argides* and *Schizocerides* seems to me to bring together genera whose affinities are very remote, and to separate others which are probably very near relations. Such is almost sure, I believe, to be the result when very large groups are established on their agreement in a single arbitrarily selected character. In this particular case of the *Arginae*, which are perhaps the most widely distributed of all Sawflies, and which appear to have reached all parts of the world, and branched out here and there into new groups which are quite unrepresented elsewhere. I cannot think that any classification of their genera is likely to be natural which ignores their geographical distribution entirely.

As I only know one *Trichorhachus* ♀ (viz. *nitidus*, Kirby), and this seems to differ from its ♂ in nothing but the usual sexual characters (simple antennae, etc.), it must suffice here to tabulate such differences as I notice in the ♂♂, and it must always be remembered that some of these differences may not really be specific.

- | | |
|--|------------------------------|
| 1. Antennae black | 2. |
| — Antennae yellowish | 3. |
| 2. Wings with clear bases but clouded apices. Body above and below bright metallic blue, only the labrum, tempora, and extreme apex of abdomen yellow. Hind-legs entirely black. | |
| | <i>australis</i> , Westwood. |

Type at Oxford. "WEST AUSTRALIA."

- Wings clear throughout. Body above nearly dead-black, but slightly nigro-aeneous on parts of the thorax, and extreme apices of abdominal segments a little discoloured. Labrum yellow, but the rest of the face quite black, though Kirby

describes it as yellowish. Abdomen rufescent beneath. Hind tibiae and tarsi yellow, except the apices of the former, which are black. *abdominalis*, W. F. Kirby.

Type in B.M. "WEST AUSTRALIA, Swan River."

3. Legs, including the femora, pale yellow. This is apparently the smallest of the species—about 5½ mm. long. *nitidus*, W. F. Kirby.

Type in B.M. "WEST AUSTRALIA, Swan River."

— Larger forms—about 8 mm. long. At least the femora of all the legs are black or fuscous. 4.

4. Four posterior legs uniformly dark throughout. Face, tempora, hypopygium with the genitalia, etc., and the front tibiae and tarsi yellowish, the rest of the body metallic (chalybeous) with reflections varying in different lights between blue-green, indigo, etc. Wings clear *hyalinus*, W. F. Kirby.

Type in B.M. "WEST AUSTRALIA, Swan River."

— Hind tibiae paler beneath than above. Otherwise quite like *hyalinus*, except that the wings appear to be somewhat darker. *sobrinus*, W. F. Kirby.

Type in B.M. "AUSTRALIA?"

The localities given above are cited from Kirby's List. It would seem from them that the genus is likely to be confined to a single locality (Swan River); but if so, and if the above are all really distinct species, it is hard to see why they should all be represented by "unica." (Of course more material may exist, though apparently unrecorded, in Australian museums; in which case it is very desirable that some competent local entomologist should revise the genus properly.)

PERGA, LEACH (AND *XYLOPERGA*, SHIPP).

SYNOPSIS OF THE SPECIES.

Perga differs from any Northern genus in many significant respects, *e.g.*—

1. Its larva (Pl. XV, Fig. 17) has no ventral prolegs, while in all true "Cimbicides" and "Abiides" of Konow's

classification these are present to the number of 16! This fact has long been known, and the larvae of various *Perga* spp. have been repeatedly described and figured.* It is therefore rather surprising to find Konow on page 41 of his unfinished Monograph (*Zeitsch. f. Hym. u. Dipt.*, Vol. I, p. 169), tabulating six species of *Perga* as having larvae "with 22 legs"! My photograph above cited is from one of a number of specimens (preserved in spirit) in B.M., and it will be seen that the character is unmistakable. Konow, I must suppose, had never seen one; but, having made up his mind that *Perga* belonged to his Subfamily *Cimbicini*, arrived by deduction from this premiss at the conclusion that its larva must have 22 legs!

2. Its posterior tibiae have "ante-apical spines"—a character absent not only in all *Cimbicides* and *Abiides*, but in all Palaearctic and Nearctic genera of Konow's *Tenthredinidae* except certain genera of the *Argini*.

3. The structure of its thorax differs obviously in the apical lobation of the scutellum, and also in certain other less conspicuous details. (I do not here dwell on the latter characters, as they are somewhat "critical," and have been dealt with by Mr. Rohwer in his recent classification of the Suborder in *Proc. Ent. Soc. Washington*, 1911.)

4. The neuration is wholly different, *Perga* has in the fore-wing (*a*) an undivided radial cell, (*b*) normally at least four cubital cells, (*c*) no lanceolate cell—the "humerus" being obsolete or undeveloped, and in the hind-wing (*d*) one cell only (a cubital).

All these characters (in some of which it agrees with all other Australian and some S. American genera) separate it absolutely from all true *Cimbicides* and *Abiides*, and quite outweigh any reason for uniting it with them which might be suggested by the form of its antennae!

5. Again, a normal *Perga* has a reduced number of joints in the labial and maxillary palpi, namely, 3 and 4 respectively, instead of 4 and 6, which latter is the number in all *Cimbicides* and *Abiides*, and, so far as is certainly known, in all Northern *Tenthredinidae* whatever! (*Xyloperga*, however, does not possess this peculiarity, but has 4 labial and 6 maxillary palpi (Pl. XII, Fig. 14) as in the Holarctic genera.) But it is not certain what inferences

* Cf. Scott's description and figures in *Proc. Zool. Soc.*, 1859, p. 211, and Pl. LXII; also those of Davis in *Entomologist*, Vol. 1, p. 89, and of Froggatt in *Australian Insects*, p. 72 and Pl. X, etc.

ought to be drawn from this fact, so I here content myself with merely mentioning it.

This difference in the number of its palpi, combined with other characters which shall presently be noticed, certainly justifies the treatment of *Xyloperga*, as a good subgenus, and possibly as a good genus, though at present I am not convinced that it is either necessary or desirable to exclude it absolutely from *Perga*. Certainly some species of the latter (e.g. the *bella* group) seem to me to have really more characters in common with *Xyloperga*, than with others (e.g. *dorsalis*, etc.) in whose company such an arrangement would leave them. Therefore, in separating *Perga* and *Xyloperga* in my Synopsis of the Genera above, I have rather deferred to what I believe to be the opinion of more competent judges of such questions, than followed any conviction of my own. But, as to the other "segregations" which have been proposed mostly on single characters often insignificant, and sometimes quite imaginary,* such as the presence or absence of a distinct 1st cubital nerve in the wings of certain species, I must claim liberty to disregard them altogether, till the collection of more material makes it possible to say for certain, whether or no these characters (when they exist at all) are really characteristic of any natural groups of species. So far as I have been able to test them, I have always found them either "individual," or absolutely non-existent! So long as a majority of the species are known only from single specimens, and the total number of supposed species is no larger than at present, I can see no advantage whatever, and on the contrary considerable disadvantage, in prematurely establishing and naming sections, which may or may not correspond to real natural groups. On this kind of work I venture to think that "the last word" was said

* *E. g.* Leach says that *P. polita* has only 3 cubital cells. This is not really the case in his own Typical specimen, the 1st cubital nerve being merely interrupted in the middle, but not absent; and examination of other specimens shows that the aberration is not specific, but individual. However, on the strength of Leach's mistaken statement, Ashmead made *polita*, Leach, the Type of a "new genus," which he characterised by the absence of the 1st cubital nerve, and named "*Pseudoperga*." Perhaps, fortunately, the same name had been already employed by Guérin (1845) and Shipp (1894) to denote a different section of the genus, the Type of which is *lewisii*, Westw.; so that *Pseudoperga*, Ashmead, may safely be ignored as a homonym.

long ago by Aristotle's master Plato. He compares it to the methods of an unskilful butcher (*κακὸς μάγειρος*), cutting up his carcasses without regard to their "natural articulations" (*ἀσθρα ἢ πέγυχε*), and therefore not inserting his knife *between* the meeting-points of the limbs, but hacking *through* the bones themselves. This, I venture to think, exactly describes the manner in which Leach's genus has been dealt with by such writers as Shipp and Ashmead—of whom the former was evidently incompetent to deal with it at all, and the latter, though versed in the *literature* of the subject, seems to have had no actual acquaintance with any of the species, whose affinities he took upon himself to determine.

Xyloperga, Shipp, however (= *Heptacola*, Konow), is at any rate a real group, and differs from normal *Perga*, not only in its mouth-parts, and the other characters mentioned *infra* in my Table, but in sundry other details such as a peculiarity in the form of its clypeus, which is rather difficult to describe but easy to recognise when once thoroughly realised. It is (approximately) bisected transversely into two distinct areas, a basal and an apical, the latter being occupied (except at its extreme apical margin, which is a little recurved) by a sort of shallow sulcus above which the basal area rises somewhat abruptly to a higher level. The division between these higher and lower levels is nearly a straight line, so that the clypeus appears to have a double apical margin, or, in other words, to end before its real apex. Something of the kind occurs also in one group of *Perga* (*bella*, etc.), in which and also in certain spp. of "*Heptacola*" (i. e. *Xyloperga*) Konow describes the phenomenon as "Clypeus in der Mitte quer gebrochen," but he does not utilise it as a general characteristic of the latter genus.

The scutellum, also, of *Xyloperga* (as pointed out by Konow) is somewhat more narrowed posteriorly than in normal *Perga* spp. (subtriangular rather than oval or subquadrate), and this generally brings the "apical lobes" rather nearer together than in the other case.

Unfortunately most of the forms which make up *Xyloperga* are represented by at most one or two specimens in B.M. and at Oxford. The only species of which I have seen anything like a series is *unicittata*, W. F. Kirby, which Konow, quite wrongly, sinks as the ♂ of "*neumanni*," Westw. (= *ferruginea*, Leach). Konow is also mistaken

in commencing his List of "*Heptacola*" spp. with *H. macleayi*, Westw.; for the latter, as I have mentioned elsewhere, is neither a *Heptacola*, nor a *Perga*, but identical with Froggatt's Type-species of *Philomastix*, hitherto known as *glabra*, Froggatt. It must be known in future as *Philomastix macleayi*, Westw.

SYNOPSIS OF *PERGA* (AND *XYLOPERGA*) SPP.

♀♂.

1. Fore-wing with its third cubital nerve (Pl. XV, Fig. 14) rising at first perpendicularly from the cubitus, but soon becoming curved (or even suddenly angled) inwards and running obliquely towards the stigma. It is therefore not nearly parallel to the second cubital nerve. 2.
- Fore-wing with its third cubital nerve (Pl. XV, Fig. 15) approximately straight throughout, and parallel (or nearly so) to the second cubital nerve 22.
2. Antennae short, but not paradoxically so*—generally about

* Two species, both belonging to the section of *Perga* in which the third cubital nerve is sharply bent inwards, cannot at present be tabulated by their antennal characters, since the unique Type-specimen of each had lost its antennae before the species was described and figured. These are *P. walkerii*, Westwood, and *P. christii*, Westwood (Types of both at Oxford). I will therefore here mention other characters by which they may probably be recognised if they should be rediscovered.

1. *P. walkerii* is a rather large and robust form about 18 mm. long. The head (above), the pronotum, and the greater part of the legs (except the black hind femora), are fulvous. The whole mesonotum including the scutellum (!), the metanotum, the three basal segments of the abdomen above and all its ventral surface up to the sawsheath are black. The remaining (apical) segments of the abdomen above are reddish-fulvous. The wings are stained with yellow, their venation and the stigma brown. (Details of "saw," Pl. XIV, Fig. 12.)

2. *P. christii* has the abdomen entirely chalybeous. The head and thorax are blackish with very copious whitish markings. Of the latter colour are the clypeus, labrum, orbits of eyes, antennal tubercles, two spots on the vertex, the edges of the pronotum widely, a spot in the posterior corner of the middle mesonotal lobe, the whole scutellum with its apical lobe-like processes and the ridges which run obliquely from its basal corners towards the insertions of the wings. The basal half of each fore-wing is clear and colourless, but its apical half is distinctly infuscated throughout and especially so under the stigma. The veins and stigma are black. Length about 15 mm.

Konow treats this sp. as a synonym of *foersteri*, West. (i. e. *bella*,

- as long as the distance between the compound eyes. Their 3rd, 4th and 5th joints are all longer than broad, distinctly separated from each other and from the apical joint, which forms a "club" by itself. The antennae are thus "capitate," and not simply "elavate" 3.
- Antennae paradoxically short—about as long as the distance between their insertions. Some at least of the intermediate joints are broader than long, and as well as the apical joint they form part of the "club," which therefore commences immediately after the two short basal joints (cf. Pl. XV, Fig. 18). 15.
3. The hind tarsi (including the claw-joint) are evidently shorter than the hind tibiae. 4.
- The hind tarsi are approximately equal in length to the hind tibiae. (Group of *lewisii* and *ferruginea*. For details of the "saws" in this group, see Pl. XIV, Figs. 13, 14, 15.) 20.
4. Neither antennae nor scutellum ever black, but yellowish or brownish. (Saws as in Pl. XIV, Figs. 1 to 10.) 5.
- Either antennae or scutellum (or both) are black. (Saws as in Pl. XIV, Figs. 16 and 11.) 14.
5. Scutellum bisected by a wide and deep longitudinal furrow.
- Scutellum at most divided by a fine line or an inconspicuous depression, or not divided at all. 6.
6. The head above, the mesonotum (except its scutellum) and almost the whole abdomen above concolorous—metallic green or blue ("aeneous" or "chalybeous"). Fore-wings stained throughout with yellow. Middle of scutellum smooth and impunctate. 7.
- The head, the mesonotum (or at least its middle lobe), and usually the abdomen not aeneous nor chalybeous, but yellowish or brown (rarely with obscure violaceous reflections in certain lights). Wings in some species quite clear ("hyaline"), in others slightly clouded in parts, but seldom, if ever, really yellow 9.
7. Mesopleura entirely pale, concolorous with the pronotum and scutellum. Abdomen more or less discoloured (beneath and

Newman), but this is certainly a mistake, for the latter species belongs to the division of *Perga* in which the third cubital nerve is straight, whereas in *christii* this nerve is very strongly bent, even angled!

I am inclined to think that the species to which *christii* comes nearest is *dahlbomii*, Westwood, but it is impossible to be sure without having seen its antennae. Those of *dahlbomii* are extremely short (Section II of Kirby's List).

at the sides) in some specimens, but this may be due to immaturity. I do not believe that this is more than an aberration of the next species (*dorsalis*). It agrees with it exactly in all structural characters, details of "saws," etc. Nor can it be considered as a "subspecies" (= local race) since both forms occur in the same locality. *affinis*, W. F. Kirby.

VICTORIA. Type in B.M.

— Mesopleura at least partly, and abdomen entirely in all specimens seen by me, chalybeous or aeneous (concolorous with the mesonotum, head, etc.). 8.

8. Large form (about 24 mm. long). The general ground-colour in all specimens seen by me is rather green than blue. The details of the "saw" (Pl. XIV, Fig. 1) differ from those in all other spp. except *affinis*. This was the first species of *Perga* to be described, and is the Type of the genus.

dorsalis, Leach (? = *eucalypti*, Scott).

N. S. WALES and VICTORIA. Type (a ♂) in B.M.

— Very like *dorsalis* but smaller (about 20 mm. long) and with a very different saw (Pl. XIV, Fig. 7). One specimen in B.M. is coloured like *dorsalis*, but the others are all rather blue than green. *intricans*, n. n.

There are three examples of this form in B.M., two from Queensland and one from Adelaide, all ♀♀. At Oxford there is only one, also a ♀, from Adelaide, which Westwood—wrongly, I believe (*v. infra*)—considered to be the ♀ of his *schiodtei* ♂, though it is quite unlike the latter in coloration. It appears therefore necessary to give it a new name.

QUEENSLAND and ADELAIDE. Type in B.M.

9. Mesonotum with its side-lobes chalybeous. The middle lobe, head, and part of the abdomen testaceous.

schiodtei, Westw.

This I believe to be the true ♀ of *schiodtei*, Westw. It strongly resembles the ♂ in coloration and other characters. In B.M. there are, besides the unique ♀ specimen (S. W. Australia, Swan River), three ♂♂ exactly like Westwood's Type, and all, like the ♀, from S. W. Australia (one from Swan River). There is no similar ♀ at Oxford, and Westwood probably was unacquainted with it.

S. W. AUSTRALIA (Swan River, etc.). Type (a ♂) at Oxford.

- All lobes of the mesonotum entirely testaceous, or rarely brown (no part chalybeous). 10.
- 10. Scutellum quite smooth and impunctate with no indication of a dividing line or furrow. Wings, at least towards their apices, slightly infuscated *klugii*, Westw.

S. W. AUSTRALIA (Swan River). Type at Oxford.

- Scutellum punctured, or bisected by a longitudinal line or a shallow furrow. Wings glassy and quite clear. 11.
- 11. Scutellum with dense rugose punctures, bisected by a distinct though shallow longitudinal impression *kirbii*, Leach.

VICTORIA. Type (a ♂) in B.M., also one ♀.

- Punctures of scutellum more or less remote 12.
- 12. Scutellum with a very few hardly noticeable punctures, bisected longitudinally by a fine impressed line.

brevitarsis, n. n.

The unique specimen in B.M. was referred by W. F. Kirby to *kirbii*, but is evidently not that species. It differs from all other forms by its extremely short tarsi, which look only about half as long as the tibiae!

S. W. AUSTRALIA (Swan River). Type in B.M.

- Scutellum more largely and closely punctured than in *brevitarsis*, but not coarsely and rugosely as in true *kirbii*. Hind tarsi of normal length. *agnata*, n. sp.*

This also is a unique specimen. Its saw (Pl. XIV. Fig. 3) is more like that of *dorsalis* than those of the species to which it seems more nearly allied. Towards its *base*, however, which is not shown in the Figure, the teeth alter their shape and become bent as in *klugii*, etc. (Possibly this character is merely individual. More specimens are needed to settle the point.)

VICTORIA. Type in B.M.

* *Perga agnata*, n. sp.

♀ *P. kirbii*, Leach, notis paene omnibus—scilicet statura, colore lutescente, alis limpidis, etc.—simillima.

Differt scutello sparsius punctato, lobis eiusdem apicalibus minus productis, denique terebrae denticulis aliter formatis—scilicet haud uncinatis omnibus, sed plerisque (ut in *P. dorsali* et *affini*) lenissime tantum curvatis, immo paene rectis.

♂ differt a *P. kirbii* ♂ scutello multo sparsius punctato.

13. (5) General colour yellowish-brown* with certain areas paler (clear light yellow) especially the scutellum, the posterior corner of the middle mesonotal lobe, and a series of marks on the sides of the abdomen (where the lateral margins of the dorsal plates fold over and become ventral in situation). Hind femora widely blackened, tibiae so only at extreme apex. Wings yellowish, but otherwise almost clear. The longitudinal furrow on the scutellum is very noticeable, linear at its base and growing wider and deeper as it approaches the apex, but its lateral limits are not sharply defined. (The absence mentioned by Leach of a 1st cubital nerve is not a constant character, though Ashmead has treated it as generic! Even in Leach's own Type the nerve is not really absent in either wing, and in most specimens it is quite normally developed.) *polita*, Leach.

EASTERN AUSTRALIA (from Victoria to Cairns in Queensland). Type, and many other specimens in B.M.

- Very like *polita* but darker than normal specimens, and the scutellum is not yellow but brown like the areas adjacent to it. Hind femora and tibiae concolorous, pale throughout in all specimens examined. Lateral marks on abdomen much as in *polita*. Wings distinctly and even strongly infuscated under the stigma. The furrow on the scutellum seems distinguishable from that in *polita* by its more sharply defined diverging margins. . . . *castanea*, W. F. Kirby.

Kirby described what I take to be certainly the ♂ of this species under the name *divaricata*, but associated with it a ♀ belonging to quite another group, namely a *bella*. (*Vide infra*, 31, and cf. Pl. XV, Fig. 6, with Pl. XIV, Fig. 17, and Pl. XV, Figs. 5, 7, 9.)

VICTORIA. Type in B.M.

14. (4) Abdomen black with no part *red*, but segments 7 and 8 (above) each with a broad apical band of pale yellow, that on segment 7 deeply excised anteriorly (almost interrupted). The 5 preceding segments are quite black above, but streaked with yellow on the sides and venter. Scutellum yellow, but

* The dorsum in Leach's Type-specimen is darker than usual, and shows obscure metallic reflections (violaceous). Probably this results from the great age of the specimen. It must have been in the Museum for more than a century.

labrum and antennae entirely black. Length about 15 mm.
Saw, Pl. XIV, Fig. 16 *antiopa*, n. sp.*

S. W. AUSTRALIA (Yallingup and Kalamunda). Type
(and other specimens of both sexes) in B.M.

— Abdomen belted with red, black at base and apex, and without
any yellow markings. Scutellum margined with yellow.
Head above black. Hind tibiae and tarsi dark red (not
“entirely black” as stated by Konow). Wings dusky,
blackish brown, especially under the stigma. Length about
14 mm. Saw, Pl. XIV, Fig. 11 *esenbeckii*, Westw.

S. W. AUSTRALIA (Swan River). Type at Oxford.
Another ♀ in B.M.

15. Antennae with only five † joints visible. Wings in West-

* *Perga antiopa*, n. sp.

♀ *Nigra*, labro antennisque concoloribus. Lutea vel eburnea
sunt—tubercula antennalia, parsque genarum his adjacens; clypei
latera; mandibularum maculae basales; striga longa (superne
abbreviata) postocularis; pronoti margo posterior; scutellum; pleu-
rorum pedumque major pars (apicibus vero tibiarum posticarum
tarsorumque nigris); segmentorum abdominis dorsalium 7^{mi} et
8^{vi} margines apicales; et in segmentis praecedentibus maculae
magnae laterales ventralesque, quae tamen desuper spectanti vix
(aut ne vix quidem) apparent.

Scutellum sparse punctatum, sulco mediano divisum. Alae
brunneo subfuscatae. Clypei apex subexcisus. Antennae capi-
tatae, normales, articulo 3^{to} sequentibus duobus conjunctis
subaequali.

♂ *Pictura* corporis cum ♀ satis bene congruit; differt vero capite
et thorace plus minusve copiose rufo-variegatis, etiamque antennis
post articulum 2^{um}, pedibus totis, mesonoto pleurisque partim
rufis, clypeo et plerumque labro immaculatis, flavis, ventre copiosius
flavo-picto.

† Konow questions this, but Westwood's statement is perfectly
correct, and his enlarged figure of the antenna shows the character
clearly. (Cf. also my Fig. 18, in Pl. XV which is drawn from Kirby's
Type-specimen of *bisecta*.)

Authors have blundered strangely about this species. W. F.
Kirby placed his *bisecta* in his Section I, as though its antennae had
been of normal length and shape, while he actually enumerates
mayrii among the species of his Section III, as though its antennae
were *seven*-jointed! Shipp makes confusion even worse confounded.
Although Westwood's Type was actually in his charge, and he
might have counted for himself the joints of its antennae and the
nerves of its cubital area, he adopts, instead, Kirby's erroneous
classification and Westwood's figure of the wing in which the
neuration is imperfectly represented, and creets accordingly an
imaginary “genus”—of which he names *mayrii*, Westw., as the

wood's Type-specimen with the 1st cubital nerve very faint, *nearly obliterated* ("fere obliterata," as the author correctly states), but not quite so, though his Figure does not show it at all. (In Kirby's Type of *bisecta* this nerve is quite distinct and normal!) The body is almost entirely fulvous, but with the pleura, sterna, metanotum, propodeum, hind femora, a spot and streak on the middle mesonotal lobe, and the edges of the scutellum as well as a large mark on its disc, more or less completely blackened. The wings have a yellow stain, and their neuration and the stigma are brownish. A larger and more robust species than most of this group (Section II in Kirby's List)—about 18 mm. long. I have not been able to examine the saw, and cannot describe its characters. . . . *mayrii*, Westw. = *bisecta* W. F. Kirby.

I have carefully compared the Types of *mayrii*, Westw., and *bisecta*, Kirby, and am certain that the two belong to one species. Both specimens were taken by the same collector (Mr. Du Boulay) in West Australia; *mayrii* at Swan River, *bisecta* at Nicol Bay.

W. AUSTRALIA. Type of *mayrii* at Oxford. Type of *bisecta* in B.M.

- Antennae with six joints 16.
 - 16. Thorax nearly unicolorous, lighter or darker testaceous throughout 17.
 - Thorax black with yellow markings 18.
 - 17. General colour pale testaceous. Head and mesonotum opaque, very closely punctured and rugulose. Hind tarsi pale.
- belinda*, W. F. Kirby.

The details of the saw in this species curiously resemble those which appear elsewhere only in the group of *bellu*. Cf. Pl. XIV, Fig. 17, and Pl. XV, Figs. 5, 6, 7 and 9. But its other characters, and especially the form of the 3rd cubital cell, suggest that it can only be very remotely connected with that group.

S. AUSTRALIA (Adelaide). Type in B. M.

type—characterised by seven-jointed antennae and only three cubital cells!! It seems to me altogether unreasonable that, when a so-called "genus" is thus founded solely on blunders and misrepresentations, and corresponds to no real group of natural objects whatever, it should be allowed "standing in nomenclature" merely because the author has gone through the form of "selecting a type." Such work is certainly no contribution to science, and does not deserve to be treated seriously as literature.

— General colour much darker—a ruddy brown. Head and mesonotum shining; the punctures on the latter large, but very sparse. Hind tarsi blackish. . . . *lucida*, Rohwer.

The Type is unique, and I have been unable to examine the details of its saw properly, but what I can see of them reminds me of the *lewisii* group, and especially of *ferruginca*, which it resembles also in coloration, though its sculpture-characters are very different.

N. S. WALES. Type in B.M.

18. Dorsum of abdomen red, except at the base and apex which are black. Head and thorax black with copious yellow markings (two large spots behind the ocelli, another in the posterior corner of the middle mesonotal lobe, etc.). Length about 16 mm. Wings quite clear. . . . *ressonii*, Westw.

Perhaps, as Konow thought, this is the ♀ of *brullei*, Westw. But its femora are black, which is not the case in *brullei* ♂, and this is a character in which the two sexes of a *Perga*-species generally agree.

ADELAIDE. Type at Oxford.

— Dorsum of abdomen entirely, or at least throughout its longitudinal diameter, dark violaceous or chalybeous. . . . 19.

19. Clypeus, labrum, apices of hind tibiae and tarsi, and also—*teste* Westwood*—the antennae, black. Abdomen nigro-violaceous. Wings not distinctly infuscated. Scutellum

* I have only seen one ♀ certainly referable to *dahlbomii*, Westw., namely the original author's Type-specimen, and this, as well as the ♂ which he described with it, has now lost both its antennae. Two ♂♂, however, in B.M. agree precisely with Westwood's ♂ in other characters, and both these have black (or at least blackish) antennae. Neither these ♂♂, nor either of Westwood's specimens, are stated to have come from any particular district in Australia. Two ♀♀ in B.M. were supposed by W. F. Kirby to belong to the same species, but they differ greatly in coloration from the type, having the antennae, clypeus, labrum, and the whole of the tibiae and tarsi yellow. (Also in one of them the sides of the abdomen are broadly rufescent.) On the whole they agree better with *christii*, Westwood, and come from the same locality, viz. Swan River. But they differ from Westwood's Type of *christii* in several characters—having, *e. g.* entirely clear and colourless wings, no yellow streaks between the insertions of the wings and the basal corners of the scutellum, the apical lobes of the latter not yellow, as in typical *christii*, but black, and the abdomen rather violaceous than cyanaceous. On the whole I can only think them to be neither *dahlbomii* nor *christii*, but a distinct species of the same group from which I propose the name *vacillans*.

flatter than usual, without the usual distinctly projecting apical lobes, but with its whole extreme apical margin slightly raised, and ending on either side in a sort of obtuse angle only—not an actual protuberance . . . *dahlbomii*, Westw.

Precise *habitat* not recorded. Type (♀) and Co-type (♂) at Oxford.

— Clypeus, labrum, apices of hind tibiae, and tarsi not black but yellow, as are also the antennae. Abdomen eyaneous. Fore-wings with the bases clear but the apical half distinctly clouded especially below the stigma. Scutellum with normal (yellow) apical lobes, an oblique narrow yellow streak runs from each of its basal corners towards the tegulae.

christii, Westwood.

W. AUSTRALIA (Swan River). Type at Oxford.

20. (3) Antennae black. Length only about 14 mm. Otherwise hardly to be distinguished from the species next following (*lewisii*). Both are almost entirely brownish-yellow above, the head and thorax rugosely sculptured and dull, the abdomen smooth and somewhat shining, the apices of the hind tibiae and tarsi black. In both the elypeus is rather dull, and scattered over it are rounded pits or "foveae," each containing at its bottom a puncture from which proceeds a longish hair. . . . *guerinii*, Westw. = *smithii*, Westw.

This ♀ is called by Westwood *smithii*, but I feel little doubt that it is the ♀ of the ♂ which he had already described under the name *guerinii*, and the latter name must therefore be adopted.

Konow considered *guerinii* to be the ♂ of *lewisii* (described long before from a ♀), and treated *smithii* as the ♀ of *ventralis* ♂ described by Guérin in 1845. But the measurements given by their authors for *ventralis* ♂ and *guerinii* ♂—the former being evidently the larger insect—and also the agreement of *guerinii* with *smithii* and not with *lewisii* in the rather unusual character of entirely black antennae, make me sure that Konow was mistaken, and that he has reversed the facts. (At the same time there seems to be at present no positive proof that the above ♂♂ and ♀♀—which differ altogether in colour—are really in any way connected. That they are so, seems to be merely an inference from their agreement in certain characters.

which are not all of equal importance.* In both cases the ♀♀ seem to be extremely common, while the ♂♂ are hardly known at all. It is most desirable that these doubts should be cleared up by rearing larvae of both forms on a large scale, which would be sure sooner or later to procure the evidence that is wanted. (Kirby's "*sericea*" ♂ in B.M. appears to me identical with *guerinii* ♂ of Westwood, and I think it likely that "*chalybea*" ♂, Froggatt, is either the same, or perhaps more probably the true *ventralis*. Unfortunately Mr. Froggatt does not mention the colour of the antennae in his species.)

The Types of *guerinii* (♂) and *smithii* (♀) are both at Oxford. Westwood gives no particular locality for either, but specimens of *smithii* in B.M. are from Victoria.

- Antennae not black, but luteous or ferruginous 21.
21. Larger (about 19 mm. long) and paler. Yellowish with the apices of hind tibiae and tarsi, and usually the sides of the mesonotum blackened *lewisii*, Westwood (1836).

TASMANIA and VICTORIA.

- Smaller and darker, brownish-testaceous, with legs and sides of mesonotum coneolourous. (*P. froggatti* (♀), Rohwer, in my opinion certainly belongs to this species, and "*newmanni*," Westw., and "*sellata*," Kirby, are ♂♂ of the same insect.)
ferruginea, Leach = *froggatti*, Rohwer.

N. S. WALES and VICTORIA. The Type of *ferruginea*, Leach, according to Kirby, is a ♀ in B.M. Westwood, however, says that it is a ♂ at Oxford; but he cannot be right as to this, for Leach describes a ♀ only, and says distinctly *Mas latet!* The Types of *froggatti* (♀) and *sellata* (♂) are in B.M. That of *newmanni* ♂ is at Oxford.

22. (1) Antennae with only 5 joints really separated from the "club," but the latter is sometimes constricted (on one side only, not all round!) so that in certain aspects the antennae look seven-jointed. A more important character is the

* The character of "three cubital cells only," on which Guérin founded his Subgenus *Pseudoperga* for *lewisii* and *ventralis*, is certainly not reliable. The first cubital nerve is not always absent in any species of the group, and very seldom so in *ferruginea*, Leach, which clearly belongs to it.

following—N.B. labial palpi scarcely thicker than the maxillary and with *only three* joints, maxillary with *only four*. (The same is the case with all the species tabulated above!) 23.

— Antennae with 6 joints distinctly separated from the club. Labial palpi much thicker than the maxillary, and *four*-jointed; maxillary palpi *six*-jointed (Genus, or Subgenus?, *Xyloperga*, Shipp = *Heptacola*, Konow). In this latter character the Group agrees with practically all non-Australian Tenthredinidae except a few in Central and South America! 32.

23. Antennae far longer than in any other species; all their joints before the club slender and elongate (joints 3 and 4 subequal, 5 a little longer, and more than half as long as the club). All these joints and the base of the club are black, its apex is white (Pl. XV, Fig. 20). Abdomen bright testaceous above, whitish beneath, blackened on each side, these lateral black vittae successively widening posteriorly and so spreading more and more on to the dorsum, till on the penultimate segments they actually meet.

cameronii, Westwood = *leucomelas*, Rohwer.

This is a very distinct and remarkable species. Unfortunately in Westwood's Type-specimen the antennae are wholly wanting and were so when he figured and described it. But in the Type-specimen of *leucomelas*, Rohwer, which I have carefully compared with Westwood's Type of *cameronii*, and which, I feel sure, is conspecific with it, the antennae are perfect, and at once suffice to distinguish the species from any other. Cf. Pl. XV, Fig. 20 (drawn from the Type of *leucomelas*).

Type of *cameronii* at Oxford, of *leucomelas* in B.M. Westwood cites no particular locality for *cameronii*. The Type of *leucomelas* is from QUEENSLAND (Cairns).

— Species with normal antennae, and very different coloration from *cameronii* 24.

24. All tibiae and tarsi quite black. Abdomen red and very shining. Antennae and scutellum black. Fore-wings with a strong brownish clouding below the stigma. Length about 14–15 mm. Saw, Pl. XV, Fig. 4. *glabra*, W. F. Kirby.

QUEENSLAND (Mackay) and N. S. WALES (Sydney). Type in B.M.

- All tibiae at least (usually the tarsi also) entirely pale, or blackened only at their apices 25.
- 25. Antennae black 26.
- Antennae never black, but yellow or testaceous 27.
- 26. Scutellum pale, labrum and abdomen entirely black, saw (very peculiar) Pl. XV, Fig. 10. *bicolor*, Leach.

VICTORIA and N. S. WALES. Type in B.M.

- Scutellum black, labrum yellow, abdomen yellow at base and apex. *spinolae*, Westw.

VICTORIA. Type at Oxford.

- 27. Small species, about 13 mm. long. Hind tibiae blackened at apex. Body almost entirely testaceous, except that the pronotum is bordered with yellow. Westwood described this ♀ as a new species (*viz. dalmanni*), but I think Konow is right in considering it to be the ♀ of *latreillei* described (from a ♂ only) by Leach.

latreillei, Leach = *dalmanni*, Westw.

ADELAIDE to SYDNEY. Type of *latreillei* (♂) in B.M. Type of *dalmanni* (♀) at Oxford.

- Larger forms, about 17 mm. long or more. Hind tibiae pale at apex. 28.
- 28. Abdomen without white or yellow lateral markings: it is either testaceous entirely, or testaceous with the apex black, above, beneath, and at the sides 29.
- Each side of the abdomen is ornamented with a continuous series of uniform white or yellow marks. These are situated on the lateral margins of the successive *dorsal* plates; but, since the latter are folded inwards under the abdomen, the marks to be fully seen must be viewed ventrally.* . . . 30.
- 29. Hind femora broadly blackened, contrasting strongly with the testaceous tibiae and tarsi. Thorax above, including the pronotum and scutellum, almost entirely black, dull and deeply punctured. Abdomen testaceous throughout. Forewings with a strong yellow stain except at their margins which are faintly violaceous in certain lights. Saw. Pl. XV, Fig. 8. About 16 mm. long *hartigii*, Westw.

Type at Oxford.

* Similar marks have been already mentioned as occurring in some species of other groups (*polita*, *antiopa*, etc.).

— Hind femora immaculate, testaceous, concolorous with the tibiae and tarsi. Abdomen testaceous, black at the apex.

In size, habit, and most external characters, this species much resembles *hartigii*, but its saw (Pl. XV, Fig. 9) is altogether different, and almost identical with that of *bella*,
gravenhorstii, Westw.

Type at Oxford.

30. Head, mesonotum (except its lateral areas which are sometimes blackened), scutellum, and abdomen, testaceous with copious yellow markings, *e. g.* a pair of spots behind the ocelli, an elongate oval mark on the middle mesonotal lobe, a series of marks (as in *polita*, *antiopa*, etc.) on the infolded margins of the abdominal dorsal plates, etc. Saw, Pl. XV, Fig. 6. *bella*,* Newman (1841)
 = "*divaricata*" ♀ (*nec* ♂), W. F. Kirby (1893).

(The ♀ associated by Kirby with his "*divaricata*" ♂ belongs in my opinion to this species. His ♂—which is the Type—I have already identified as the male of *castanea*.)

VICTORIA: S. AUSTRALIA (Adelaide).

— Yellow markings much as in *bella*, but the general colour of the body is not testaceous, but very dark, black, or nigro-chalybeous, or nigro-violaceous 31.

31. Hind femora black. Yellow marks of head thorax and abdomen as in *bella*, but the ground-colour very different, that of the thorax black, that of the abdomen above chalybeous. Scutellum black, except its apical lobes and a triangular space

* The Type of *bella* seems to have long ago disappeared. It was from Adelaide, "a single ♀ in the cabinet of the Entomological Club." In 1844 the Club presented its collection to B.M. But according to Kirby's List (1882) the three specimens of *bella* from Adelaide then (and still) in the Museum were all "purchased." If so—and Kirby's statement is borne out by the Museum "Register of Accessions"—none of these can be the Type, which would have been registered as "*presented*," and not as "*purchased*." (F. Smith seems to have confounded *bella* with *ferruginea*, and Westwood states that the two forms are very near to each other. But I can see no likeness whatever between them, and they certainly belong to quite different groups, since they agree neither in venuration nor saw-characters.)

(stretching from these lobes to the base of the scutellum), which are yellow *bella*, var. ? *

N. S. WALES. Type in B.M.

— Femora tibiae and tarsi concolorous, testaceous. Middle lobe of mesonotum not spotted in the middle with yellow, but testaceous at its sides. Ground-colour of thorax and abdomen black, with a violaceous tinge in certain lights. Pale markings of head and abdomen as in typical *bella*.

rubripes, Rohwer.

TASMANIA. Type in B.M.

32 (22) Dorsum of abdomen for the most part yellow or testaceous 33.

— Dorsum of abdomen chalybeous; at most its sides and ventral surface are pale or red 36.

33. Antennae blackish. Body except the base of the abdomen almost entirely yellow. Size appears to vary greatly—from 15 to 20 mm. long. Details of saw Pl. XV, Fig. 12.

aurulenta, n. sp. †

* This specimen in the B.M. collection is labelled "*bella*, var. *nigra*, Rohw." But I believe that this name is unpublished. It is exceedingly like *rubripes*, and I doubt if it really differs from the latter specifically. In fact, since all these forms agree absolutely in practically everything but colour, and especially in the highly characteristic structure of their saws, I am tempted to think that Kirby, Westwood, etc., were right in including them all as forms of *bella*.

The ♂ of *bella* is probably, as suggested by Konow, *foersteri*, Westw. But if so, of course Newman's much older name (*bella*) should be adopted for the species. Konow also sinks the name *christii*, Westw., as a synonym of "*foersteri*," i. e. *bella*. But this is certainly a mistake, for *christii* (see above, 19) belongs to the section of *Perga* in which the 3rd cubital nerve is bent (Pl. XV, Fig. 14), while in "*foersteri*" and *bella* (♀) this nerve is straight (Pl. XV, Fig. 15).

† *Perga* (*Xyloperga*) *aurulenta*, n. sp. ♀.

Pallide flava paene tota, sed partibus his denigratis—antennis; suturis abbreviatis inter antennis ocellosque posticos, suturis occipitalibus et macula prope occipitale foramen sita: fascia bilobata ante pronoti marginem basalem, vitta lata triangulari in mesonoti lobo medio, aliaque macula (multo minore) ante scutellum; fascia basali in dorso abdominis; pedum posteriorum femoribus, tibiarum apicibus, et parte tarsorum. Clypei dimidium basale elevatum, et a dimidio apicali concavinsculo truncatura fere rectilineari transversa separatum. Scutellum apicem versus angustatum, lobis eiusdem apicibus satis longis. Alae flavescentes, venis et stigmatibus aurantiacis. ♂ ignotus.

I have seen two specimens only (both ♀♀) of this very distinct species, which were received at the B.M. in 1911 from Mr. H. J. Hillier. Except these, I have seen no Sawflies at all from Central Australia; and though evidently congeneric with the *Xyloperga* spp. of the coast districts (Swan River, etc.), they differ exceedingly from them all in coloration, resembling rather in this respect certain groups of Hymenoptera which are chiefly found in the sandy deserts of tropical and subtropical Africa and Asia.

CENTRAL AUSTRALIA (Hermannsburg). Type in B.M.

- Antennae not blackish, but ferruginous or yellow 34.
34. Apices of hind tibiae blackened. Head thorax abdomen and legs for the most part nearly concolorous (ferruginous), but the abdomen in some specimens is more or less clouded or streaked transversely with black. Length about 15 mm. Details of saw, Pl. XV, Fig. 13. . . *univittata*, W. F. Kirby.

(The resemblance between this insect and "*newmanni*," Westwood (i. e. *ferruginea*, Leach), of which Konow supposed it to be the ♀ is quite superficial. In all structural characters they wholly differ.)

QUEENSLAND (Mackay). Type and other specimens (♂♂ and ♀♀) in B.M.

- Legs quite pale, not blackened at the apices of the hind tibiae. Head above for the most part black 35.
35. Mesonotum with the middle lobe only anteriorly, and the side lobes only posteriorly, blackened, otherwise concolorous with the dull pale-brownish scutellum. Tempora and a streak behind each of the posterior ocelli whitish yellow, otherwise the head above is black. Length about 12½ mm.

leachii, Westw.

VICTORIA. Type in B.M.

- Mesonotum quite black, scutellum clear yellow. A handsome, highly-coloured insect. Larger (about 14 mm. long) than *leachii*, though Westwood says it is smaller, evidently by a mere slip, as he also gives correctly the measurements of the two in lines. Details of saw, Pl. XV, Fig. 11.

halidaii, Westw.

(The *halidaii* of B.M. Catalogue has nothing to do with this species. It is merely a small *latreillii*.)

S. AUSTRALIA (Adelaide). Type at Oxford.

36. (32) Legs and venter violaceous black. Tempora, scutellum, and sides of abdomen, bright reddish-orange. Scutellum unusually wide at the apex, its lobate processes far apart. Length about 15 mm. *juvunda*, W. F. Kirby.

W. AUSTRALIA (Swan River). Type in B.M.

- Legs and venter at least partly pale or red 37.
 37. Hind tibiae not blackened at their apices 38.
 — Hind tibiae blackened at their apices 40.
 38. Legs and venter bright orange-red. Length about 13 mm.
amenaïda = *rufomaculata*, W. F. Kirby.

This ♀ was described by W. F. Kirby as *rufomaculata*, but Konow was right, I think, in treating it as the ♀ of *amenaïda* (♂), which name precedes *rufomaculata* in Kirby's List.

ADELAIDE. Type in B.M.

- Legs and venter not reddish, but pale luteous 39.
 39. Antennae scutellum and venter entirely luteous. Length about 14½ mm. Tempora, a pair of longitudinal streaks behind the posterior ocelli, edge of pronotum very narrowly and oblique lateral carinations of mesonotum yellow. Body nearly dead-black, the abdomen having a very slight tinge of metallic purple only noticeable in a strong light.
jurinei, Westw.

N.W. AUSTRALIA? Type (a ♂) at Oxford (♀ in B.M.).

- Antennae, part at least of scutellum, and sides of ventral segments black. Abdomen with a very noticeably metallic coloration, purple in some lights, blue in others; the propodeum, however, the mesonotum, the pronotum (except its luteous edges), and the dark markings on various parts of the fulvous head are simply black. *semipurpurata*, n. sp.*

Of two specimens in B.M. one (the Type) is larger, fully 15 mm. long; its scutellum is yellow, bisected longitudinally by a broadish stripe of black; its antennae

* *Xyloperga semipurpurata*, n. sp.

Caput fulvum nigro-variegatum; thorax niger luteo-pietus; propodeum nigrum, reliqui abdominis dorsum (exceptis lateribus et apice luteis, pulcherrime metallescens (purpureo-cyanicum), venter luteus nigro anguste marginatus. Pedes post coxas toti lutei. Alae superiores lutescentes, inferiores albo-vitreae. Long. 15-12 mm. (Scutellum vel flavum nigro-vittatum, vel interdum totum nigrum.)

entirely black. The other is much smaller, only about 12 mm. long, and its scutellum is entirely black. (The antennae in this specimen are broken, but what remains of them is black.) In all other characters the two specimens agree exactly, they were taken in the same place, and I have no doubt that they belong to one species. The smaller form is probably an aberration merely. If a name be needed for it, it may be called *semipurpurata*, var. *melanaspis*.

S. W. AUSTRALIA (Yallingup). Types in B.M.

40. (37) Antennae entirely yellow. Middle lobe of mesonotum margined with yellow, side-lobes and basal segments of abdomen more or less rufescent. Length about 12 mm.

lalage, W. F. Kirby (?) *

— Much larger than *lalage*, and with the antennae not entirely yellow 41.

41. Antennae black except the basal joint. Middle lobe of the mesonotum in the unique Type apparently entirely black (but, being pinned through this part, it cannot be examined quite satisfactorily). Not unlike a very large *semipurpurata*; the colour of the abdomen above is a fine rich purple, as in that species, but the venter seems to be marked with black only at its base, the scutellum has no black central vitta (though the commencement of one seems to be indicated by a little black triangle at its extreme base), and the head above is almost entirely luteous between the ocellar area and the occiput, with only a narrow black longitudinal vitta bisecting the vertex, while in *semipurpurata* there are also a pair of subtriangular black maculae running from the occiput to the eyes and covering a part of their orbits. This, except *aurulenta*, is the largest *Xyloperga* which I have examined, fully 18 mm. long . . . *dentata*, W. F. Kirby.

S. AUSTRALIA (Adelaide). Type in B.M.

— Antennae fulvous except the two basal joints and extreme apex of each which are black. Middle lobe of the mesonotum with a yellow mark in its posterior angle. Smaller than *dentata* (about 16 mm. long) and with the metallic colour of

* The type of *lalage* is a ♂ from Melbourne. The ♀ which I venture to associate with it was received in B.M. after Kirby's death, and is from a very different locality, viz. Cairns in N. Queensland. Still it appears to me conspecific with Kirby's Type.

the abdomen different—not rich purple, but a sort of dark indigo. The scutellum is yellow, with no black central vitta, but bisected longitudinally by a sharply defined sulcation *buyssoni*, Konow (?)*

VICTORIA.

♂♂.

(For *localities* of spp., so far as I know them, see the Table of ♀♀ above.)

- 1. Third cubital nerve bent as in Pl. XV, Fig. 14 2.
- Third cubital nerve approximately straight 15.
- 2. Hind tibiae considerably longer than hind tarsi (claw-joint included) 3.
- Hind tibiae about as long as hind tarsi 14.
- 3. Antennae of normal length, capitate, 3rd and following joints before the elub distinctly separated, and never broader than long 4.
- Antennae paradoxically short, more or less clavate from the 3rd joint onwards, the joints usually indistinctly separated and broader (at their apices) than long 12.
- 4. Intermediate segments of abdomen above clothed with dense rows of pale decumbent hairs, the hairs in each row of equal length and lying parallel to one another (longitudinally). (A character not unlike this occurs in ♂♂ of the non-Australian genus *Abia*!) Large forms (about 20 mm. long in average specimens) 5.
- Intermediate segments of abdomen above glabrous 6.
- 5. Head above and mesonotum (except its yellow scutellum) unicolorous (metallic greenish). (Abdomen usually coloured similarly, but one specimen in B.M. from Melbourne has it entirely reddish!) Mesopleura with or without yellow markings, but never perhaps entirely yellow (Type in B.M.).
dorsalis, Leach.
- Head and mesonotum coloured as in *dorsalis*, but mesopleura entirely yellow, and abdomen with its sides and apex rather brightly rufescent. (Whether the unique B.M. "Type" from Tasmania really belongs to its supposed ♀ and differs specifically from *dorsalis* seems very doubtful)
affinis, W. F. Kirby.

* I have not seen the Type of *buyssoni*, which is presumably at Berlin: but a single unnamed specimen in B.M. answers fairly well to his description. The locality cited for it by Konow is Tasmania.

6. Scutellum bisected longitudinally by a deep and wide sulcation. Fore-wing with a conspicuous* patch of scale-like hairs (situated on the underside of the wing, but visible *through it* from above) which occupies part of the radial and cubital areas (Pl. XI, Fig. 5) 7.
- Scutellum not deeply sulcate—at most with a slight central impression. Fore-wing with no *conspicuous* aggregation of hairs, as described above, though several species when carefully examined seem to possess the character to a certain extent, while others lack it entirely 8.
7. The fore-wing only with a pilose patch as above described. General colour of the insect testaceous brown, but the scutellum distinctly yellow *polita*, Leach.
- Hind-wing with a pilose patch like that of the fore-wing but much smaller. General coloration of insect darker, scutellum not yellow but brown like the rest of the dorsal surface.
castanea, W. F. Kirby = *divaricata*, W. F. Kirby. ♂, nec ♀! †

Type of *divaricata* in B.M.

8. Two basal joints of antennae black, the rest testaceous. Abdomen black above, sulphur-yellow beneath. Scutellum testaceous (not yellow) with a more or less conspicuous central sulcation *antiopa*, n. sp.
- All joints of antennae luteous (none black!) Dorsum of abdomen never black. (Scutellum may be *yellow*, or may differ from that of *antiopa* in its sculpture) 9.

* Visible to the naked eye! It is very desirable that these hairs should be examined in living specimens. They much resemble the so-called *androconia* of some ♂ Lepidoptera, and I venture to suggest that they may have a similar function. This point cannot be investigated to any purpose in old dried specimens. "Australian Entomologists, please note!" So far as I know, the existence of scent-scales in the wings has never yet been suspected in any Hymenopteron, though it is well known that certain ♂ Bees have a peculiar fragrance (*Psithyrus*, etc.).

† The ♂ and ♀ described together by W. F. Kirby (*Ann. and Mag. N.H.*, 1893, p. 39) as the sexes of a new species "*divaricata*" cannot possibly be conspecific, their neuration showing that they belong to different groups. *Divaricata* ♂ I take to be almost demonstrably the ♂ of *castanea* previously described from ♀ only by the same author; and *divaricata* ♀ is in my opinion a specimen of *bella*—it certainly belongs to the *bella* group, as shown both by its neuration and its saw-characters!

Kirby (*l.c.*) says he was "at first inclined to refer these specimens to *P. castanea*, Kirby." He did not do so because "in that species the scutellum is much less thickly punctured."

9. Scutellum bright yellow, almost or quite impunctate and unsculptured 10.
 — Scutellum brown (or only obscurely yellow) with strongly punctured disc 11.
 10. Side lobes of mesonotum partly chalybeous . *schioddei*, Westw.
 — Side lobes of mesonotum entirely testaceous . *klugii*, Westw.
 11. Puncturation of scutellum extremely dense and rugulose.
kirbii, Leach.
 — Puncturation of scutellum scattered and irregular. *agnata*, n. sp.
 12. Abdomen above and below dark violaceous. Hind legs with femora tibiae (at extreme apex) and tarsi blackened. A small form—about 12 mm. long . . . *dahlbonii*, Westw.
 — Abdomen for the most part testaceous above and below . 13.
 13. Larger—about 17½ mm. long. Scutellum with its entire apical margin black. Abdomen with its intermediate dorsal segments feebly but rather broadly infuscated above, the infuscation looking somewhat metallic (greenish) in certain lights.
vollenhorii, Westw.*

Type at Oxford.

- Smaller—10 to 15 mm. long. Scutellum entirely yellow, or with its apical lobes only darkened. (N.B.—In all ♂♂ of this group the scutellar lobes are almost obsolete.) Abdomen above after the propodeum either entirely testaceous or with very slight and interrupted indications of a darker central line. In some specimens (*dubia*, W. F. Kirby) the propodeum is yellowish, in others—as also in *vollenhorii*—it is black. All these colour differences are likely to be inconstant; and I can only at present recognise one variable species in the specimens before me *brullei*, Westw.
= *ritsemei*, Westw. = *dubia*, W. F. Kirby.

Types of *brullei* and *ritsemei* at Oxford. Type of *dubia* in B.M.

14. Antennae black; scutellum black except its yellow apex; abdomen above chalybeous, (a beautiful steel-blue!) beneath pale yellow. Hind tibiae with black apices.
guerinii, Westw. = *sericea*, W. F. Kirby.

Type of *guerinii* at Oxford. Type of *sericea* in B.M.

* Two ♂♂ of this in B.M. were determined by W. F. Kirby as *brullei*, Westw. These specimens are from Queensland.

- Antennae scutellum and abdomen all testaceous. Hind tibiae without black apices *ferruginea*, Leach
 = *newmanni*, Westw. = *sellata*, W. F. Kirby.

Type of *newmanni* at Oxford. Type of *sellata* in B.M.
 The Type of *ferruginea* (B.M.) is a ♀.

15. Antennae with only 5 joints completely * separated from the apical club. Labial palpi with only 3 joints, maxillary with only 4 16.

- Antennae with 6 joints completely * separated from the club. (Genus *Xyloperga*, Shipp = *Heptacola*, Konow). Labial palpi with 4 joints, maxillary with 6 18.

16. Larger—about 14 mm. long. Wings stained with yellow, their margins with a faint greyish-purple infuscation. Abdomen belted with bright red over its 2nd and 3rd segments, the following segments deep black.

gravenhorstii, Westw. = *peletieri*, Westw.

Type of *peletieri* at Oxford. The Type of *gravenhorstii*—also at Oxford—is a ♀.

- Smaller—about 11–12 mm. long. Wings and abdomen coloured otherwise 17.

17. Abdomen blackish above, more or less rufescent near the articulations of its segments. At the sides and on the ventral plates it bears conspicuous whitish markings. Clypeus and labrum yellow. *bella*, Newman = *foersteri*, Westw.

N.B. The clypeus, especially when viewed laterally, appears as though its apex ended on each side in a blunt, but distinctly projecting, tooth! (This is because the clypeus, before its apical margin which is slightly reflexed, is impressed deeply at its centre but not at its sides so that the corners are left standing up at a higher level than the rest.)

N.B.—Both fore- and hind-wings, as in *castanea*, are furnished with patches of scale-like hairs in the radial and cubital areas!

Type of *foersteri* at Oxford. (It is, I think, certainly the ♂ of *bella*, which was described from a ♀). There is another specimen quite like it in B.M.

* By "completely" I mean "all round." The club itself sometimes appears more or less *indented* laterally (as though jointed), but the indentation never runs completely round it!

- Abdomen almost entirely red, with no white markings at the sides or beneath. Clypeus black. A patch of scale-like hairs occurs in the fore-wings only.* Apex of clypeus simply rounded on each side, with no reflexed margin, nor appearance of dentiform corners *lutrellii*, Leach.

Type in B.M.

18. Abdomen with its basal half mostly luteous, the apical segments only being chalybeous *X. univittata*, W. F. Kirby.

Co-types in B.M. (The Type is a ♀.)

- Dorsum of abdomen practically chalybeous throughout 19.

19. Basal joints of antennae, hind femora, and apices of hind tibiae blackened *X. lulage*, W. F. Kirby.

Type in B.M.

- Antennae and legs altogether testaceous or luteous 20.

20. Vertex shining and almost impunctate. Middle lobe of mesonotum with a conspicuous V-shaped yellow mark defining its posterior (= basal) angle. The scutellum is not entirely yellow, its apical half being partly occupied by a subtriangular impressed space of darker (brownish) colour.

(The puncturation both of head and thorax in this species is much less close than in *jurinei* and the surface very much more shining.) *X. amenaida*, W. F. Kirby.

Type in B.M.

- Middle lobe of mesonotum only touched with yellow at its extreme base (no conspicuous V-shaped mark!). Scutellum entirely yellow.

Puncturation of head and thorax dense and "granulose," the surface consequently appearing completely dull.

X. jurinei, Westw.

Type at Oxford.

The other described forms of *Xyloperga* are all ♀♀, mostly unique specimens at Oxford or in B.M., and their ♂♂ have yet to be discovered.

* This, at any rate, is the case with the Type; which, however, is of course a very old specimen, though it seems in fair condition.

CEREALCES, W. F. KIRBY.

SYNOPSIS OF THE SPECIES.

The genus *Cereales* is known only from Australia. It contains two species only, both described by W. F. Kirby, and of each ♂♂ only have occurred. These may be separated as follows—

Scutellum rufo-fulvous; hind tibiae entirely pale yellowish-brown. Antennae 10-jointed, the joints except the two first and the last distinctly (but not paradoxically) dilated at their apices *scutellata*, W. F. Kirby.

Type in B.M. "SOUTH AUSTRALIA."

— Scutellum black (with only the tubercles at its apex yellow); hind tibiae with black apices. Antennae 11- or 12-jointed, the intermediate joints paradoxically expanded (cup-like) at their apices. (The antennae of the Type are now unfortunately lost!) *cyathiformis*, W. F. Kirby.

Type in B.M. No precise locality is given.

PHILOMASTIX, FROGGATT.

SYNOPSIS OF THE SPECIES.

Two species of *Philomastix* have been described, namely *macleayi*, Westw. (= *glaber*, Froggatt), and *nancarrowi*, Froggatt; the latter, by some oversight, is not included in Konow's list in *Genera Insectorum*. Westwood, as I have elsewhere mentioned, mistakenly described *macleayi* as a *Perga*, but this error does not invalidate the *specific* name which he gave to it, and this therefore has priority as against that proposed by Froggatt.

The species are practically identical in colour, at any rate in the ♀♀ (I have seen no ♂♂ of *macleayi*). But they seem to differ considerably in size, *macleayi* being the larger species, and also apparently always in the number of antennal joints, as stated below. It is curious that, in *nancarrowi* at least, the ♂ antennae are shorter than the ♀, and yet have more joints! See Pl. XII, Figs. 5, 6.

Westwood's Type of *macleayi* is at Oxford. The Types of *nancarrowi* and *glaber* are, I suppose, in Australia,

and of course I have not seen them, but two specimens of "*glaber* ♀" and many of *nancarrowi* ♂♂ and ♀♀ are in B.M. named by the author.

♀♀.

Stigma with pale (yellowish) apex. Antennae more than 15-jointed in the ♀. Larger species.

macleayi, Westw. = *glaber*, Froggatt.

— Stigma entirely dark. Antennae only 13- or 14-jointed (the apical joints are not very distinctly separated) in the ♀. Smaller species *nancarrowi*, Froggatt.

The very curious larva of *Philomastix* is figured in Froggatt's "Australian Insects." It has, like *Perga*, no ventral legs and, unlike that or any other Australian sawfly-larva, two paradoxically long anal appendages (*cerci*?). In both these characters it seems allied to the *Pamphilidae*, but in these the cerci are comparatively quite short! I doubt, however, whether this similarity is due to any special phylogenetic affinity between the Australian and the Palaearctic species. The former is much more probably a peculiar genus of the *Pergidae*, with which it agrees in several characters (reduced number of palpi, etc.) not found in any of the *Pamphilidae*.

(For the alar neuration of *Philomastix* see Pl. XI, Fig. 13.)

PERGULA, n. g.

I have only seen one species of this curious little genus, and of that species only one specimen, a ♂. It is, however, so distinct that I venture to describe it.

Pergula turneri, n. sp. ♂.

Black, shining, feebly and shallowly punctured. Mouth-parts, trochanters, knees, tibiae, tarsi, and genitalia sordidly whitish. Apices of hind tibiae, and the tarsal joints following, more or less infuscated. Wings hyaline.

Antennae very shortly pilose, 7-jointed; the apical joint about as long as the two preceding it, and rather longer than joint 3. The joints, except the apical and the two short basal ones, are all obconical, and the antennae as a whole might be called subclavate. Face subquadrate, inner margins of eyes parallel. Clypeus very short (its apical margin slightly sinuated inwards), antennae inserted close above it. Frons deeply sulcate longitudinally from the

anterior ocellus to the elypeus, it is also sulcate on each side between the supra-antennal carinations and the compound eyes. Ocelli in a low broad triangle.

Fore-wings with the costa much dilated before the stigma, nearly filling up the intercostal area, the latter with no visible transverse nerve or longitudinal vein dividing it. Radial cell without a dividing nerve, and not appendiculate at its apex. Four cubital cells present, the 2nd and 3rd each receiving a recurrent nerve near its middle. Laneeolate cell wanting, as in *Perga*, etc. Hind-wings with one closed cell (cubital); humerus present. Tibiæ without ante-apical spines, but with the hind calcaria extremely long—longer than the metatarsi.

Length about $4\frac{1}{2}$ mm.

S. W. AUSTRALIA, Yallingup (near Cape Naturaliste), taken by Mr. R. E. Turner in September or October 1913. Type in B.M.

PTERYGOPHORUS, KLUG.

SYNOPSIS OF THE SPECIES.

The first Sawfly to be described from Australia was a *Pterygophorus*, and the genus seems to be one of the most abundant in most parts of that region, and also one of the most striking both in colour and structure.

Its affinities are rather doubtful, but perhaps its nearest relative is the Brazilian genus called by Cameron *Lophyroides*, and by Konow (wrongly, I think) *Perreyia*. Konow associates it with the Northern group of which the best-known genus is that called by Jurine *Pteronus* (from its plume-like ♂ antennae) = *Diprion*, Schrank = *Lophyrus*, Auctt. But its neuration in both wings is so very different, that I think any relationship it may have to that group must be extremely remote!

Since its larva has ventral pro-legs, and its palpi have the normal number of joints (4 labial and 6 maxillary), it approaches more than *Perga*, etc., to the usual structure of the Sub-order. In fact, its only real abnormality seems to be in the matter of neuration, and in this it agrees with *Perga*, etc., except in the complete disappearance, or non-development, of a "second" cubital nerve in the fore-wing.

See Plate XII for figures of the antennae (♂ and ♀) in

certain species, and Pl. XI, Fig. 12) for the neuration of the wings.

♀♀.

1. Dorsum of abdomen, except its yellow apex, unicolorous—chalybeous or deep-black with no broad yellow or testaceous markings. (Group of *cyaneus*) 9.
- Dorsum of abdomen entirely testaceous, or broadly banded with that colour or with yellow 2.
2. Pronotum and scutellum concolorous with the mesonotum—chalybeous not testaceous nor yellow. Length of body seldom exceeds 10 mm. 3.
- Pronotum and part at least of the scutellum testaceous or yellow. Mostly large forms, 15 mm. long or more . . . 4.
3. At least 5 consecutive segments of the abdomen are testaceous. Wings (Pl. XI, Fig. 12) for the most part clear hyaline, but distinctly clouded under the stigma—the clouding elongate, extending a little beyond the apex of the radial cell. Costa not concolorous with the subcosta but yellowish. Antennae (Pl. XII, Fig. 10) not simply *serrate* as in most ♀♀ of this genus, but evidently *pectinate* though more shortly so than those of the ♂♂. . . . *analis*, Costa = *gudialis*, Konow.
- Only four consecutive abdominal segments are testaceous. Wings more or less violacco-fuscous throughout, but (as usual in this genus) somewhat more so in the upper part of the fore-wing. Costa and subcosta concolorous—fuscous. Antennae (Pl. XII, Fig. 9) simply serrate.

uniformis, W. F. Kirby.

QUEENSLAND (Mackay). Type in B.M.

4. About as large as *analis* and *uniformis*, smaller than the spp. following. Abdomen, except its extreme base and the apex of the saw-sheath, entirely testaceous. Middle lobe of mesonotum narrowly yellowish at the sides. Fore-wings (N.B.) bisected transversely by a conspicuous dusky stripe which runs from the stigma right down to the inferior margin. A similar but smaller clouding covers the upper basal nerve and fills the base of the wing, and the inferior margin is clouded likewise. (The antennae in the only B.M. specimen have only 12 joints, but this is probably exceptional. Brullé figures the antennae of his Type as 20-jointed.)

bifasciatus, Brullé.

N. S. WALES (Tweed River) B.M. Coll. TASMANIA (*teste* Brullé).

- Larger, usually about 15 mm. long. Abdomen blackened at least at the sides, or widely before the apex. Middle lobe of mesonotum immaculate, entirely chalybeous. Fore-wings with elongate (not transverse) clouding 5.
- 5. Abdomen above black or cyaneous at the sides only. Antennae entirely black. Stigma fuscous, costa testaceous. General colour rather brick-red than yellow or orange.
interruptus, Klug.

All eastern AUSTRALIA and TASMANIA.

- Abdomen above with at least three of the intermediate segments blackened right across. Costa and stigma yellow. General colour inclining more to yellow or orange than to red (group of *cinctus*) 6.
- 6. Yellow banding of abdomen narrower, only one dorsal segment—the third—entirely yellow. Sixth segment black except narrowly at its apex. Seventh segment black 7.
- Bands of abdomen broader, and the colour rather orange than yellow. At least the second and third segments and a part of the seventh are of this colour. The fourth segment is rarely entirely black, and when it is so the seventh segment is entirely flavous. Generally both these segments are partly black and partly yellow. (Whether these colour-differences are more than subspecific seems very doubtful!) 8.
- 7. Apex of clypeus widely and angularly (but very obtusely) emarginate *cinctus*, Klug.

N. S. WALES (Woodford, etc.): VICTORIA; S. QUEENSLAND.

- Apex of clypeus in the unique specimen in B.M. truncate; otherwise exactly like *cinctus*, of which it is possibly only an individual aberration. (It is not a "subspecies," having been taken along with the typical form of *cinctus*!).
distinctus, Rohwer.

N. S. WALES (Woodford). Type in B.M.

- 8. Seventh dorsal segment of the abdomen, but not the fifth and part only of the fourth, for the most part yellow.
insignis, W. F. Kirby.

Only known from QUEENSLAND (Mackay). Type in B.M.

- Seventh dorsal segment black, fourth and fifth entirely yellow. I have only seen one specimen of this form, viz. Mr. Rohwer's

Type. The author compares it with *interruptus*, Klug, but it has little resemblance to that species and is evidently much nearer to *cinctus*. (I am inclined, as is also Mr. Turner, to regard all these forms (*distinctus*, *insignis*, and *zonalis*) as specifically not separable from *cinctus*: but more material is needed before the question can be positively decided).

zonalis, Rohwer.

QUEENSLAND (Mackay). Type in B.M.

9. Joints 3rd to 8th of the antennae pale yellow. Apex of clypeus not bilobate, but sinuated inwards very slightly through its whole extent. General colour deep-black with slightly metallic (greenish) reflections on the abdomen, purplish on the mesonotum, and brightly chalybeous on the face, except the clypeus which is greenish at the base and violaceous at the apex. Pronotum, scutellum and a very narrow (widely interrupted) fascia at the apex of the propodeum pale yellow. Wings yellowish, infuscated at their bases and in the radial and cubital areas *turneri*, Rohwer.

QUEENSLAND (Cairns). Type in B.M.

- Antennae entirely black. Apex of clypeus bilobate . . . 10.
 10. Basal half of fore-wings and the entire hind-wings nearly clear and colourless, apical half only of fore-wings distinctly clouded. Abdomen entirely chalybeous except its extreme apex, which is yellow *cyaneus*, Leach *
 = *leachii*, Konow, nec W. F. Kirby.

VICTORIA.

- Wings brownish-violaceous throughout, though darkest at their bases and in the radial and cubital areas. Colour of body as in *cyaneus* of which it is very probably a "subspecies."
leachii, W. F. Kirby, nec Konow.

QUEENSLAND (Bowen, Mackay, Townsville). Type in B.M.

♂♂.

1. Abdomen brick-red, with the apical ventral plate, the propodeum and the two following segments, and (N.B.) a spot on each side of segments 4th to 8th, chalybeous or violaceous-

* Leach does not mention the yellow apex of the abdomen, and Konow therefore distinguishes *cyaneus* from *leachii* as not having this character. But in fact the colour of the ♀ abdomen is identical in both forms, though in the ♂♂ it *does* differ as stated by Konow !

black. The pronotum, episternum of mesopleuron, scutellum, and postscutellum yellow. Antennae black, with a pectination of 20 rays. (The $\frac{1}{2}$ is unknown.). *cygnus*, W. F. Kirby.

W. AUSTRALIA (Swan River). Type in B.M.

- Abdomen differently coloured (especially without the lateral spots on the intermediate abdominal segments!) . . . 2.
- 2. Pronotum concolorous with the mesonotum—chalybeous . 3.
- Pronotum yellow, contrasting with the chalybeous mesonotum. 4.
- 3. Wings with a slight uniform brownish or violaceous infuscation throughout. Antennae longer than in the next species, with more numerous (about 20!) but proportionately shorter rays. These are about equidistant from one another throughout, and grow shorter very gradually from the 10th joint onwards *uniformis*, W. F. Kirby.

QUEENSLAND (Mackay).

- Wings clearer, almost colourless. Antennae shorter, with fewer (about 18) rays. These are closely packed together near the base, but towards the apex become more widely separated, and grow abruptly shorter from about the 14th joint onwards *analis*, Costa.

VICTORIA.

- 4. Abdomen with a broad red basal belt. Wings colourless, unclouded. Antennae entirely black . . . *interruptus*, Klug.
- Abdomen not belted with red. Antennae sometimes yellow, entirely or only at their bases 5.
- 5. Abdomen belted with yellow 6.
- Abdomen unicolorous, chalybeous or black 7.
- 6. Fore-wings with a distinct elongate clouding along their upper margins. Yellow belting of abdomen sharply defined. *cinctus*, Klug, and (var. ?) *insignis*, W. F. Kirby.
- Fore-wings faintly brownish with no distinct marginal clouding. Yellow markings of abdomen somewhat vague and indefinite. *leachii*, W. F. Kirby.
- 7. Antennae with black bases. Wings coloured as in *leachii*, but with a distinct small clouding under the stigma. Abdomen chalybeous and shining. *cyaneus*, Leach.
- Antennae with yellow bases. Wings yellowish as in the ♀, but without conspicuous clouding. Abdomen black and dull. *turneri*, Rohwer.

The ♂ of *bifasciatus* is unknown.

DIPHAMORPHOS, ROHWER.

SYNOPSIS OF THE SPECIES.

Of this genus two species only are known; they were both introduced and described in detail by Mr. Rohwer, in *Entomological News*, vol. xxi, p. 474 (December 1910).

The ♀♀ differ conspicuously both in size and colour as follows—

♀♀.

- Larger, length about 6 mm. Head, thorax, and abdomen black without red markings *nigrescens*, Rohw.

VICTORIA. Type in B.M.

- Smaller, length about 4 mm. Head and thorax black, but abdomen with a broad red belt covering at least four consecutive segments. (These ♀♀ superficially resemble small ♂♂ of *Clarissa divergens*, but are naturally broader in proportion to their length, and the antennae (Pl. XII, Fig. 11) have more joints, and taper more towards their apices.)

minor, Rohwer.

NORTH QUEENSLAND. Type in B.M.

♂♂.

The ♂ of *nigrescens* is unknown. That of *minor* differs from the ♀ in having the abdomen entirely black, and also, in such specimens as I have examined, in having 16-jointed antennae. these in the ♀ seem to be always 15-jointed.

EURYS, NEWMAN.

SYNOPSIS OF THE SPECIES.

Eurys and the genera most allied to it have been supposed to be distinguishable among themselves by differences in the number of joints in their antennae. But even in the very limited material before me I find these differences far from constant. Generally no doubt the number of these joints in *Eurys*—or at any rate in its ♀♀—is 9. But in one of the three ♀ specimens of *E. laetus* in B.M. the number is 10. It is 10 also in a specimen which Mr. Rohwer has ticketed as the "Type ♂" of his n. sp. *deceptus*, and in one of two others marked by him as "paratypes"

of the same. Solely, it would seem, on account of this character the species *inconspicuus*, Kirby, which in size and colour is utterly unlike a normal *Eurys* and has also a difference in its neuration, has been placed in this genus. But here, too, a ♂ in B.M. has distinctly not 9 joints, but 10. (I have little doubt myself that this species is no *Eurys*, but a *Clarissa*, and shall treat it accordingly!).

Again, *Euryopsis*, Kirby, is said to have 11-jointed antennae, and this is true of the only two specimens (both ♂♂) on which this supposed "genus" has been founded. But I am almost sure* that these specimens are really the hitherto unidentified ♂♂ of two *Eurys* species of which ♀♀ only have been described. "*Euryopsis nitens*," W. F. Kirby, I take to be almost certainly the ♂ of *Eurys laetus*, and "*Euryopsis bella*," Rohw., most probably the ♂ of *Eurys nitidus*. The number of joints in *Clarissa* spp. varies even more. Of *divergens*, W. F. Kirby, I have seen specimens with 10, 11, 12, and 13 joints respectively, and in the Type (at Oxford) of *C. thoracica*, n. sp. the number of joints is 11. *NeoEurys*, Rohwer, is said by the author to be easily known by its 14-jointed antennae, but in the Type of *E. metallica* the number of the joints is 15. And in a ♂ of another species from Mount Wellington, Tasmania, it is 11 only!

Thus in the comparatively few specimens before me the number of antennal joints in *Eurys* (as I should define that genus) varies from 9 to 11, in *Clarissa* from 9 (or 10 if *inconspicuus* be not included) to 14, and in *NeoEurys* from 11 to 15. Such a fluctuating character is practically useless for determination of specimens, and even if it were more constant, I should hesitate to consider it of really generic value.

On other characters, however, the three groups of species, though closely allied, seem capable of being maintained as at least good subgenera, and perhaps as good genera, though on the existing material I should not myself have ventured to erect them as such. Thus—

Eurys (including *Euryopsis*) differs from *Clarissa* in the brilliant metallic coloration of all its species, and also in having the radial cell more distinctly appendiculated, in consequence of which its apex is not adjacent to the margin of the wing. The same character separates it

* If I am mistaken in this, no ♂♂ at all of *Eurys* have been described!

also from *Neoeurys*, with which it agrees in coloration. And *Neoeurys* is also a smaller and much more slender form, with evidently more elongate joints in its antennae, and also in its legs—the hind tarsi (in particular) being far longer in proportion to the tibiae.

The four forms actually known to me which I should unhesitatingly refer to *Eurys* may be tabulated as follows—

♀♀.

1. Abdomen entirely metallic, without yellow or whitish markings at the sides or beneath 2.
- Abdomen with the inflexed sides of its dorsal plates margined at their posterior corners with white or yellow 3.
2. Head, thorax, and abdomen metallic green or greenish-blue throughout, with slight golden, fiery, or eupreous reflections in certain lights. Femora not blackened at their bases above but entirely testaceous orange, concolorous with the tibiae and tarsi. Length about 7 mm. . . . *laetus*, Westw.

Type (described as a "*Dictynna*") at Oxford.

- Head and thorax reddish-eupreous throughout, densely punctured and therefore somewhat opaque; the abdomen is distinctly greener, with little if any eupreous tint. Femora evidently infuscated at their bases above. Rather smaller than *laetus*—about 6 mm. long.

rutilans, n. sp. (= *aeratus*, W. F. Kirby! *nec* Newman?)

W. F. Kirby called this specimen "*aeratus*, Newm.," but it does not correspond at all well to Newman's description, which particularly states that the head and also the thorax are "nigro-aeneous." *Aeratus* was described in 1811 from two specimens in the Collection of the Entomological Club. That Collection was presented a year later to B.M., so the Types ought to be there now. But if they ever arrived there, they have long disappeared, for no mention of them is made in Kirby's List. (The present specimen is certainly not one of the missing Types, having been acquired at a much later date by purchase.) On the whole I see no reason for identifying this form with *aeratus*, Newm., and provisionally treat it as distinct.

Type in B.M.

3. The largest and most highly coloured of the forms. Length about 8 mm. Head and thorax finely and rather closely

punctured. Abdomen greenish at base and apex, but the intermediate segments above are mostly rich purple, diversified with bluish, indigo, and green reflections in certain lights. Beneath, the lateral white or rather pale yellow markings are conspicuous and well defined, contrasting strongly with the green surface of the ventral plates which they overlap. The legs are testaceous or luteous with the apices of the hind tibiae, and the tarsi more or less blackened.

nitidus, W. F. Kirby.

Type in B.M.

Considerably smaller than *nitidus*. The white markings of the abdomen are not so well developed, and its dorsum is nearly unicolorous (metallic blue- (or sage-) green, and darker than the thorax, which is brassy, sparsely punctured, and very shining). The tibiae and tarsi are immaculate.

deceptus, Rohwer.

Type in B.M.

(In all these insects the labrum is more or less white, the head and thorax delicately punctured, and the abdomen has a very fine and close transverse striation. Without more material it is impossible to be sure which of their differences are really of specific value.)

NEOEURYS, ROHWER.

SYNOPSIS OF THE SPECIES.

In the original description of genus *Neoeurys* it was said to be readily separated from its allies by the 14-jointed antennae, but I have found variations in the number of antennal joints in all genera of this group. And, in fact, the Type of *metallica* in B.M. (a ♀) has the antennae 15-jointed, while in a ♂ of another species the number of joints is only 11.

The characters which seem to me best to distinguish this genus from *Eurys*, with which alone it is likely to be confused are: (1) the much shorter and broader face, and (2) the more elongate joints of the hind-legs, particularly the tarsi, which appear to be quite as long as the tibiae, whereas in *Eurys* they are evidently shorter. It differs also from *Eurys* as stated in my Synopsis of Genera

(*supra*) in having the apex of the radial cell close to the margin of the wing, and no definite appendicular cell beyond it.

The B.M. collection contains at present 7 specimens of *Neocerys*, viz. (1) a ♀ (the Type) of *metallica*, Rohwer. (2-4) a ♂ and two ♀♀ taken by Mr. A. M. Lea on the summit of Mount Wellington, Tasmania. (5-6) two ♂♂ taken by Mr. Turner on the same mountain, but not near its summit (these are considerably smaller than Mr. Lea's ♂, and I doubt if they belong to the same species, and (7) a ♂ also taken by Mr. Turner at Eaglehawk Neck—a very different locality from the summit of Mount Wellington, namely a low-lying sandy isthmus on the coast of Tasmania. (It does not appear to me identical with the specimens from Mount Wellington, but on such material as I have yet seen it appears safest to reserve judgment.)

I thought at first that Mr. Lea's captures were sure to be identical with Mr. Rohwer's n. sp. *tasmanica*, of which the ♀ was taken apparently with them (cf. *Ann. and Mag. N. H.*, November, 1918). But I am now rather doubtful, because Mr. Rohwer does not mention the most obvious, though perhaps not most important, character, of the B.M. ♀ specimens—namely, the non-metallic pale reddish-testaceous apex of the abdomen. If this character is not constant, the B.M. ♀♀ are probably *tasmanica*; and the ♂ accompanying them, though larger than the male assigned to them by Mr. Rohwer (which was taken at Eaglehawk Neck, and is no doubt identical with Mr. Turner's ♂ from the same locality) unquestionably belongs to them. Not having seen Mr. Rohwer's Types, which are still in America, I cannot clear up the matter; but provisionally I will assume that his *tasmanica* ♀ is a different species from Mr. Lea's captures now in B.M., and propose in that case to call the latter *Neocerys caudata*, n. sp.

The ♀♀ of *metallica* and *caudata* differ much in coloration, as follows—

— Head, thorax, and abdomen concolorous, reddish cupreous.
The apex of the abdomen not differently coloured.

metallica, Rohw.

— Thorax and abdomen except its apex not at all reddish, but black with a slight greenish (aeneous) tinge. The apex of the abdomen not at all metallic, but pale testaceous.

caudata, n. sp.

In the ♂ of *caudata*, which is very nearly as large as the ♀ (about 4 mm.) the abdomen is unicolorous, blackish from base to apex, the antennae 11-jointed.

The other ♂♂ had better, I think, remain undetermined in the absence of any ♀♀ with which they seem likely to be associated. It will probably be found that several species (or at least subspecies) exist in Tasmania and elsewhere. The Type of *metallica* is not from Tasmania, but from Victoria.

CLARISSA, NEWMAN.

SYNOPSIS OF THE SPECIES.

Though the relationship between *Clarissa* and *Eurys* is evidently very close, they differ so markedly—at least in the few species of each yet known to me—in the matter of coloration, that it is easy to distinguish them at sight. In *Eurys* this coloration is thoroughly metallic—as much so as in many of the *Chrysididae*, whereas in *Clarissa* it requires close examination to discover any tendency to metallescence. The present metropolis of *Eurys* seems to be West Australia, while that of *Clarissa* seems to be rather North Queensland, and the only locality I can name where both genera have yet occurred is the neighbourhood of Adelaide. Striking as is this difference in colour, it is perhaps of no very essential importance, for in many Hymenopterous and other genera metallic and also non-metallic species occur in the same regions. Still, as they differ (though slightly) in neuration, and on an average in the number of antennal joints, the distinction between them may provisionally be treated as generic: yet it would not be surprising, if the discovery of intermediate forms should lead to a uniting of them at some future time. But setting aside this possibility, which it is really useless to suggest while so few of the imagines and none of the larvae, etc., of either genus have been described, I will proceed to a tabulation of such material as lies before me.

♀♀.

1. Abdomen with no part testaceous, either black with white markings, or black entirely 2.
- Abdomen red except at its (black) apex 3.
2. Thorax black; a large whitish mark on each side of the 2nd

abdominal segment. Apex of clypeus, labrum, etc., trochanters, and part of the tibiae whitish, the rest of the body and legs black. Length of body about 7 mm.

atrata, G. Turner.

N. QUEENSLAND. Type in B.M.

— Thorax red; abdomen entirely black; apex of clypeus, labrum, and legs luteous or testaceous—the tibiae and posterior tarsi widely blackened. Wings rather cloudy, their neuration and the stigma brown. The antennae of the unique Type are 14-jointed. *thoracica*, n. sp.

“AUSTRALIA” (*teste* Westwood). Type at Oxford.

3. Thorax above entirely testaceous. Antennae usually more than 10-jointed, but the number varies (10 to 13). Abdomen testaceous with black apex. Length of body about 7 mm.

divergens, W. F. Kirby.

N. QUEENSLAND (Cairns and Mackay). Type in B.M.

— Prothorax red, but mesonotum almost entirely black. Antennae usually 9-jointed, but sometimes 10-jointed. Abdomen coloured like that of *divergens*. Much smaller than any other species of *Clarissa* or *Eurys*, the largest ♀♀ not above 4 mm. in length. *inconspicuus*, W. F. Kirby

(described as an *Eurys*).

N. QUEENSLAND, also Adelaide. Type in B.M.

♂ ♂.

I do not know the ♂ of *thoracica*. Those of the three other species are coloured very similarly, black with testaceous antennae and legs, and with the intermediate dorsal segments of the abdomen more or less rufescent. *Inconspicua* can be recognised at once by its tiny size, barely 3 mm. long. In *divergens* the abdomen has a broad red belt occupying at least the whole of segments 2 and 3 and often extending to segment 4. In *atrata* these segments have their *apices only* red, but their *bases* black. Both in *divergens* and *atrata* the antennae, and parts of the legs (the femora and the apices of the tibiae and tarsi) are somewhat infuscated; in *inconspicua* this is not so. All the ♂♂ are slightly shorter and considerably less broad-bodied than their ♀♀, and the prothorax in all of them is entirely black.

Note 1.—On the Distribution of Sawflies in general : the three Zoological "Realms" : and the probable origin of the Australian Sawflies.

In this Note, and several of those which follow it, I propose to avail myself on occasion of certain terms which have been employed by Lydekker in his valuable and suggestive little book *A Geographical History of Mammals* (Cambridge Geographical Series, 1896). The principal land areas of the Earth are there divided into three chief zoological "Realms," namely, ARCTOGAEA (= North Land), NOTOGAEA (= South Land), and NEOGAEA (= New Land), and the two first of these "Realms" are further divided into areas called "Regions." Though originally founded on the Distributions of past and present *Vertebrate* groups, especially Birds and Mammals, and entirely without regard to that of Insects, these divisions seem applicable also to the *present* Distributions of Sawflies. Of their *former* Distributions we know, unfortunately, next to nothing. Such fossil remains of the Sub-order as have yet been described, are too few, too imperfect, and of far too recent date, to throw any considerable light upon the subject.

For our present purpose the limits of the three great "Realms" will be sufficiently defined by saying that "Neogaea" is nearly coextensive with such parts of America as lie south of the Tropic of Cancer; "Arctogaea," besides including the rest of America, extends across the Bering Straits and occupies all Europe, Asia and Africa with their adjacent islands, except so much of the Malayan Archipelago as lies east of "Wallace's Line"; while "Notogaea" consists primarily of Australia and Tasmania, which form a "Region" by themselves, but is also reckoned as embracing three other isolated Regions, namely, (1) the "Austro-Malayan" islands (especially New Guinea), (2) Hawaii (the Sandwich Islands) and (3) "Polynesia" (New Zealand, etc.). Hawaii and Polynesia, however, may here be left out of account, for the former (as I learn from Mr. Muir) has no indigenous Sawflies at all, and, with one doubtful exception, the same is the case with Polynesia. The Sawflies of New Guinea, Celebes, etc., are very little known as yet, but some of them appear to be related to Australian forms, though not actually identical with them.

Not much need be said here as to most of the "Regions" included in Arctogaea. The largest and by far the most

important is the "Holarctic," which includes the greater part of North America, all Europe, and the parts of Asia and Africa adjacent to the Mediterranean Sea, Siberia, N. China, Japan, and Central Asia. The parts of Asia nearest to and north of Australia (India, South China, Sumatra, Borneo, etc.) are the "Oriental Region." South Arabia and South and Central Africa make up the "Ethiopian Region." Madagascar is the centre of an isolated Region of its own. And the "Sonoran Region" separates—or, rather, bridges over the interval which separates—Neogaea from Holarctic America. The word "Holarctic" will occur frequently in this Note, but the other Regions will seldom have to be mentioned. I know their Sawflies only from Museum specimens, but if the inferences suggested by these can be trusted, the differences between Holarctic forms and those occupying other Aretogaëic Regions are not very striking and *negative* rather than positive: *i. e.* the latter are characterised chiefly by the *absence* or extreme rarity of groups which are dominant in the North, and the places of these are filled not by other groups peculiar to the Region, but by a further differentiation and increase of certain particular genera which are well represented in the Holarctic Region also. In Africa, for instance, and perhaps throughout the Ethiopian Region, forms identical, or nearly identical, with Holarctic *Arge* and *Athalia* spp. seem in a manner to have made themselves paramount. (*Pachylota*, Westw., originally described as from "S. Africa," would be a singular exception to the general rule, if we did not know that this genus was really Neogaëic.) In the number of well-differentiated "high" divisions (Families, Sub-families, etc.) included in—and often confined to—it, the Holarctic Sawfly-Fauna far exceeds that of all the other Regions taken together, and from this it is natural to infer that the Sub-order has been longest established there, and that somewhere in this Region was probably the original centre of its distributions, the Sawflies of the other Regions being really descendants of such Holarctic genera as have overflowed into them and succeeded in adapting themselves to the new surroundings. Any genus which could not do this would remain, of course, confined to its original habitat, or extend only in certain limited directions—chiefly eastwards or westwards, such movements involving no change of climate, etc.

But if, after comparing the Sawflies of various Aretogaëic

Regions with one another, we proceed to compare them as a whole with those of Notogaea, it becomes at once apparent that we are dealing with far more substantial differences. The line of demarcation between the two groups is almost as distinct as that which separates the Mammals of the two Realms. We find, indeed, one single Siricid (a *Xiphydria*) belonging to a genus which is represented by species not very dissimilar in the Oriental Region, and by other species of slightly different appearance (longer ovipositor, etc.!) in Europe, and even in England! We find also one true *Sirex* (manifestly imported, for the natural range of this genus is exclusively Holarctic). And we find, also, that one very common and mischievous Sawfly, whose slimy slug-like larva is a notorious pest in European and American orchards has reached, evidently by unintentional and quite recent importation, both Australia and New Zealand. We find lastly one small insect which, though I believe it to be generically distinct from anything in Arctogaea, has so many characters in common with a well-known Arctogaëic genus, that it was referred to it by the late W. F. Kirby and described as "HYLOTOMA" *apicale*, n. sp. But otherwise, so far as I know, Australia and Arctogaea have not a single really native species, nor genus, perhaps not even one "Tribe" of Sawflies in common. It is not till we reach the higher category of "Subfamilies" (according to Konow's classification in *Genera Insectorum*, etc.) that the Faunas of the two Realms begin to show connection. Finding this we are naturally reminded—though I do not mean to say that the cases are precisely parallel—of the fundamental dissimilarity between the present Mammalian Faunas of Australia and Arctogaea. Apart from Bats, which in all such questions must be left out of account—it is well known that not only have these lands no native Mammals in common, but that they differ even as to the "Orders" represented in them, the Mammals of Arctogaea (except one American Opossum, which has spread northwards out of Neogaea) being exclusively Eutherian, while those which are unquestionably native* (*i. e.* not importations) in Australia are never Eutherian, but either Marsupials or Monotremes.

There is, in fact "si parva licet componere magnis"—a really curious and interesting parallelism in many respects

* Neither the "Dingo" nor the Australian *Muridae* are "unquestionably" natives.

between the distributions throughout the world of Mammals on the one hand, and Sawflies on the other. Thus (*a*) outside Australia (the N. American Opossum above-mentioned excepted) Marsupials occur in Neogaea only, and there also only we find Sawflies possessing certain characters otherwise confined absolutely to Australian forms (no "lanceolate cell," labial and maxillary palpi with a reduced number of joints), and agreeing with them also in general "facies" and coloration; (*b*) it is well known that the indigenous Faunas of Oceanic islands include no Mammals except Bats, and the same appears to be the case with Sawflies, except the Timber-boring forms, which, like Bats, have special possibilities of distribution; (*c*) the Faunas of Madagascar and Arctogaea have at present, I believe, only two Mammalian genera in common, and I can only find one record of any Sawfly genus occurring in both, viz. *Athalia*, except which no Sawflies at all are known to occur in Madagascar, and Mr. H. Scott tells me there are none in the Seychelles; (*d*) a few groups only of Mammals (e. g. *Canidae* and *Felidae*) have a practically world-wide distribution extending in one case to Australia; and similarly among Sawflies one remarkable group (the *Arginae*) is thoroughly cosmopolitan and has certainly reached Australia. This may perhaps be the case with a few others (*Lophyrinae*? and *Umbicinae*?), but a majority probably, both of Mammals and Sawflies, have their ranges strictly confined between certain parallels of latitude, and this applies not only to species but to genera, Tribes and Subfamilies; (*e*) lastly, though certain groups both of Mammals and Sawflies have reached their maximum of abundance and differentiation in other Regions, it is pretty clear that the real metropolis and original centre of distribution of Sawflies must have been Holarctic, as was certainly that of Mammals. Practically all the primary divisions of the Sub-order (and of *Hymenoptera* generally) are well represented there, and one at least (*Lyridae*, Konow = *Megalodontoidea*, Rohwer)—as well as many flourishing Subfamilies, Tribes, and genera of others—is apparently quite confined to that Region. Therefore, though we have no palaeontological evidence whatever as to the former habitats of existing Sawflies or their ancestors, such as abounds in the case of Mammals, it seems highly probable that the present representatives of both groups, in any particular district, have arrived in their present habitats from not very

different centres of distribution by similar routes, helped or hindered from time to time by similar causes. For whatever physical barriers—such as seas, rivers, mountains running east and west, deserts, intolerable climates and temperatures, absence of certain kinds of vegetation, etc., etc.—would present unsurmountable obstacles to the migrations of a rather feeble and sluggish herbivorous Mammal, would also restrict the distributions of most genera of Sawflies; and, on the contrary, in both cases such circumstances as sudden complete and long-continued isolation in a favourable district through the disappearance of land-bridges by which they had entered it would tend to the rapid multiplication and differentiation into new forms of some few stocks in that particular district, while everywhere else they might be extinguished by the competition with them of their superiors. Thus it is, perhaps, not to be wondered at that Australia should have a Fauna consisting, alike as to its Mammals and its Sawflies, of genera and species apparently well-differentiated and fairly flourishing, but representing a very small and probably not the most characteristic part of—not the *present* Oriental Fauna, but the Fauna which occupied that Region before Notogaea ceased to be in contact with it!

Nor, when we reflect on the long ages that have elapsed since that contact finally ceased, and the multitude of forms that must have since been developed or become extinct on both sides of Wallace's Line, will it surprise us that the present Australian Sawflies should no more resemble those of the Oriental Region than those of any other part of the world, or that the forms most resembling them should happen to survive only in a country so distant as Neogaea. Nearly the same has been the case with the Mammals. And we may, perhaps, regard the phenomenon as somewhat parallel, though on a much larger scale, to that of a country peopled throughout almost its whole extent by certain dominant races, but with a few dwindling remnants of tribes which had failed to hold their own in the interior lingering on still, at points very far apart, in adjacent islands, or headlands on its coasts. Alike in Australia and in South America the southward migrations of Sawflies appear to have reached their extreme limits; * the vegeta-

* I have sought in vain for any record of Sawflies from Patagonia or South Chilé. Darwin's collections made there and now in B.M. include not one of that group!

tion and climates of certain parts in both are known to have something in common, and may be alike adapted to the occupation of somewhat similar groups. The Aculeate Family of *Thynnidae* is, I believe, also limited to these two Realms.

To judge from the evidence of Distribution—and we have really no other evidence to go by—it is hardly conceivable that the Sawflies of Australia can have arrived there otherwise than from Arctogaea, by way of the Oriental Region, and travelling entirely overland. Even if, in very ancient periods, “land-bridges” or “belts” may have connected Neogaea and Notogaea by way of Africa, or Oceania, or an extension of the Antarctic Continent, we do not know that at that time any Sawflies existed at all, nor do any of the districts through which they would have passed contain now, so far as is known, any evidence whatever of such migrations. Africa is the only one of them in which at present any *Tenthredinidae* are normally to be found, and not a single African Tenthredinid has the least appearance of special affinity to Notogaenic or Neogaenic forms: it is hardly too much to say that from Algeria and Egypt to the Cape the whole “facies” of every species and genus indicates a comparatively speaking not very ancient Holarctic origin! Again, much as the present Arctogaenic Sawflies differ in certain respects from those of Notogaea and Neogaea, there is so much essential agreement in the general structure and instincts of the whole Sub-order, that it is impossible to doubt that all must have radiated out from one original centre of distribution: and it is most unlikely (taking all facts into consideration) that such centre was anywhere but in Arctogaea. All that is most strange and exceptional in the characters of Notogaenic and Neogaenic Sawflies can be probably accounted for by their long separation from their Holarctic relatives, during which separation they have lived under different conditions, and no doubt undergone, in consequence, quite different modifications of structure, instincts, etc., in successive generations: and, as might be expected, the Notogaenic Sawflies are, on the whole, much more abnormal than those of Neogaea, the former only having been *completely* isolated since Tertiary times.

Although I have ventured to express the above opinions with some confidence, I must admit that they rest mainly on circumstantial and not altogether satisfactory evidence.

The Sawflies of very few Regions have been collected and studied to any considerable extent, and the known species of any other are probably a very small fraction of those actually existing there. This is especially true of South America, except a few particular districts, and also of the Oriental Region. For instance, up to December 1911 only *eight* species representing *seven* genera of Sawflies (including the *Siricidae*) had been recorded from Java; and then, all at once, the captures made by a single Dutch collector in one visit to the island *doubled* the number of its known genera and brought that of its known species up to *twenty*. It is also a significant fact that this collector's captures included only one species that had been recorded from Java before! (*vide* Enslin in *Tijdsch. v. Ent.* LV, 1912, p. 104). I have already alluded to another difficulty in dealing with our present subject, namely, the want of any palaeontological evidence as to the former range of any particular group. Without such evidence, as has been remarked by Lydekker, many facts as to the present distribution of Mammals would have been incapable of explanation. And it seems only too probable that for lack of it many of the points on which I have ventured to speculate must always remain unsettled.

Note 2.—On Sawflies in general. The Characteristics of the Sub-order, and the Groups included in it.

The Sawflies, if that word be used in its widest sense, are a primary division (Sub-order) of the Order *Hymenoptera* distinguishable from all its other Sub-orders by at least two very definite and obvious differences, one in the structure of the imago, and another in that of the larva. In neither case has this difference been *developed within the Sub-order itself*. What has really happened, on the contrary, is that, whereas all the imagines of other Hymenopterous groups have *developed* a character unknown in any other Order, and all their larvae have *lost* a character which seems to have been formerly universal in the Class *Insecta*, the Sawflies, both as imagines and as larvae, have remained true to the original type. A similar primitiveness, or *conseratism*, may be noticed in other characters of the Sub-order, especially in the venation of their wings, which as compared with that of all other Hymenoptera is remarkably "generalised." There is, on the whole, much more uni-

formity and simplicity in their instincts and habits than is found in other groups; they form no communities, nor, so far as is certainly known, does "inquilinity" or "commensalism" of any kind occur among them. We have, perhaps, scarcely such evidence as would justify a positive assertion that they are actually the oldest existing branch of the Hymenopterous family-tree, but I can point to nothing either in their structures or in their life-histories which would render this view improbable.

(a) The imaginal character which most definitely distinguishes the Sawflies from all other Hymenopterous Sub-orders is the absence of any "constriction" at the point where the so-called "thorax" joins the abdominal segments which follow it. But this so-called thorax in the *Hymenoptera* includes, besides the three truly thoracic segments, a fourth (the "propodeum") which has become more or less incorporated with them during pupation, having originally formed part of the abdomen. And it is really not between the thorax and the abdomen, but between this segment and the rest of the abdomen that the constriction is situated. Accordingly, it might be correct to include this segment always when counting the number of abdominal segments, and in the case of the Sawflies it is not unusual to do so. But in dealing with other Sub-orders most authors commence their enumerations *after* the constriction, so that what is really the 2nd abdominal tergite is called the 1st, and so on. Since this remarkable constriction (which enables Wasps, Bees, Ichneumons, etc., etc., to turn and twist in all directions the segments following it, and thus bring their "stings" to bear on any part they please of any creature attacked by them) is a character peculiar to *Hymenoptera* and not developed in insects generally, its entire absence in the Sawflies* is clearly a

* Konow's name for the Sub-order, which is adopted in Rohwer's Classification (1911), viz. *Chalastogastra*, meaning, I suppose, (*Hymenoptera*) "with unstricted abdomen," seems to describe the real state of things more exactly than Lepeletier's *Sessiliventre*s and other names that have been suggested (e. g. *Symphyla* as opposed to *Apocrita*), which imply that the *thorax and abdomen* are fused together. This, so far as the basal segment of the abdomen (= *propodeum*) is concerned, is the case with *all* Hymenoptera! Another name, employed in some other Papers of Rohwer, and of Enslin is *Penthredinoidea*, but for philological and other reasons I have a special dislike to names formed after that pattern, and prefer to accept *Chalastogastra*.

ease of "generalisation" and suggestive of antiquity in the group.

The larvae of all other *Hymenoptera* are footless, but those of the Sawflies invariably possess three pairs of visible *thoracic* legs—even in such cases as that of the *Siricidae*, where these legs are feebly developed and probably quite useless. Here, again, the Sawflies' structure appears to be more primitive, though the Hymenoptera are not the only group in which the thorax of the larva bears no legs. Also in the largest and most typical subdivision of Sawflies most of the abdominal segments are furnished with processes serving as legs ("pro-legs") much like those of Lepidopterous "caterpillars." Opinions differ as to the origin of this character. Some have thought that the ancestors of all insects possessed abdominal legs which have now disappeared in all imagines and most larvae, though they have survived in larvae of these two Orders, but Handlirsch seems more likely to be right in holding that in neither case have they been inherited from any primitive common ancestors, and that such resemblance as exists between the larval pro-legs of Lepidoptera and those of certain Sawflies is merely "analogous," and consequent on the similar habits and surroundings of the organisms. Although a great majority of Sawfly larvae possess them, these all belong to one only of several distinct Families or "Superfamilies," into which most recent specialists divide the Sub-order. Larvae which at all times live and feed concealed in wood (*Sirex*, *Oryssus*, etc.), or in buds, stems, reeds, stalks of cereals, etc. (*Cephus*, etc.), or wrapped up in rolled leaves, or silken webs (*Pamphilus*, etc.), never have pro-legs, having, in fact, no need for them, as we shall see presently.

(b) The character from which the "Sawflies" receive their vernacular name in English (and also in French, sc. *Mouches-à-scie*) is the *serration* or *denticulation* of a part of their ovipositing organs, namely, the two bilaterally symmetrical blades, placed side by side, and sliding freely backwards or forwards along a supporting "backpiece"—this also consisting of two bilaterally symmetrical parts, not, however, freely movable, but bound together at least at their bases, so that they must move together when they move at all—with which they form receptacles for their eggs. These blades have often a really striking resemblance to saws, and a part at least of their operations may

fairly be described as "sawing." But there are two objections at least to considering this as the *essential* distinction between this and the other Sub-orders. In the first place *all* Hymenoptera (the Aculeates, Ichneumons, etc., included) have their ovipositors so far saw-like that their apices are armed with teeth, and are used for making their way through the substances (whether animal or vegetable) on which they are operating very much as a saw makes its way through *wood*, etc., chiefly by help of its denticulations. And, secondly, it is only in certain Sawflies that the organ has really a *saw-like appearance*, with fairly broad blades, and denticulations elsewhere than at the apex. In many cases it is rather lancet-like than saw-like, scarcely to be distinguished from the "sting" of a Wasp or an Ichneumon, and in *Oryssus*, etc., it is practically identical with the terebra of a Cynipid. It may be added, that in all cases, whatever be the general appearance of the organ, all its parts are absolutely homologous—the sliding toothed cutting-blades, their more or less connate "supports," the attachments to the apical ventral segments, the complicated arrangements by which the "saws" are started and guided in their movements, etc., etc. The purpose for which their operations are undertaken (namely, to prepare a suitable "larder" or "refectory," which will provide an unfailing supply of food for the expected offspring) is identical, whether the insect be a Sawfly, or a Cynipid, or even an Ichneumonid, or a Fossor,* for food is food, whether it be animal or vegetable! On the whole, then, it is the *post-basal constriction of the abdomen*, rather than any character of the ovipositor, which really distinguishes other Hymenopterous Sub-orders from the Sawflies.

There are, however, a good many other characters which, at least in the order *Hymenoptera*, are exhibited by Sawflies only; but most of these (e. g. *two* calcaria instead of *one only*—on the front tibiae) are not found in all groups of the Sub-order. Always, however, their wings have a greater number of veins.† and this should also indicate "general-

* It seems to be only in the *Social Aculeates* that the organ is chiefly used for other purposes, as a *weapon* rather than a *tool*, to some extent merely for self-defence, but more for protection of the community (by repelling enemies, extirpating its useless members, etc., etc.).

† Except in *Oryssidae* where the alar venation seems "degraded." And even these have the "lanceolate cell," which is peculiar to Sawflies!

isation," though it may be remarked that the wings of extinct (fossil) Sawflies seem to lack certain veins which are well developed in such living forms as come nearest to them, and that long-isolated groups sometimes (as, for instance, in Australia) have a distinctly *less* complete venuration than that which prevails in Arctogæic forms. We shall presently see that certain veins are always wanting in Australian genera, which are either invariably, or at least generally, present in non-Australian Sawflies, and this and other facts seem at first sight to conflict with the view that, when a vein usually present is absent in certain cases, it existed in them formerly, but has since been lost. I will reserve this subject, however, till I come to deal in another Note with the special peculiarities of Australian Sawflies.

Hitherto I have throughout been using the word "Sawflies" in its widest sense, including under it the two Linnæan "genera"—or, as most authors would now call them, "Families"—*Sirex* and *Tenthredo*.* But it is often also applied (with or without deliberate intention) to the latter only, and in America—but not, I think, in England—vernacular names have also been proposed for the former. Comstock, *e. g.*, in his well-known *Manual* (10th edition, 1912) distinguishes "*Tenthredinidae, Sawflies*," from "*Siricidae, Horn-tails*," and Rohwer (1911) writes on the "*Genotypes of Sawflies and Wood-wasps*," etc. In Germany (from Panzer, Schrank, Christ, etc., onwards) many authors have called them respectively "*Blattwespen*" and "*Holzwespen*" (= *Leaf-wasps* and *Wood-wasps*), but I doubt if in this country we shall ever bring ourselves to call a stingless insect a *wasp*! To an English reader the name *Wood-wasp* would rather suggest a Hornet (or perhaps a "*Vespa sylvestris*") or some such creature as a *Pemphredon* or a wood-boring *Crabronid*.

But to proceed: whatever names we are to substitute for *Tenthredo* and *Sirex* as originally distinguished by Linné (and for the moment I shall follow Comstock in calling them respectively *Tenthredinidae* and *Siricidae*), the differences between the two groups are very important, and suggest a

* The "Law of Priority" as at present interpreted has made it necessary to restrict both these names to a few only of the species originally included in them, and unfortunately both of them have been restricted to different groups by different authors. However, as none of these groups contain any Australian species, except the (imported) *Sirex*, or "*Paururus*," or "*Urocerus*," *juvencus*, no more need be said here on this subject.

number of questions which I have found very interesting even when I have failed in answering them to my own satisfaction. Let us inquire, then, how the typical members of these sections differ—first, as to their Bionomics (= the life-history of the individuals in each group), and afterwards in other ways, some of the latter differences being apparently consequent on the former.

(a) The food of their larvae differs, though in both cases alike it consists exclusively of vegetable tissues. The typical *Siricidae* feed on *timber* of some sort, perhaps never quite sound and sometimes actually rotten; the *Tenthredinidae* on fresh *leaves*, which in some cases are devoured entirely, in others merely skeletonised, or more or less emptied of their “parenchyma.”

(b) The special mark of the *Tenthredinidae*, however, is not so much the precise nature of their food—for leaves are also eaten by certain genera (*Pamphilius*, etc.) which in other respects differ considerably from any typical Tenthredinid—as the circumstances that (i) they are able to *move freely* about the substances on which they are feeding, and that (ii) while thus moving about they are usually *fully exposed to view*, or at most imperfectly screened by the semi-transparent cuticle of a leaf within whose interior they are feeding. Larvae of *Siricidae*, on the contrary, issuing from eggs deposited at the bottom of a deep and extremely narrow hole in the interior of timber, find themselves hemmed in on all sides by material through which they can only pass by gnawing a tunnel out of it with their jaws, and afterwards forcing themselves forwards into this tunnel, so as to continue the operation, with the help (as it is believed) of a sort of horny spike, which arms the other (anal) extremity of their body. Continuing this progress, which must, of course, be slow and practically always in one direction, they gradually pass by a tunnel which grows wider and wider as they themselves increase in size from the interior of the timber towards the world outside; but do not actually emerge into it till they have completed their metamorphoses and are no longer larvae but imagines. Accordingly, (i) their movements are not free, but severely limited, and (ii) they are under cover, and indeed buried in absolute darkness, during the whole of their larval life.

(c) Evidently connected with these differences in the bionomics of the two groups are certain other differences—

namely of structure and general appearance—exhibited almost without exception in their larvae.

(i) The free movements of Tenthredinid larvae are greatly assisted by their possession of well-developed thoracic legs, jointed, and armed with claws, and also of “abdominal pro-legs” more or less like those of Lepidopterous caterpillars, not indeed so elaborately constructed, but generally more numerous (six pairs at least, and most commonly eight). So far as is yet known, it is a rule to which, outside Australia, there are no exceptions, that whenever the larva of a Sawfly feeds on leaves openly and moving freely about them, it possesses abdominal pro-legs. On the other hand, such pro-legs never occur among the *Siricidae*, and even their thoracic legs are ill developed and jointless. Nor are pro-legs developed in *Pamphilius*, etc. (whose larvae feed on leaves, but keep always under cover, spinning silken webs or rolling about themselves (like Tortricids) cases formed from portions of the leaves on which they are feeding; nor, again, in the *Cephiidae* which feed not actually *in wood*, but as a rule *out of sight*, in buds, berries, corn-stalks, hollow or pithy stems, reeds, etc., and appear to be, both in habits and structure, at least as nearly related to the *Siricidae* as to the normal *Tenthredinida*.*

(ii) The open life of a Tenthredinid larva exposes it to many accidents and attacks of enemies, against which a Siricid is to a great extent protected by its surroundings. Hence in the former group many self-protective instincts and “characters” have been developed, which would be useless and are unknown among the *Siricidae*. Such, for instance, are habits of dropping out of sight when alarmed; lurking *under* a leaf, when not actually feeding; emission of nauseous odours and secretions; assumption of “threatening attitudes,” etc. Many species again have developed protective colorations, cryptic or aposematic, etc., etc. Nothing of the kind, naturally, is to be found among the *Siricidae*. It is probable that their larvae have no instincts but such as are common to all insects at that stage (feeding, moulting, preparing in due course to pupate, and so forth); and, like most animals which live absolutely in the dark,

* In one or two (non-Australian) genera, which on the whole must be reckoned as *Tenthredinidae* (*Phyllotoma*, *Kaliosysphinga*, etc.) the pro-legs are ill developed, though never perhaps entirely wanting. But these are leaf-miners—*internal feeders*—and therefore no exceptions to the rule as stated above!

they are practically colourless, and would gain no immunity from any dangers by "mimicry," etc., or formidable appearance, or disguises of any kind. Against the only enemies likely to assail them (Ichneumonids, carnivorous beetles, centipedes, etc.) they are protected to a great extent by their surroundings; and if these fail to save them, they can only succumb. Disguises assumed in the midst of darkness would not help them, and they cannot take refuge by leaving their burrows.

(iii) Siricid larvae, with one doubtful exception, are said to be always eyeless; whereas those of *Tenthredinidae* have invariably a single pair of ocelli, one on each side of the head. The connection of this difference with their different modes of life is so obvious that it needs no comment. But it may be added, that in the *Cephidæ* eyes are not wanting, though they *are* said to be very small. In *Pamphilius*, etc., they are present and well-developed; and as these, though feeding under cover, do not live in actual darkness, we have every reason to suppose that eyes are useful to them.

(d) The different bionomics of the two groups have a certain effect on the structure not of their larvae only, but of their imagines. In order that a Siricid egg may be introduced into such surroundings as will suit the larvae which is to issue from it, the ovipositor of the ♀ parent must be of considerable length. Its function being simply to pierce, any unnecessary breadth or thickness would render it less serviceable, and yet it must be armed (at least near its apex) with something in the nature of saw-teeth that it may make its way through a certain amount of resistance in the material to be penetrated. Accordingly the terebra of a ♀ Siricid is long—sometimes paradoxically long!—and narrow; its paired blades are shaped like fine needles which have been more or less flattened to give them cutting edges; and these cutting edges have a few minute denticulations just before their apices. (In the *Oryssidae* the whole apparatus is so phenomenally slender that it might almost be mistaken for a long fine hair!) Even in those cases where it is shortest—as, for instance, in *Derecyeta*, *Brachyriphus* and certain spp. (chiefly Oriental) of *Xiphydria*—it still projects to a considerable distance beyond the dorsal apex of the abdomen, and, even when at rest, cannot (as in *Tenthredinidae* and also in Bees, Wasps, etc.) be drawn backwards completely out of sight. A certain amount of protection, however, is usually given to it by a modification

in the form of the last dorsal segment. This is constricted laterally and drawn out into a kind of spine which overhangs the base of the terebra, and is often jagged at the sides in a manner which suggests that it may play some part in the operations of the latter. (In the *Oryssidae*, however, the last dorsal segment is simple, but in these the terebra, though actually longer than the abdomen, is so slender and elastic, that it can be bent back at its base, and packed away out of sight in the abdomen itself. This Family, as several authors have remarked, seems to be a link between the *Chalastogastra* and other Hymenopterous groups, especially, I would suggest, the *Cynipidae*.)

The ovipositions of the *Tenthredinidae* are made quite otherwise. Here the eggs are to be so placed that the free-moving larvae may pass at once after hatching to the leaves which will form their food. There would be no gain, but the contrary, if the eggs should be sunk any more deeply into the food-plant than suffices to keep them in position till the larvae emerge from them. They are deposited accordingly, never at any great depth, in a sort of slit or pouch formed by the terebra of the ♀ parent between the transparent cuticle of a leaf (or stem) and the tissues underlying it. The terebra best adapted for cutting out such a receptacle need not be particularly long, and extreme slenderness would be actually undesirable. As a matter of fact, the form of the pouch, and the manner of its formation varies considerably in different cases, and though the "saws" of all *Tenthredinidae* have a certain family-likeness they differ exceedingly in details for reasons which have yet to be discovered. But, at any rate, they are always much broader and thicker in proportion to their length than those of any Siricid, armed with many more denticulations, and altogether departing much more from what seems likely to have been the primitive type of an ovipositor. They seldom extend beyond the apex of the abdomen, and are never too long to be completely sheathed, when not in use, within the modified last ventral segments. The dorsal segments seem to be little if at all affected as to their shape and size by their vicinity to the ovipositor. Occasionally they are slightly compressed laterally in the anal direction, but never so as to form an actual spike, and they may usually be described as simple.

We have now seen (1) that to a certain extent the different manner of oviposition in the two groups seems to be actually

necessitated by the different requirements of their larvae in the matter of food; (2) that in each case it determines in part the surroundings, and consequently the habits and even the structures of the larvae, and (3) that it requires in each case a different modification in the terebra of the ♀ parent, and of the abdominal segments to which the terebra is attached. It appears also to have another consequence, namely, that it affects the possible distributions of genera and species in the two groups.

A Siricid larva may be and often is conveyed alive and unhurt from one Region or even Realm to another, under circumstances which would make such transportation practically impossible in the case of a Tenthredinid. Very rarely indeed certain species of the latter group have passed into and become established in a new district otherwise than by their normal methods of dispersal, carried unintentionally by human agency over barriers which they could never otherwise have surmounted, *e. g.* across sea-straits, and even oceans. Whenever this is known to have happened, it is generally known that their food-plant was transported also.* And it seems almost impossible that such transportation should be successful unless the transported insect happened at the time to have "spun up" or "gone down" for pupation. Neither the exposed larva nor the imago would be likely to survive a violent disturbance of all its normal surroundings, and the life of the latter is

* In illustration of this two cases may be cited. (a) The Nematid *Pteronidea tibialis*—an American species—occurs quite commonly in Europe feeding on *Robinia pseudacacia*, a tree belonging to an exclusively American group. This tree was introduced for the sake of its timber on a very large scale by the celebrated William Cobbett. (He sold 40,000 specimens to the then Lord Folkestone for planting, cf. his *Rural Rides*.) Within a few years it became distributed far and wide, and now abounds in all Western Europe. Not long afterwards the insect made its first appearance in England, and was described as *tibialis*, n. sp. by Newman. Subsequently, in the same year, Hartig recorded it (under another name) as *hortensis*, n. sp. from Germany.

(b) The only Tenthredinid common to New Zealand and Australia, or to either of these regions and any other, is *Culiroa limacina*, Retz. Though described from New Zealand as a new indigenous species under the name *Monostegia antipoda*, W. F. Kirby, it is undoubtedly the mischievous species whose ugly slimy larva has been a nuisance to all fruit-growers for at least a century and a half, both in Europe and North America, and there can be no doubt whatever that it has reached Australia through the importation of Holarctic fruit-trees.

under any circumstances exceedingly short. On the other hand, *Siricidae* are constantly imported, as larvae (in timber) over great distances on shipboard, or by rail, etc., and when the transportation involves no great change of climate they often become established in the new habitat, nor is it necessary that material for their future ovipositions should accompany them, for such is sure to be found wherever they may go. This, no doubt, helps to explain why the range of some *Siricidae* is practically world-wide, even when they cannot be said to be abundant anywhere, and why the distribution of others is so extraordinarily "discontinuous," whereas that of *Tenthredinidae*, whether their range be wide or otherwise, is almost always strictly "continuous." At the same time there are probably reasons why the *normal* dispersals also of *Siricidae* should be less restricted than those of *Tenthredinidae*. The imago of the latter is commonly a soft-bodied, feeble, and rather clumsy and awkward insect, timid and inert, incapable of bearing rough usage, and disinclined to change its quarters without necessity—in fact, its whole life is often passed on or near the plant, on whose leaves it had fed as a larva. Its wings, though ample, lack rigidity, and are usually far less well adapted to prolonged flights than those of a *Siricid*, even if it had instincts prompting it to undertake them. The mere fact that its migrations would generally be only from one leaf to another of the same plant, or from one plant to another of the same sort growing hard by, would naturally make its dispersal slower than that of a *Siricid*, for the ♀♀ of that group seem not unfrequently to oviposit at a considerable distance from the timber out of which they have emerged. They seem, too, altogether better adapted for rambling afield than most *Tenthredinidae*. Their bodies are harder, their wings stronger, and their speed, strength, and often somewhat formidable appearance may carry them safely over areas which it would be dangerous for a *Tenthredinid* to enter. It may be remarked also that the *Siricidae* whose distributions are most "discontinuous," belong to a group (*Oryssus*, *Ophrynoptus*, etc.) whose species are rarities everywhere, and may probably be approaching extinction. It is still represented by at least one or two species in all Regions, and there can be little doubt that it was once a flourishing Family. Most of its characters appear to be exceedingly primitive, those of the ovipositor, etc., being remarkably "generalised"; others, however—

as the defective neuration of its wings—are suggestive rather of “degradation.” On the whole, it seems likely that this is one of the oldest, and perhaps the very oldest, of all groups included in the Sub-order, and the discontinuity of its distributions may simply be due to its extinction in the intervening areas. Yet it is certainly very puzzling, and to my mind even inexplicable, that *Ophrynopus* should occur only in Notogaea and Neogaea, and should be represented in these very distant Regions by forms which can only just be distinguished specifically, unless we suppose that some unknown cause has interfered with its natural dispersal. I believe, too, that one of the two recorded European spp. of *Oryssus* (*unicolor*, Latr.) is really an American form; and Enslin has lately described another sp., closely allied to the only other European sp. (*Abietinus*, Scop.), from a most unexpected locality—viz. the interior of Africa!

For the two-fold division of the Sub-order adopted by Linné, later systematists generally substitute one which recognises either three “Families” (Konow) or four “Families” (Enslin) or four “Superfamilies” (Rohwer). The two latter authors agree in separating the *Oryssidae* from the *Siricidae*, whereas Konow kept them together. These two groups differ greatly in the structural characters of the imago, but the larvae of *Oryssidae* seem to be entirely unknown, and though we may be sure that they live enclosed like *Siricidae* in timber it has never been ascertained whether or no they feed on it. For certain reasons it has sometimes occurred to me that they may be parasitical, and I find from Rohwer's *Studies* of this group (1912) that the same idea has suggested itself to others. If, however, their structure and habits should prove to be identical with those of Siricid larvae, I incline to think that the agreement between the two groups would outweigh their differences, and at any rate that these differences ought not to be treated as equivalent to those which separate both alike from the *Tenthredinidae*. It might be well, perhaps, to leave this question open for the present, until *Oryssid* larvae have been discovered, and their structures and life-histories elucidated.

The chief point on which systematists now differ is as to the place which should be given in classifications to two groups whose habits and structure seem to be hardly those of either true *Siricidae* or true *Tenthredinidae*—namely,

the "*Lydini*" and "*Cephini*" of Konow. To explain the points at issue we may begin by recapitulating briefly the most conspicuous peculiarities of these groups. I have alluded to most of them already.

The imagines of *Cephini*, superficially at least, much more nearly resemble *Siricidae* than *Tenthredinidae*. They agree with the former also in having *one* calcar only on the front tibiae, whereas the *Lydini* and the *Tenthredinidae* have *two*. Their ovipositors are much shorter than in most *Siricidae*, but of a somewhat similar type: narrow throughout, with comparatively few and simple denticulations shaped like those in the "stings" of Bees and Wasps; and they are generally more or less exerted. Their hind tibiae in most genera are armed (besides the calcaria) with other spines before their apices. In this they agree with the *Lydini*, but differ from *Siricidae* and also from most *Tenthredinidae*, though certain genera of these latter (chiefly Notogaëic and Neogaëic) possess such spines. Their larvae, like those of *Siricidae*, have no abdominal pro-legs, but, unlike them, they have a pair of small and simple eyes. These characters taken together would suggest that they were nearer to *Siricidae* than to *Tenthredinidae*, and might be an aberrant group of the former. Many authors, in fact, have so treated them.

The imagines of *Lydini*, on the contrary, have hardly any resemblance to those of *Siricidae*; but superficially, and also in a character of some importance (front tibia with *two* calcaria), come much nearer to the *Tenthredinidae*. A detail of structure, however, in the thorax which they share with the *Cephini*, distinguishes them from the *Tenthredinidae*. But it also separates them from the normal *Siricidae*. Their ovipositors are small and little developed in any way, but more like those of *Tenthredinidae* than of *Siricidae*. Their tibiae are more copiously spined than those of any other group, and this especially distinguishes them from any normal *Siricidae*. Enslin, calling attention to their bi-calcarate front tibiae, tabulates them as *Tenthredinidae*, but treats the *Cephini* as a Family apart (*Cephidae*, Ensl.), though he remarks on their likeness to *Siricidae*. Konow, however, and also Rohwer, form one Family, or (as Rohwer calls it) Superfamily (*Lydidae*, Konow = *Megalodontoidæ*, Rohwer) out of the *Lydini* and *Cephini*. I thought at one time that Enslin was certainly wrong in associating the *Lydini* with the *Tenthredinidae*, because the

whole structure and bionomics of their larvae differ profoundly. Larvae of *Lydini* have no abdominal pro-legs, they have a most singular and characteristic development of certain anal appendages (cerci), in both which characters they seem more "primitive" than normal *Tenthredinidae*; and though they feed *on leaves*, they are all the time *concealed* in rolled leaves or silken webs, one such web being sometimes spun in concert by a whole brood of larvae feeding together gregariously. But my confidence on the point was shaken when I found that several Australian larvae, which seem to be *Tenthredinid*, possess no pro-legs; that one of these (*Philomastix*) has also anal cerci developed even more paradoxically than those of the *Lydini*; and that the larvae of a certain Neogaeic *Tenthredinid* (*Diclocerus*) are stated by Curtis to spin up gregariously in a sort of joint-cocoon (*Tr. Linn. Soc. Lond.*, 1844, p. 248). The imagines of the Australian species above mentioned have ante-apical tibial spines as well as the usual "calcaria"; and putting all these facts together, I am tempted to think that both these latter and the *Lydini* may have inherited these characters from primitive *Tenthredinid* ancestors who had not yet completely developed the structures and habits, which have now become almost universal in the Family. At present, therefore, I cannot bring myself to follow Konow and Rohwer in uniting the *Cephini* with the *Lydini* as a single Family or Superfamily apart from and on a level with the *Siricidae* or *Tenthredinidae*. It seems to me more probable that the *Oryssidae*, *Siricidae* and *Cepidae* are subdivisions of one main group from which the *Tenthredinidae* should certainly be excluded. The *Lydini* (= *Pamphilinae*, Ensl.) may perhaps represent a primitive group of *Tenthredinidae* which had branched off from the main stock before it had developed certain characters (especially abdominal pro-legs in the larva, and the manner of feeding connected therewith) which are now almost universal in it—a few species, all Australian, being the only known exceptions. But even if this be true, it must remain a mere hypothesis in the absence of palaeontological evidences to support it, and such evidences must be admitted to be wholly wanting. Such little knowledge as we possess of the earliest representatives of the Sub-order has been carefully gathered and summarised in Handlirsch's great work on Fossil Insects. But the results at most indicate—it cannot be said that they *prove*—that the *Siricidae* are a more

ancient group than the *Tenthredinidae*. The former are represented in Secondary (Jurassic) strata by several forms which are referred to an extinct genus, *Pseudosirex*, and by a single very peculiar fossil, originally, but (*teste* Handlirsch) wrongly, described as an Ichneumonid (*Ephialtites*). If this be really a Sawfly it must, I suggest, have been an *Oryssid*. No *Tenthredinidae* or *Pamphilinae* occur in these strata, and no Sawflies of any kind have been found in those of Cretaceous or Eocene times. It is not till after the earliest division of the Tertiary period that *Tenthredinidae* and *Pamphilinae* begin to appear, namely, in the *Oligocene* deposits, and as most of these fossil forms are stated (sometimes, perhaps, in error?) to belong to well-known existing genera, they cannot be relied upon as fixing a date before which these groups cannot have come into existence. It is quite likely that they were already well established in Eocene times at least, and perhaps in Cretaceous, or even earlier, for *Siricidae* certainly must have existed all through these periods though we have no records of them, any more than of the *Tenthredinidae*! What is the precise relationship between these great groups can as yet be only conjectured. Judging from their "characters"—and we have nothing else to judge by—we may suppose that the *Siricidae* are the earlier group, but whether the *Tenthredinidae* and *Lydini* had Siricid ancestors, or whether *Siricidae* + *Cephini* + *Oryssidae* and *Tenthredinidae* + *Lydini* are respectively earlier and later branches of a common stock are questions which must here be left unanswered. Of one thing we may reasonably feel sure, viz. that the earliest Tenthredinid and Lydine genera were not differentiated exactly as are those which now exist, and that therefore those representatives of them that have been described from Oligocene deposits are not the first generations of these Families. The original ancestors may yet be discovered in earlier strata, or may never be discovered at all.

Note 3.—Characters of Australian and non-Australian Sawflies compared or contrasted.

If, as I believe is the case, the Sawflies of Australia are all descended from Holarctic ancestors, it is natural enough that we should be able to recognise among them far fewer distinct and strongly characterised groups, than in many Holarctic regions of an extent equal, or inferior, to that of

Australia. For they can include no forms but such as have succeeded in maintaining themselves while passing gradually southwards through climates and surroundings which differed at every stage in the journey, and as have found everywhere a vegetation suitable for their ovipositions, and held their own against a continual succession of fresh competitors and enemies of all kinds. And even among such Holarctic forms as possess this more or less exceptional adaptability, so that they now extend into districts lying as far south as Notogaea, probably a few only had reached the parts of Asia adjacent to Australia when the latter became inaccessible by its isolation. Had that isolation been a little longer delayed, Australia might probably have received from Arctogaea both Sawflies (e. g. *Athalia* and *Stromboceros*) and Mammals (e. g. *Tapirus* and *Elephas*) which seem never to have actually reached it. It is also not surprising that the type of Sawfly ("TENTHREDO *antennis filiformibus: articulis 7-9*" of Linné) which is most dominant of all in Holarctic districts—no doubt because it is best adapted to their special surroundings—should be precisely that which is most conspicuously absent from Notogaea, or, at any rate, from Australia. Whereas groups which have a more cosmopolitan range (*Arginae*, *Lophyrinae*, and *Cimbicinae*) though not unrepresented in Arctogaea form comparatively a very small part* of its Fauna.

I will now enumerate some of the most definite ways in which Australian forms differ often or always from the most normal Arctogaenic Sawflies. Not all the characters to which attention will be called are invariable in Australia or Arctogaea as the case may be: but some really are so, when we take them one by one; and others are *combined* together in one Realm in a way to which we cannot find parallels in the other. Considered as a whole they help to show, what has already been shown often and perhaps more conclusively by other kinds of evidence, (1) that the Fauna of Australia is as *distinct* as we should expect it to be from its long isolation, (2) that it includes representatives of only a few of the groups occurring elsewhere, (3) and that, however the fact is to be explained, there is more appearance of affinity between certain Neogaenic and Noto-

* A rough calculation, based chiefly on localities cited by Konow in *Genera Insectorum*, gives us in Arctogaea 4 *Arginae* only out of nearly 100 genera peculiar to it, in Neogaea 16 out of 33, and in Notogaea 3 out of 15.

gaëic forms than between the latter and any now to be found in Arctogaea.

As to "larval" characters, we have seen that occasionally in Australia, but never in Arctogaea, forms which feed moving freely about over their food-plants have notwithstanding developed no pro-legs. It would be interesting to know whether any such cases occur in Neogaea, and especially if there are any among such genera as in other ways seem to show affinity with *Perga*, etc. But I have sought in vain to get any information on this point, so we may pass on at once to consider the characters of imagines.

(a) *Venation of the fore-wing.*

i. In most groups of Arctogaëic Sawflies, and in almost all those which may be considered typical and dominant in that Realm, the radial cell is divided by a transverse nerve. The exceptions are the *Arginæ*, the *Lophyrinæ*, and a great majority of the *Nematinæ*.

On the contrary in Notogaëic forms, to whatever group they may belong, the radial cell is invariably undivided. In some cases this is not surprising, for three of the Australian genera are *Arginæ*, and others appear to be more akin to that group and probably also to the *Lophyrinæ* than to any Arctogaëic genus in which the radial cell is divided. But we cannot thus account for the absence of a transverse nerve in the *Syzygoniides* (*Perga*, etc.). The only existing Arctogaëic Family in which these could possibly be placed is that of the *Cimbicinæ*, and all Arctogaëic genera of that Family have the radial cell divided. Such at least is now the case though it is not easy to explain why it should be so, for the earlier (fossil) genera of *Cimbicinæ*—the *Phenacopergini* of Rohwer's Classification—are stated to have the cell undivided, so that—contrary to what might have been expected—the venation of modern *Cimber*, *Abia*, *Amasis*, etc. seems to be more "generalised" than that of their probable ancestors. But it is possible, no doubt, that the *Syzygoniids* and *Phenacopergini* represent one branch of the *Cimbicinæ* in which the "transverse radial nerve" long ago disappeared, and the Arctogaëic *Cimbicinæ* another branch of the same stock which have retained it. However, in any case, the universal absence of this nerve in Notogaëic *Tenthredinidæ* is a circumstance which deserves to be noted.

ii. A character which separates all Arctogaëic Sawflies from Hymenoptera of other Orders is the presence of a

"lanceolate cell." The vein which bounds this "cell" inferiorly, called by Konow the "humerus," and by Comstock reckoned as a branch (or branches) of the "anal vein," is subject to much modification. It may be visible as running without a break from end to end of the lanceolate cell, and keeping entirely clear of the so-called "*brachius*"* (sic! in Konow's nomenclature) which bounds that cell from above. Or it may seem that these veins are in part combined into a single vein, with the result that the lanceolate cell becomes either "longly contracted," or "petiolate." But in no case is a lanceolate cell actually wanting.

But in several Australian genera, belonging to at least two or three distinct groups, no lanceolate cell whatever can be recognised. And of the genera which possess such a cell, one only—viz. *Zenarge*, Rohwer—has the cell shaped as in the most typical Aretogaëic genera (*Dolerus*, *Allantus*, *Tenthredella*, etc., etc. In all the others which belong to the *Arginae* it is "contracted," and in all which are not *Arginae* it is "petiolate." Here again, we find an agreement between the Notogaëic and Neogaëic Faunas. For, in Neogaea also, the lanceolate cell is wanting in several groups, and when present, is generally either petiolate, or contracted. And here, again, the facts seem rather puzzling. For the latest authorities on such subjects assure us that the venation of Hymenoptera becomes "specialised" by Reduction (i. e. loss of veins) only! And from this it would seem to follow that in this case the present Aretogaëic Sawflies, which have all retained the "vena humeralis," are more "generalised" and primitive than *Perga*, *Syzygonia*, and the other genera which have lost it. Yet, if this and the other abnormal characters of the latter were inherited from very ancient common ancestors—and this seems more likely than that they should have been differentiated independently and yet identically in some half-dozen different genera in two very distant Regions, and in no genus at all anywhere else—it is rather surprising that those ancestors should have had a venation less "generalised" and primitive than that now universal in Aretogaëa.

* Who invented this word I do not know. The nearest approach to it I can find in Lewis and Short's Latin Dictionary is the neuter substantive "*bracchium*" (less correctly "*brāchium*") with an adjective "*bracchialis*" formed from it.

(b) *Venation of the hind-wing*.—In most Arctogaëic genera a “cubital” and also a “recurrent” nerve are present in the hind-wing, and the former lies *beyond* the latter (*i. e.* approaches nearer to the apex of the wing), so that two “enclosed cells” appear, of which the upper one is larger than the lower. More rarely the recurrent nerve only is present; and in some cases *both* nerves are wanting, so that the wing has no enclosed cells at all.

In Australia all indigenous genera except two out of its three *Arginæ*, viz. *Trichorhachus* and *Antargidium*, have the cubital nerve present, and the recurrent absent—the one state of things which, if I mistake not, is never to be found in Arctogaëic forms. And both *Trichorhachus* and *Antargidium* differ from very nearly all Arctogaëic genera, even from their nearest relations among the *Arginæ*, in that, though a cubital and a recurrent nerve are present, the former never lies beyond the latter, but (*vice versa*) the recurrent nerve in *Trichorhachus* lies far beyond the cubital, making the upper of the two “cells” by far the smaller!, while in *Antargidium* the two nerves are practically interstitial, and the “cells” are approximately equal. I had almost said that *no* Arctogaëic genus had a similar venation, but I should have been wrong, for *one* has it, viz. *Athalia*! There, too, the nerves are interstitial, and the two cells approximately equal. Of the Neogaëic genera *Syzygonia* and *Incalia* only seem to have a Notogaëic type of neuration in the hind-wing. In other cases *two* closed cells are regularly present, and these have the shapes and proportions usual in Arctogaëic forms.

(c) *Antennæ*.—The type of antenna which is beyond all comparison the most usual in Arctogaëic Sawflies—namely, *nine* nearly simple cylindrical joints, generally tapering slightly from the base to the apex, none of them showing any very noticeable tendency to swell out or project at its apex and so give the antenna a “serrate,” “moniliate,” or “pectinate” appearance—seems to be entirely unrepresented in Australia. Instead, we find there all the Tenthredinid genera furnished with antennæ more or less resembling those of some or other Arctogaëic, but not *especially* Arctogaëic, group. *Zenarge* and *Antargidium* have them much as in *Arge*; *Trichorhachus* as in *Schizocera*; *Perga* and *Nyloperga* as in *Cimber* or more often as in *Abia*; *Pterygophorus* and *Polycellus* as in certain *Lophyrinæ*; and both sexes of several genera as

in ♀♀ (not ♂♂) of the latter group. Nine, instead of being the normal number of their joints, is about the rarest of all; almost confined to one genus, *Eurys*, and even there by no means universal, while the form of the joints is never simply cylindrical.

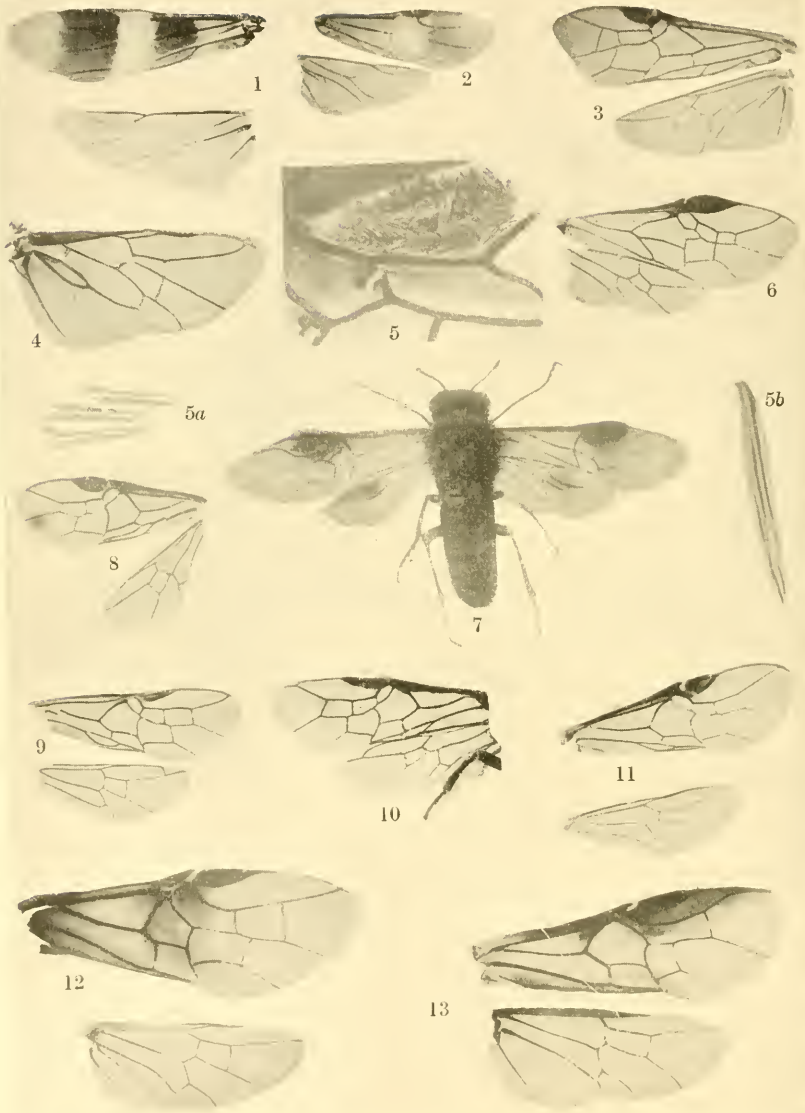
The most characteristic of the Neogaëic Genera resemble one or other of the Australian groups in their antennal characters. But genera also occur there which seem to have arrived more recently, either identical with present Aretogaëic groups or very closely related to them, and in these the antennae are of the prevailing Aretogaëic Type.

(d) *Mouth-parts.* *The palpi.*—Having examined dissections of the mouth-parts in many Aretogaëic *Tenthredinidae* I have invariably found that the maxillary palpi had 6 joints and the labial 4. The same numbers are normal in other Hymenopterous groups, though there are exceptions, *e. g.* the Bees.

But this rule is by no means so universal either in Notogaëa or Neogaëa. Citing only cases where I have myself examined the dissections, I can testify that in the Australian genera *Phylacteophaga*, *Philomastix* and *Perga*—not, however, in *Xyloperga*—and in the Neogaëic *Incalia* (*hirticornis*), *Pachylosticta* (= *Plagiocera*) *albiventris*, and *Lophyroides* (= *Perreyia*, Auctt. *nee?* Brullé) *tropicus* the numbers of joints are not 6 and 4 respectively, but 4 and 3. Again in *Syzygonia* they are 5 and 3, and in what I take to be the real *Perreyia*, Brullé, actually only 2 (or possibly 3) and 1.

There is no doubt that two or more quite unrelated groups might independently undergo a similar modification of their mouth-parts, and again that groups very nearly related might differ in this character, through adaptation to some special circumstance connected with their feeding. (Mr. Turner has thus explained a difference in the development of their palpi between the American and Australian *Thynnidae*.)

But it seems highly improbable that the agreement in so unusual a character between certain particular groups in two very distant districts, these groups having also a singular affinity in other quite different characters, should be a mere coincidence, the American and Australian forms having (as Cameron suggests) developed the reduction in the number of these joints independently since they reached their present habitats. I should suspect rather



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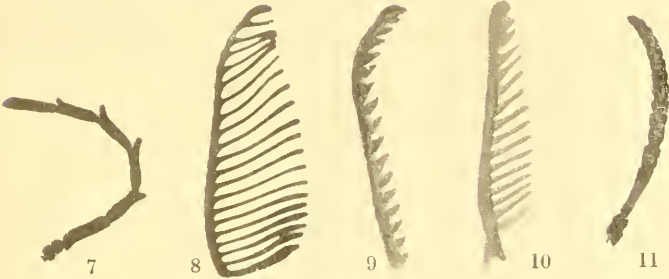
AUSTRALIAN SAWFLIES.

EXPLANATION OF PLATE XI.

- FIG. 1. Wings of *Ophrynopus sericatus*, ♀.
2. " " " " ♂.
3. " " *Zenarge turneri*.
4. Hind-wing of *Antargidium apicale*.
5. Hair-patch (*androconia*?) on fore-wing of *Perga polita*, ♂, slightly magnified.
- 5a. Hairs from same, magnified ($\frac{1}{2}$ in. power).
- 5b. One of the hairs more highly magnified ($\frac{1}{6}$ in. power).
6. Wings of *Phylacteophaga eucalypti*.
7. *Perga castanea*, ♂, showing hair-patches on both wings of each pair.
8. Wings of *Diphamorphos minor*.
9. " " *Ncoeurys* sp. (?).
10. " " *Eurys laetus*.
11. " " *Clarissa divergens*.
12. " " *Pterygophorus uniformis*.
13. " " *Philomastix nancarrowi*.

EXPLANATION OF PLATE XII.

- FIG. 1. Antenna of *Ophrynopus sericatus*, ♂.
 2. " " " ♀.
 3. " *Trichorhachus nilidus*, ♂.
 4. " *Zenarge turneri*, ♂.
 5. " *Philomastix naucarrowi*, ♂.
 6. " " " ♀.
 7. " *Phylacteophaga eucalypti*, ♂.
 8. " *Pterygophorus uniformis*, ♂.
 9. " " " ♀.
 10. " " *analis*, ♀ (!).
 11. " *Diphamorphos minor*, ♀.
 12. Mouth-parts (palpi, etc.) of *Perga dorsalis*.
 13. " " " *ferruginea*.
 14. " " " *Xyloperga univittata*.
 15. " " " *Philomastix naucarrowi*.
 16. " " " *Phylacteophaga eucalypti*.
 17. " " " *Pterygophorus uniformis*.
 18. Hind tibia of *Ophrynopus sericatus*, ♀.
 19. Middle " *Zenarge turneri*, ♀.



Photo, F. D. Morice.

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AUSTRALIAN SAWFLIES.



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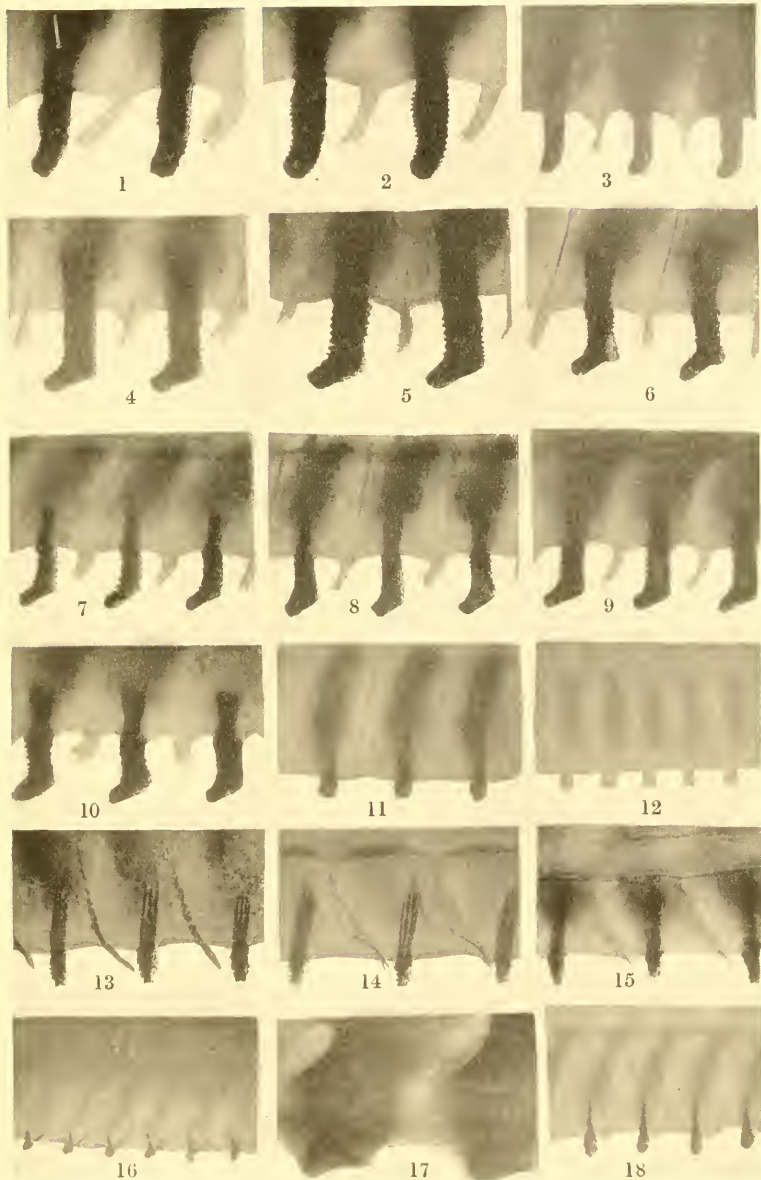
AUSTRALIAN SAWFLIES.

EXPLANATION OF PLATE XIII.

- FIG. 1. Terebra of *Ophrynopus sericatus*, ♀.
2. Apex of " " more highly magnified.
3. " " " still further magnified.
4. "Saw" and "support" of *Perga castanea*.
5. " " " *gravenhorstii*.
6. "Saw" of *Xyloperga univittata*.
7. Support of " "
8. Saw and support of *Zenarge turneri*.
9. " " *Philomastix nancarrowi*.
10. " " *Phylacteophaga eucalypti*.
11. " " *Pterygophorus uniformis*.
12. " " *Clarissa divergens*.
13. " " *Diphamorphos minor*.

EXPLANATION OF PLATE XIV.

- FIG. 1. Details of "saw" in *Perga dorsalis*.
- | | | | | |
|-----|----|----|----|-------------------------------------|
| 2. | .. | .. | .. | <i>affinis</i> . |
| 3. | .. | .. | .. | <i>agnata</i> . |
| 4. | .. | .. | .. | <i>klugii</i> . |
| 5. | .. | .. | .. | <i>kirbii</i> . |
| 6. | .. | .. | .. | <i>schödtleri</i> . |
| 7. | .. | .. | .. | <i>intricans</i> . |
| 8. | .. | .. | .. | <i>brevitarsis</i> . |
| 9. | .. | .. | .. | <i>polita</i> . |
| 10. | .. | .. | .. | <i>castanea</i> . |
| 11. | .. | .. | .. | <i>esenbeckii</i> . |
| 12. | .. | .. | .. | <i>walkeri</i> . |
| 13. | .. | .. | .. | <i>lewisii</i> . |
| 14. | .. | .. | .. | <i>ferruginea</i> . |
| 15. | .. | .. | .. | <i>guerini</i> (= <i>smithii</i>). |
| 16. | .. | .. | .. | <i>antiope</i> . |
| 17. | .. | .. | .. | <i>belinda</i> . |
| 18. | .. | .. | .. | <i>cameronii</i> . |



Photo, F. D. Morice.

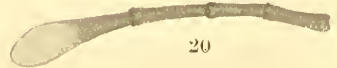
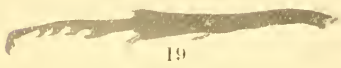
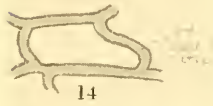
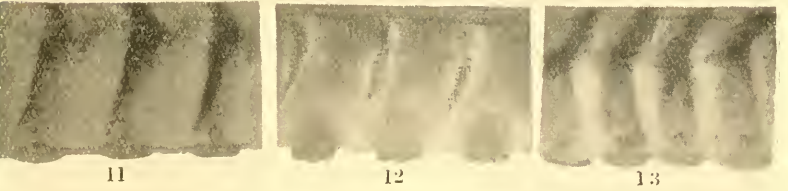
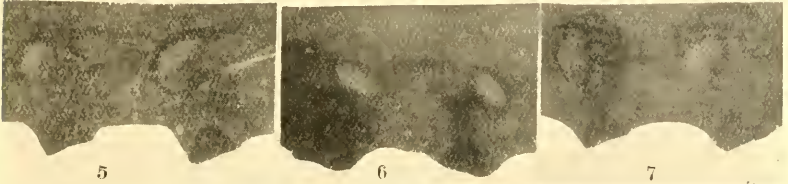
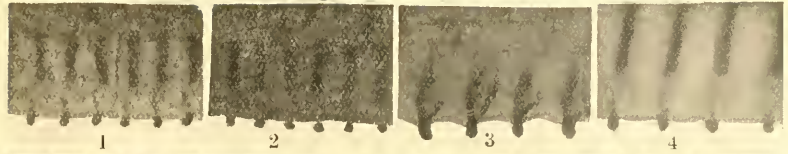
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EXPLANATION OF PLATE XV.

- FIG. 1. Details of "saw" in *Perga vacillans*.
 2. " " " *latreillei*.
 3. " " " *spinolae*.
 4. " " " *glabra*.
 5. " " " *bella*.
 6. " " " " *dicaricata* " (= *praecedens*?).
 7. " " " *rubripes*.
 8. " " " *hartigii*.
 9. " " " *gravenhorstii*.
 10. " " " *bicolor*.
 11. " " " *Xyloperga halidaii*.
 12. " " " *aurulenta*.
 13. " " " *univittata*.
 14. Third cubital cell in *Perga dorsalis*.
 15. " " " *Xyloperga univittata*.
 16. Genital armature of *Perga antiopa*, ♂.
 17. Larva of *Perga* sp. (probably *dorsalis*).
 18. Antenna of *Perga mayrii*.
 19. Hind tibia and tarsi of *Perga antiopa*, ♀.
 20. Antenna of *Perga cameronii*, ♀ (4 apical joints).

(14, 15, 18 and 20 are photographed from *drawings* made by the writer from specimens in B.M.)



Photo, F. D. Movice

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AUSTRALIAN SAWFLIES.

that in both cases the peculiarity was inherited from Arctogaëic ancestors common to both groups, who have bequeathed it to some, but not to all, of their descendants. However explained, it seems a curious fact that *Perga* and *Xyloperga* spp. (at least in all such specimens as I have been able to examine) should differ in this character, for apart from it the two genera are so closely allied that it may be doubted whether we do right in separating them.

I think that we must consider the 6- and 4-jointed condition to be the primitive one, but that it is useless to spend much thought on the question, *why* such and such forms have departed from it. Had the modification anything to do with any peculiarity in the feeding-habits of such genera as possess it, it would have surely extended to *Xyloperga* as well as *Perga*. At that we may be content to leave it!

(e) The spinose tibiae of so many Australian imagines are a character which is not easily accounted for. It is an extremely rare character in Arctogaëa: in fact, apart from the *Pamphilinae*, it seems to be limited in the Holarctic region to one genus, namely *Arge*. In Notogaëa, however, besides occurring (as might be expected) in the three genera which are manifestly *Arginae*, it is found also in *Perga*, *Xyloperga*, *Phylactophaga*, *Philomastix*, and *Cerealces*. In Neogaëa, again setting aside genera of *Arginae*, tibial spines (apart from the apical "calcaria," are found in *Syzygonia* and *Incalia* which are in other characters closely allied to *Perga* and *Cerealces*, but not in *Pachylosticta* (which is in many ways a *Perga*-like form). Tibial spines occur also in several genera belonging to groups which, as Mr. Rohwer has lately suggested (*Ann. and Mag. Nat. Hist.*, November 1918), may probably be allied to the *Arginae*, and also to the Australian *Pterygophorus*. But I do not think that so large a proportion of Neogaëic, as of Notogaëic genera possess them. Nor do I at present feel able to draw any particular inferences from these facts as to *special* affinities between Notogaëic and Neogaëic groups unless (*e. g.* those which Konow calls *Syzygoniides*) they agree in a considerable aggregate of other characters.

It may be remarked that spinose armature of the legs is a very frequent character in Hymenoptera other than Sawflies, and serves among these many purposes (*e. g.* in

the pairing of the sexes, and the nidifications of sand-burrowing Fossors) which it certainly never serves in the case of a Sawfly. In fact, Secondary Sexual characters—even those of the antennæ—are rather noticeably infrequent in that group, nor have any of its genera Fossorial habits. What use they can have for tibial spines, unless, like the calcaria, as an assistance to their “toilettes,” I cannot suggest. Nor can I see any reason for their more frequent development in one group, or one district, than in another.

As to the *Siricidae* and *Oryssidae* recorded from Australia little need here be said of them. They amount only to 3 species in all, one of which (a *Sirex*) is a manifest importation. The others, though neither species is known to occur elsewhere, belong to genera whose species are widely and in one case very irregularly distributed, namely, *Xiphydria* (a Siricid) and *Ophrynopus* (an Oryssid). *Xiphydria* occurs all over the world, England included, and a section of it, to which the Australian species appears to belong, with certain local peculiarities (unusually short ovipositor, etc.), is represented by several species in the Oriental Region, from which Australia in all probability received it, but when, or how, can only be conjectured. *Ophrynopus* has an extraordinarily discontinuous distribution. The metropolis of the genus seems to be in Neogaea, outside of which Realm, so far as I know, it has only occurred on two occasions (once in considerable numbers) in North Queensland, and also in New South Wales and in the Aru Islands (between Australia and New Guinea). There is the closest possible resemblance between its various species, and it seems impossible to form any plausible theory to account for its actual distribution. [It is remarkable that most of the North-Queensland specimens were taken in company with many other insects of various kinds, and that among these were examples of an Australian Fossorial-wasp (*Aphelotoma striaticollis*, Turner), of which it might almost be supposed to be a mimic! * The district is so wild, and as yet so little in touch with civilisation, that the insect can hardly be thought to have been imported. Yet if it be truly a long-established indigene, its agreement—in fact almost identity—with Neogaëic forms seems altogether inexplicable!]

* The ♀ also, when its wings are closed, has quite a startling resemblance to the formidable stinging ♀ of a *Mutilla*.

Note 4.—Proposals to break up the Genus Perga as defined by Leach.

When Leach (1817) established the genus *Perga* he described it as "Genus artificiosum, sedulose" (sic!) "elaborandum." He suggested, however, no names for the groups into which he thought it divisible, and this is not to be regretted, for such differences between them as he noticed are all either sexual characters, or due to aberration in individuals. Westwood (1880), recognising this, deliberately ignored Leach's divisions, nor did he himself propose any others, but confined himself to elucidating by descriptions and figures all the species with which he was acquainted. Two years later W. F. Kirby published his British Museum list of all Sawflies known to him by autopsy or in literature, arranging the *Perga* spp. into 3 "sections" according to differences in their antenae, but he gave no names to these sections, and in his later publications I believe that he never alludes to them. Up to that time, except Leach himself, and Lepeletier, who quotes Leach's remark to that effect, no author seems to have thought the genus in need as a whole of revision, though it was suggested by Guérin in 1845 that it might be desirable in future to treat two forms (*P. lewisii* and *ventralis*—which are probably only the sexes of one species) as a distinct subgenus, in which case he proposed to name it *Pseudoperga*. There is no doubt, I think, that if it should become advisable to divide *Perga* into a number of named sections *Pseudoperga*, Guérin, with *lewisii*, Westw., for its Type will have to be one of them. But I see no need for this at present, and the section, whenever it has to be established, must be established on other characters than that by which Guérin proposed to distinguish it, namely, the absence of a 1st cubital nerve in the fore-wing. For (1) this nerve is not unfrequently absent in other groups. In fact, Leach and Ashmead describe it as absent in *polita*; and sometimes (though only as an aberration) it is so in that, and several other species. (2) It is, sometimes at least, quite well developed in *lewisii*. (3) And it is more often present than not in *ferruginea*, which seems to me clearly a member of the *lewisii* group.

Of the "New Classification of the Genus *Perga*" pro-

posed by Shipp in the *Entomologist*, Dec. 1894, I have already expressed my opinion (*supra*, pp. 264, 271). Much of it is sheer nonsense, as for instance when he sets up an altogether imaginary genus *Plagioperga* (characterised as having 7-jointed antennae and 3 cubital cells), selects as its Type precisely the one species of Leach's genus (viz. *mayrii*, Westw.) in which the antennae have not even the usual 6 joints, but only 5 (!), and mentions as another example of it a species really belonging to an entirely different group—in fact, a perfectly normal *Xyloperga*! There was really no excuse for his blunder about *mayrii*, for Westwood not only describes but figures its 5-jointed antennae! In one case, however, Shipp has proposed a name which must apparently be accepted, for his "*Xyloperga*" (n.g. with Type *halidaii*, Westw.) happens, though he did not know this, to be a real natural division of the group, separated from all others not by antennal characters only, but by a different number of joints in its palpi. It may also become necessary at some future time to accept the restriction of the name *Perga* to a group with *dorsalis* for its Type. *Cameronii* again—the Type of Shipp's *Acanthoperga*—has some very extraordinary characters, though I doubt if they need exclude it from *Perga* as we now define that genus. For *Pseudoperga* (with Type *lewisii*) not Shipp, but Guérin is responsible. *Pergadopsis* (Type *dahlbomii*) and *Camptoperga* (Type *cressonii*) are separated only by one character. *Pergadopsis* being said to have 3 cubital cells only, and *Camptoperga* 4. This character in my opinion is quite valueless for systematic purposes unless it be accompanied by other differences in the forms to be separated. However, I have examined Westwood's Types of *dahlbomii* and *cressonii* and can find no such difference in the neuration as has been stated to exist. Both appear to me to have four cubital cells, and I see no reason to doubt that they are congeneric. Having thus gone once more point by point over Shipp's "New Classification" I remain unconvinced that it ought to be taken seriously.

Ashmead (1898), probably unaware that Shipp had anticipated him, also attempted to disintegrate Leach's unfortunate genus. He proposed to make of it four genera—*Perga*, *Pseudoperga*, *Paraperga*, and *Neoperga*. Of *Perga* he named no Type; his *Pseudoperga* (Type *polita*) is a "homonym" of Guérin's *Pseudoperga* (Type *lewisii*);

Paraperga (Type *juvanda*), and *Neoperga* (Type *amenaïda*), are "synonyms" of *Xyloperga*, Shipp!

Konow in his unfinished Monograph, and also in *Genera Insectorum*, divides the group into two genera, viz. *Perga* and *Heptacola*. The latter name must sink as a synonym of *Xyloperga*; and the author also fell into a mistake by commencing his list of *Heptacola* spp. with *maeleayi*, Westw. That species, as I have remarked elsewhere, is really a *Philomastix*.

In concluding these remarks, I would suggest that, even when a genus can be divided into more or less definite sections, it does not follow that it is well to *name* such sections, and still less to erect them into "Genera." The study of any natural group is, no doubt, advanced in one direction if we can detect and point out unnoticed differences between the sections into which (like all other natural groups) it is divisible. But in another direction it is impeded, if such stress is laid on these differences as to make us forget the not less important differences which separate the group as a whole from other groups. If the object of Systematics were merely to facilitate the naming of specimens, it would be only a question of practical convenience in each case, whether at such and such a time this or that genus should be upheld or disintegrated. But, if our ideal be rather a classification corresponding as nearly as our knowledge permits to the actual proportion of likeness as well as of unlikeness existing between the objects we are studying, I venture to think that, whereas a single character may suffice to isolate some one form as a "good species," much more than this—in fact, a considerable aggregate of characters peculiar to some one section of a group (and also some reason for considering them possessed of phylogenetic significance), should be producible, before we are justified in treating that section as a "Genus." It is true that we can never hope to establish categories of classification which shall fully represent the degrees of consanguinity between related organisms. But still that should be the ideal at which we aim, and if we aim at it, we shall hesitate before we decide to call that a *generic* difference which can scarcely be distinguished from another which we call *specific*.

Note 5.—BIBLIOGRAPHICAL.

References to authors and passages cited in these Notes. Names of Genera first recorded from Australia follow the dates between square brackets. Synonyms and misidentifications in smaller capitals. Genera not peculiar to Australia in italic capital letters.

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Rohwer (*Ent. News, Philadelphia*, pp. 167 *et seq.*), 1910
[NEOEURYS, DIPHAMORPHOS].
id. (*Ann. and Mag. Nat. Hist.*, November), 1918
[XIPHYDRIA, ZENARCHE].
Vide also "*Australian Insects*," by W. W. Froggatt
(Sydney), 1907.

EXPLANATION OF PLATES XI—XV.

[See *Explanation facing the PLATES.*]

XV. *The Hymenoptera of Fiji.* By ROWLAND E. TURNER,
F.Z.S., F.E.S.

[Read November 20th, 1918.]

ONLY fifty-three Hymenoptera seem so far to have been recorded from Fiji, including five new species described here. Of these several are undoubtedly introduced species, and others are known to have a wide range in Polynesia. A few of the larger species are almost certainly confined to Fiji, and show no near relationship to species found in any other group of islands. Thus *Cyphononyx vitiensis*, Turn., is very distinct from any of the *Psammocharidae* inhabiting New Caledonia or New Zealand; and *Stizus inermis*, Handl., is very distinct in the structure of the male antennae from the wide-ranging section of the genus to which it approaches most nearly in other respects. Though doubtless the fauna of the group is very poor in the larger Hymenoptera, there must be many of the more minute species still remaining to be discovered, and it is important that the fauna should be studied before it becomes too much changed by the ravages of cultivation and the competition of imported forms.

Most of the material used for this paper was collected by Mr. R. Veitch and forwarded to the Imperial Bureau of Entomology.

Family FORMICIDAE.

Subfamily PONERINAE.

1. *Odontomachus angulatus*, Mayr.

Odontomachus angulatus, Mayr, Sitzungsber. Akad. Wiss.
Wien, liii, p. 500, 1866.

Hab. Ovalau.

2. *Odontomachus haematoda*, Linn.

Formica haematoda, Linn., Syst. nat. Ed. 10, i, p. 582,
1758.

Odontomachus haematodes, Latr., Hist. nat. Crust. et Insect,
xiii, p. 257, 1805.

TRANS. ENT. SOC. LOND. 1918.—PARTS III, IV. (MAR. '19)

Hab. Natova (*R. Veitch*), August: Nairai (*Voyage of the Herald*), November 1855. Also from almost all tropical regions.

Subfamily *MYRMECINAE*.

3. *Cardiocondyla nuda*, Mayr.

Leptothorax nulus, Mayr, Sitzungsber. Akad. Wiss. Wien, liii, p. 508, 1866.

Cardiocondyla nuda, Forel, Mitth. München. Entom. Ver., v, 1, p. 3, 1881.

A wide-ranging species in the Oriental and Australian regions.

4. *Pheidole oceanica*, Mayr.

Pheidole oceanica, Mayr, Sitzungsber. Akad. Wiss. Wien, liii, p. 510, 1866, ♀♂ (*nec* ♀, *nec* ♂).

Hab. Ovalau. Also from Tonga.

5. *Pheidole umbonata*, Mayr.

Pheidole oceanica, Mayr, Sitzungsber. Akad. Wiss. Wien, liii, p. 510, 1866, ♀♂ (*nec* ♀ *nec* ♂).

Pheidole umbonata, Mayr, Verh. Zool.-bot. Ges. Wien, xx, p. 977, 1870, ♀.

Hab. Ovalau. Also from Tonga.

Subfamily *CAMPONOTINAE*.

6. *Camponotus cristatus*, Mayr.

Camponotus cristatus, Mayr, Sitzungsber. Akad. Wiss. Wien, liii, p. 489, 1866.

Hab. Ovalau.

7. *Camponotus laminatus*, Mayr.

Camponotus laminatus, Mayr, Sitzungsber. Akad. Wiss. Wien, liii, p. 489, 1866.

Hab. Ovalau.

8. *Camponotus schmeltzii*, Mayr.

Camponotus schmeltzii, Mayr, Sitzungsber. Akad. Wiss. Wien, liii, p. 490, 1866.

Hab. Ovalau.

9. *Camponotus (Colobopsis) dentatus*, Mayr.

Colobopsis dentata, Mayr, Sitzungsber. Akad. Wiss. Wien, liii, p. 492, 1866.

Hab. Ovalau.

10. *Camponotus (Colobopsis) carinatus*, Mayr.

Colobopsis carinata, Mayr, Verh. Zool.-bot. Ges. Wien, xx, p. 943, 1870.

Hab. Ovalau.

11. *Camponotus (Colobopsis) oceanicus*, Mayr.

Colobopsis oceanica, Mayr, Verh. Zool.-bot. Ges. Wien, xx, p. 943, 1870.

Hab. Ovalau.

Family APIDAE.

Subfamily PROSOPIDINAE.

12. *Prosopis fijiensis*, Ckll.

Prosopis fijiensis, Ckll., Ann. & Mag. Nat. Hist. (8) iv, p. 393, 1909, ♀.

I think this species should be placed in the genus *Palaeorhiza*, Pkns., but, as I have only seen the female, I leave it provisionally in *Prosopis*.

Subfamily ANDRENINAE.

13. *Haliectus perpessicus*, Kohl.

Haliectus perpessicus, Kohl, Denkschr. Akad. Wiss. Wien, lxxxii, p. 307, 1908, ♀♂.

Hab. Cuvu (*R. Veitch*), June. Described from Samoa, but also recorded from Fiji by Kohl.

Subfamily MEGACHILINAE.

14. *Lithurgus albofimbriatus*, Sichel.

Lithurgus albofimbriatus, Sichel, Reise d. Novara Zool. ii, Hymen., p. 154, 1867, ♀.

Hab. Cuvu (*R. Veitch*), July and August. Also from Tahiti.

This species has recently become established in Hawaii.

15. **Megachile scutellata**, Sm.

Megachile scutellata. Sm., Deser. New Spec. Hymen.,
p. 66, 1879. ♀.

Hab. Cuvu (*R. Veitch*), June.

16. **Megachile fimbriventris**, Friese.

Megachile fimbriventris. Friese, Deutsche Ent. Zeitschr.,
p. 453, 1911.

Hab. Cuvu (*R. Veitch*), June.

This seems to me to be a subspecies of *M. similis*, Sm., from the New Hebrides, differing in the distinctly stronger puncturation of the tergites.

Family SPHEGIDAE.

Subfamily STIZINAE.

17. **Stizus inermis**, Handl.

Stizus inermis. Handl., Sitzungsab., Akad. Wiss. Wien, ci,
p. 91, 1892. ♂.

Stizus pacificus. Turn., Trans. Ent. Soc. London, p. 82,
1917, ♀.

The male varies very much in colour, the abdomen in some specimens being almost entirely pale yellow, also the greater part of the median segment and postscutellum, the greater part of the scutellum laterally, the sides of the mesonotum and two longitudinal bands near the middle of the mesonotum. The colour of the female does not seem to vary as much.

Hab. Cuvu (*R. Veitch*), January. ♂♀; Natova, October, ♀.

Though near the *tridens* group, this species is very distinct in the simple antennae of the male, as pointed out by Handlirsch.

Subfamily CRABRONINAE.

18. **Rhopalum oceanicum**, Schulz.

Crabro (Rhopalum) oceanicum. Schulz, Spolia Hymenopt.,
p. 202, 1906.

19. **Crabro veitchi**, Turn.

Crabro veitchi, Turn., Trans. Ent. Soc. London, p. 84,
1917, ♀.

Subfamily *LARRINAE*.20. *Notogonia retiaria*, Turn.

Notogonia retiaria, Turn., Proc. Zool. Soc. London. p. 479, 1908.

Hab. Natova (*R. Veitch*), April; Cuvu, January. Also from Australia.

Subfamily *TRYPOXYLONINAE*.21. *Pison ignavum*, Turn.

Pison ignavum, Turn., Proc. Zool. Soc. London, p. 511, 1908.

Hab. Rarawai (*R. Veitch*), November. Also from Queensland.

22. *Pison tahitense*, Sauss.

Pison tahitense, Sauss., Reise d. Novara Zool., ii. Hymen., p. 65, 1867.

Hab. Natova (*R. Veitch*), October.

Described from Tahiti, also recorded by Kohl from Samoa.

23. *Pison rechingeri*, Kohl.

Pison rechingeri, Kohl, Denkschr. Akad. Wiss. Wien, lxxxi, p. 309, 1908.

Hab. Fiji (*R. C. L. Perkins*).

Described from Samoa.

Family *EUMENIDAE*.24. *Eumenes ovalauensis*, Sauss.

Eumenes ovalauensis, Sauss., Stett. Entom. Zeit., xxx, p. 53, 1869.

Belenogaster bidentatus, W. F. Kirby, Ann. & Mag. Nat. Hist. (5) xiii, p. 410, 1884, ♂.

Hab. Suva (*Woodford*); Sigatoka (*R. Veitch*), May.

25. *Rhynchium rufipes*, Fabr.

Vespa rufipes, Fabr., Syst. Ent., p. 367, 1775.

Rhynchium rufipes, Sauss., Reise d. Novara, Zool. ii. p. 8, 1867.

Hab. Cuvu (*R. Veitch*), September; Sigatoka, May. Also from Rarotonga Tahiti and other Pacific Islands.

26. *Odynerus (Leionotus) mediocinctus*, sp. n.

♀. Nigra; mandibulis, clypeo, macula inter antennis, scapo, flagelli articulo primo, prothorace, mesopleuris macula magna sub alis, tegulis, scutello fascia lata transversa, segmento mediano macula apicali utrinque, segmentis abdominalibus primo, quinto sextoque, pedibusque rufis-aurantiacis; alis infumatis, venis fuscis.

Long. 9 mm.

♀. Clypeus rather sparsely punctured, much longer than its greatest breadth, rather narrowly subtruncate at the apex; a short longitudinal carina between the antennae. Front strongly, vertex more finely punctured; thorax sparsely, but rather strongly, punctured, more finely on the pleurae than on the dorsal surface, somewhat elongate; scutellum and postscutellum almost flat; the postscutellum subtriangular, narrowly rounded at the apex. Median segment prolonged horizontally at the sides, the middle strongly convex from the apex of the postscutellum. Abdomen shining, with a few scattered punctures; first tergite scarcely more than half as broad at the apex as the apex of the second, the second somewhat constricted at the base, longer than its greatest breadth; second sternite rather sparsely punctured, almost flat. Second abscissa of the radius very short, the second cubital cell almost triangular.

Hab. Fiji (*R. Veitch*). 1 ♀.

It is possible that the colour of the markings has been altered by cyanide and should be yellow, as in the allied species, *O. bizonatus*, Sauss., and *O. quodi*, Vach., to which it is closely allied in structure and sculpture, though differing much in the distribution of the colour on the abdomen.

27. *Alastor (Paralastor?) graeffei*, Sauss.

Alastor graeffei, Sauss., Stett. Entom. Zeit., xxx, p. 55, 1869.

Hab. Ovalau.

Family VESPIDAE.

28. *Polistes macaensis*, Fabr.

Vespa macaensis, Fabr., Entom. Syst. ii, p. 259, 1793.

Polistes macaensis, Fabr., Syst. Piez., p. 272, 1801.

This species has been imported into Fiji, and into many other Pacific Islands.

Family SCOLIIDAE.

Subfamily SCOLIINAE.

29. *Scolia ovalauensis*, Sauss.

Discolia ovalauensis, Sauss., Stett. Entom. Zeit., xxx, p. 62, 1869. ♀♂.

Hab. Ovalau (*Saussure*); Suva (*Woodford*); Cuvu (*R. Veitch*), June to August.

Family PSAMMOCHARIDAE.

30. *Cyphononyx vitiensis*, Turn.

Cyphononyx vitiensis, Turn., Trans. Ent. Soc. London, p. 78, 1917, ♀♂.

Hab. Rarawai (*R. Veitch*), October to January; Natova (*R. Veitch*), October; Cuvu, (*R. Veitch*), May.

31. *Psammochares elatus*, Sm.

Pompilus elatus, Sm., Journ. Proc. Linn. Soc. Zool., viii, p. 82, 1862.

Pompilus inquirendus, Vachal, Revue d'Entomologie, xxiv, p. 117, 1907.

Hab. Cuvu (*R. Veitch*), January. Also from Vavau, New Caledonia, N. Queensland and Morty.

Typical *elatus* from Morty has the third abscissa of the radius nearly half as long as the second, whereas in *inquirendus*, which occurs in the other localities mentioned, the third cubital cell is pointed on the radius.

Family DRYINIDAE.

32. *Haplogonatopus vitiensis*, Pkns.

Haplogonatopus vitiensis, Pkns., Exp. Stat. Hawaiian Sug. Pl. Ass. Entom. Bull., i, p. 488, 1906.

33. *Pseudogonatopus melanaerias*, Pkns.

Pseudogonatopus melanaerias, Pkns., Exp. Stat. Hawaiian Sug. Pl. Ass. Entom. Bull., i, p. 487, 1906.

34. *Pseudogonatopus kiefferi*, Pkns.

Pseudogonatopus kiefferi, Pkns., Exp. Stat. Hawaiian Sug. Pl. Ass. Entom. Bull., i, p. 487, 1906.

35. **Gonatopus anomala**, Pkns.

Gonatopus anomala. Pkns., Exp. Stat. Hawaiian Sug. Pl. Ass. Entom. Bull. xi, p. 14, 1912.

36. **Neogonatopus vitiensis**, Pkns.

Neogonatopus vitiensis. Pkns., Exp. Stat. Hawaiian Sug. Pl. Ass. Entom. Bull., i, p. 490, 1906.

Family CHALCIDIDAE.

Subfamily ENCYRTINAE.

37. **Coenocyrtus pacificus**, Waterst.

Coenocyrtus pacificus. Waterst., Bull. Entom. Res., vi, p. 307, 1915.

Subfamily APHELINAE.

38. **Physcus fijiensis**, Howard.

Physcus fijiensis. Howard, Proc. Entom. Soc. Washington, xvi, p. 84, 1914.

Subfamily MYMARINAE.

39. **Polynema eucharis**, Pkns.

Polynema eucharis. Pkns., Exp. Stat. Hawaiian Sug. Pl. Ass. Entom. Bull., x, p. 25, 1912.

40. **Dicopus psyche**, Girault.

Dicopus psyche, Girault. Proc. Entom. Soc. Washington, xiv, p. 22, 1912.

Family EVANIIDAE.

Subfamily EVANININAE.

41. **Evania appendigaster**, Linn.

Ichneumon appendigaster. Linn., Syst. Nat. Ed. 10^a, i, p. 566, 1758.

Evania appendigaster, Fabr., Syst. Ent., p. 345, 1775.

Hab. Cuvu (*R. Veitch*), June.

This cosmopolitan species has been spread by ships to every part of the world.

42. *Evania impressa*, Schlett.

Evania impressa, Schlett., Ann. Naturh. Hofinns. Wien, iv, p. 153, 1889.

Hab. Natova (*R. Veitch*), January and June.

Also recorded from the Philippines, New Guinea, Palau and Tonga. There is also a female from Malekula, New Hebrides in the British Museum collection.

Subfamily FOENINAE.

43. *Hyptiogaster ex'ranea*, sp. n.

♂. Ferruginous; abdomine supra, femoribus tibiisque posticis supra, tarsis posticis flagelloque fuscis; tegulis pedibusque anticis intermediisque flavo-testaceis; alis hyalinis, iridescentibus, venis nigris.

Long. 7 mm.

♂. Very slender; head broader than the thorax, clypeus and face shining, closely microscopically punctured; front and vertex opaque, very finely granulate. Second joint of the flagellum three times as long as the first, equal to the combined length of the first and third joints. Neck rather short; prothorax rounded, without spines; mesonotum shorter than its apical breadth, rather strongly transversely striated, the parapsidal furrows deep and nearly reaching the posterior margin. Scutellum transversely striated, strongly depressed at the apex, with strong lateral and apical marginal carinae. Median segment convex, longer than broad, rugulose, with one or two distinct transverse striae in the middle. Petiole and the whole abdomen smooth and very slender, the dorsal surface almost black, tergites 2-5 luteous at the apex; petiole as long as the three following segments combined. Joints of the hind tarsi symmetrical, much longer than broad, the unguis small, hind tibiae thinly clothed with short upright hairs. Cubitus originating just below the middle of the basal nervure.

Hab. Cuvu (*R. Veitch*), June.

This is allied to the Australian species *H. darwini*, Westw., but is a more slender species and differs much in the sculpture of the mesonotum, in the symmetrical joints of the hind tarsi, and in the hairs on the hind tibiae. The female is unknown, but doubtless belongs to the group in which the terebra does not reach beyond the apex of the abdomen.

Family ICHNEUMONIDAE.

Subfamily PIMPLINAE.

44. *Lissopimpla semipunctata*, Kirby.

Rhyssa semipunctata, W. F. Kirby, Trans. Ent. Soc., London, p. 202, 1883.

Lissopimpla decemnotata, Kriechb., Entom. Nachr., xv, p. 310, 1889.

Lissopimpla haemorrhoidalis, Kriech., Entom. Nachr., xv, p. 310, 1889.

Lissopimpla semipunctata, Cam., Mem. Manchester Lit. & Phil. Soc., xlvii, 1902.

Krieger records this common Australian species from Fiji. It is doubtless an imported species.

45. *Lissopimpla veitchi*, sp. n.

♀. Fusco-ferruginea; facie, clypeo, pedibusque rufescentibus; abdomine mesonotoque obscure violaceo suffusis; antennis articulis 12-14 albidis; alis hyalinis, venis fuscis, stigmatibus ochraceo.

♂. Feminae similis, antennis omnino fuscis, stigmatibus, tibiis tarsisque fuscis, tibiis anticis infra ochraceis.

Long. ♀, 7 mm.; terebrae long. 3 mm.; ♂, 7 mm.

♀. Basal portion of the clypeus shining and almost smooth; the apical portion (clypeolus) finely and closely punctured, almost black. Eyes widely and shallowly emarginate on the inner margin, separated from the mandibles by a distance equal to about twice the breadth of the mandibles at their base. Face finely and irregularly punctured, with a broad median longitudinal carina; raised into a broadly V-shaped carina below the base of the antennae; the face shallowly concave on each side of the median carina. Front very shallowly concave from the anterior ocellus to the base of the antennae, smooth and shining. Thorax shining almost smooth, the mesonotum very minutely punctured, parapsidal furrows strongly developed; scutellum with distinct marginal carinae from the basal angles reaching to the middle of the lateral margins but not to the apex; postscutellum shining; pleurae smooth and shining, the longitudinal grooves on the mesopleurae less strongly developed than in *L. semipunctata*. Median segment with lateral and apical marginal carinae, and with two longitudinal carinae near the middle running from the base to the apical carina, the two median carinae more than twice as far from the lateral carinae as from each other; the dorsal surface of the segment rugulose, the apical slope oblique and almost smooth, the apical carina not

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produced into spines either at the apical angles or in the middle; the lateral carinae with a rather sharp angle in the middle. Abdomen smooth and shining; the first segment nearly twice as long as its apical breadth; second and third segments with a shallow groove on each side before the apex. Hind femora with a small tooth beneath nearly three-quarters from the base; hind tibiae almost smooth, the spines on the outer margin microscopic. Nervulus antefurcal; the mediella and cubitella forming a continuous line without an angle at their junction, the nervellus sharply bent just before its junction with the cubitella, the discoidella originating at the angle formed by the bend in the nervellus.

Hab. Natova, Fiji (*R. Veitch*), April, 1918.

In colour this resembles *L. concolor*, Krieg., from Timor, but differs in the absence of apical spines or lamellae on the median segment, also in sculpture and in the neurulation of the hind-wing; in the latter the mode of junction of the mediella and cubitella shows affinity with *Theronia*, but I consider that the form of the clypeus, the deep parapsidal furrows, the spine or tubercle on the hind femora and the antefurcal nervulus show conclusively that the species belongs to *Lissopimpla*. The radius of the fore-wing resembles that of *Theronia*, and is not sinuate beyond the areolet as in typical *Lissopimpla*.

46. *Echthromorpha immaculata*, Krieg.

Echthromorpha immaculata, Krieg., Mitt. Zool. Mus. Berlin, iv, p. 331, 1909.

Hab. Fiji.

Species of *Echthromorpha* are recorded from many of the Pacific Islands, but I have not seen *immaculata*.

47. *Echthromorpha diversor*, Morl.

Echthromorpha diversor, Morl., Revis. Ichneum., ii, p. 47, 1913.

Hab. Cuvu (*R. Veitch*), May to July; Nadi, October.

Subfamily OPHIONINAE.

48. *Henicospilus turneri*, Morl.

Henicospilus turneri, Morl., Revis. Ichneum., i, p. 51, 1912.

The single specimen sent by Mr. Veitch has the sculpture of the median segment much stronger than in typical Queensland specimens, the striae being strongly developed; it will probably constitute at least a subspecies.

49. **Henicospilus apicifumatus**, Morl.

Henicospilus apicifumatus, Morl., Entomologist, xlviii, p. 139, 1915.

Hab. Nadi, Nadovi and Sigatoka (*R. Veitch*), March and September.

Apparently a common species.

50. **Paniscus opaculus**, Thoms.

Paniscus opaculus, Thoms., Opusc. Entom., p. 1199, 1888.

Hab. Nadi. Also from the whole Eastern hemisphere.

Apparently identical with Queensland specimens determined by Morley.

Subfamily *ICHNEUMONINAE*.

51. **Ichneumon (Euichneumon) promissorius**, Erichs.

Ichneumon promissorius, Erichs., Arch. f. Naturges. viii, 1, p. 256, 1811.

Probolus albocinctus, Cam., Entomologist, p. 181, 1906, ♀.

Probolus varilineatus, Cam., Proc. Linn. Soc. New South Wales, p. 191, 1912, ♂.

Hab. Natova (*R. Veitch*), April. Also from Tasmania and E. Australia as far north as Mackay.

I cannot find any specific distinction between Fijian and Australian specimens, and conclude that the species has been recently imported into Fiji.

Family *BRACONIDAE*.

Subfamily *CHELONINAE*.

52. **Chelonus vitiensis**, sp. n.

♂. Niger; mandibulis, scapo, tegulis, pedibusque, coxis inclusis, rufo-testaceis; tibiis posticis apice leviter infumatis, tarsis posticis fuscis; palpis pallidis; alis hyalinis, iridescentibus, stigmatibus venisque fuscis.

Long. 3 mm.

♂. Antennae 24-jointed; head transverse, distinctly narrowed behind the eyes, opaque and minutely punctured. Mesonotum closely punctured-rugulose, more coarsely posteriorly than anteriorly; scutellum finely punctured, with a strongly crenulate transverse basal groove; mesopleurae coarsely punctured. Postscutellum longitudinally striated. Median segment short, transverse, coarsely

reticulate, with a low carina from the base to the apex of the dorsal surface, the posterior angles produced and armed with a short spine; the surface of the posterior truncation finely punctured-rugulose. Abdomen about half as long again as the thorax, rather slender, at least four times as long as its basal breadth, not incised at the apex; the basal half coarsely longitudinally striated, with oblong reticulations; the third quarter finely punctured granulate, with fine longitudinal striae at the base; the apical quarter very closely and minutely punctured. Radial cell broad, a little shorter on the costa than the stigma, third abscissa of the radius straight.

Hab. Cuvu (*R. Veitch*). September.

The colouring is somewhat similar to that of *U. rufipes*, Szépl., from New Guinea and E. Australia, but the antennae in that species are testaceous almost to the apex and the sculpture of the thorax is coarser, especially on the mesonotum, than in the present species; there is also an apical abdominal incision in *rufipes*.

Subfamily MICROGASTERINAE.

53. *Apanteles expulsus*, sp. n.

♀. Nigra; scapo, apice excepto, palpisque luteis; flagello basi subtus pedibusque flavo-testaceis, coxis nigris; trochanteribus posticis supra nigris; alis hyalinis, venis luteis; stigmatibus fusco-ferrugineo; terebra brevissima; segmento mediano areolato.

Long. 2mm.

♀. Antennae 18-jointed. Mesonotum and pleurae finely and closely punctured, subopaque; scutellum shining and almost smooth. Median segment short, not as long as the scutellum, with a smooth rhombic area in the middle from base to apex; the sides minutely punctured. First and second tergites finely rugose; the first tergite broad, the hind margin transverse, the second tergite about equal to the third in length; the third and following tergites smooth and shining. Hind coxae shining, minutely punctured; spurs of hind tibiae slender, not more than half as long as the metatarsus. Terebra exerted, very short. Cocoons pure white, not enclosed in a web.

Hab. Natova (*R. Veitch*). April.

Bred from the larva of a Noctuid moth (*Anticarsia irrorata* Fabr.). This is near the *Urogaster* section of the genus, but has the terebra shorter than usual, not reaching beyond the apical tergite.

XVI. *Notes on a large Heliconine collection made in French Guiana in 1917, compared with a similar collection made in 1915.* By J. J. JOICEY, F.E.S., and W. J. KAYE, F.E.S.

[Read November 6th, 1918.]

WITH SKETCH MAP.

PERHAPS the most striking and interesting point about this great collection is that the percentages both as to the various forms under *melpomene* and under *erato*, and also the ratios of the one species to the other, are found to be in substance the same as those worked out in our previous paper (Trans. Ent. Soc. 1917, pp. 412-431), thus giving confirmation to our published figures. The present collection is four times as large as the one made in 1915, and when slight discrepancies occur in percentages probably the present figures are more correct. Thus in 1915 the number of black hind-winged *melpomene* was 125 out of 731, or 17·53 %, but in the present collection there are only 302 out of 2,935, or 10·29 %, and we think it highly probable that the latter figure is more correct. The red basal streaked section is near enough (54·32 % against 57·03 %) to practically prove that it preponderates over the other two sections combined, while it follows that what the black hind-winged section lost the fully streaked or "thelxiope" hind-wing gained, so that in the present collection the fully-streaked section have 35·39 % instead of 25·44 % in 1915.

The number of *H. melpomene* secured is the very large total of 2,935. They are divided amongst the three sections as follows:—

		<i>melpomene</i> .	Percentage of Total.		<i>melpomene</i> .	Percentage of Total.
Black hind-wing .	1917	302	10·29	1915	125	17·53
Red basal streak .	1917	1,592	54·32	1915	420	57·03
Red basal streak and cross streaks	1917	1,041	35·39	1915	186	25·44
		2,935	100·00		731	100·00

We have heard from Mons. le Moul't that the collectors have instructions not to catch typical *melpomene*, and that in his own experience very many more *melpomene* should be estimated for than what we did in our former paper. It is unfortunate that any check was put on the collectors from the scientific standpoint. The remarkable fact, however, remains that of the two collections there is very close agreement, and that, whatever the correct proportion of typical *melpomene* may be, the addition would be approximately the same for both collections. Prof. E. B. Poulton has made the interesting observation to me that probably the *cybele* type of hind-wing with the short red streak would on the wing be much more likely to be mistaken for the all-black hind-wing than the *thelxiope*-streaked hind-wing. It is clear, if this is true, that the fully-streaked forms are in a considerable minority and not at all like Para, where they are practically the only forms found.

Those forms are rarest that represent the most distant geographical races. Thus ab. *penelope* occurs as a race in Bolivia on the Rio Juntas, ab. *rufolimbata* is from the Tapajos River, ab. *timareta* occurs as a race in East Ecuador at Sta Inez and elsewhere. This last form has not yet been seen in the French Guiana collections, but by inference it should occur, even if very rarely, as it is only the representative of *penelope* without any red on fore- or hind-wing. The *penelope* forms graduate into *vicina* forms, the latter occurring as a race on the Upper Amazon at Pebas and Tefte.

Several aberrations are of special interest and afford fresh connecting links. There is one specimen of the *melpina* form, which shows three yellow subapical spots. This suggests at once the spotting of such species (or races of *melpomene*) as *hermogenes* or *galanthus*. Although we have now received in all 3,666 *melpomene* from French Guiana, this is the only specimen showing such spotting.

Three new forms, one of the *cybele* section and two of the *melpomene* section, we think should be named as they are representative of already named similar forms but with different hind-wing. The first, which we call *faivreii*, after Mons. Faivre, is complementary to *negroida* and *negroidens*. A second form of the *melpomene* hind-wing section which we call *compacta* is complementary to *faustalia*

and *rafolimbata*, while the third new form we call *cybeleia*, represents *aglaopeia* with a *cybele* hind-wing.

H. melpomene melpomene ab. faivreii, nov.

Fore-wing black with only a dusky yellow half-band at end of cell, edged externally with an almost equal half-band of red. Hind-wing wholly black.

Hab. FRENCH GUIANA, St. Jean de Maroni.

Type in coll. Joicey.

This form is the same fore-wing form as *negroida* and *negroidens*, but with a black hind-wing.

H. melpomene melpomene ab. compacta, nov.

Fore-wing black with a large solid yellow patch around the discocellulars, the veins alone showing black, and with a half-band of red edging the yellow patch externally between costa and vein 4. Hind-wing wholly black.

Hab. FRENCH GUIANA, St. Jean de Maroni.

Type in coll. Joicey.

This form is the equivalent of *faustalia* and *rafolimbata* as to fore-wing, but with a black hind-wing.

H. melpomene cybele ab. cybeleia, nov.

Fore-wing like *aglaopeia*, with the yellow group of spots darkened with blackish. Hind-wing like *cybele*, with the short red basal streak.

Hab. FRENCH GUIANA, St. Jean de Maroni.

Type in coll. Joicey.

This is the representative of *aglaopeia* with a *cybele* hind-wing.

It is most unfortunate that Staudinger gave the name *aglaopeia* to an insect which is not a bit like *aglaope*. However, as it is well figured in the "Iris" (vol. ix, Pl. V), the form he named *aglaopeia* need never be in doubt. The equivalent form with a black hind-wing has not yet been seen.

A very interesting and suggestive aberration is one of the *melanippe* form showing a trace of a yellow basal

streak along the median vein, thus suggesting the well-developed yellow streak in such races as *nanna* from S. Brazil, and to a lesser extent in *amandus* from E. Bolivia. Many specimens of the black hind-wing section of *melpomene* from F. Guiana show a yellow basal blotch at the submedian, but the extension along the median seems to be very infrequently developed.

There are one or two specimens showing white markings partly in place of yellow, and these our friend Dr. Eltringham will consider, and rightly so, as lending support to his theory that the Colombian and Central American white marked species *cydno*, *galanthus* and *hermogenes* are really races of *melpomene*.

There are four specimens of different fascies all showing a white portion of what would be the true *melpomene* red patch. Thus one is nearly an *aglaopeia*, with what is usually the yellow spot in the cell partly white and partly black scaled.

Another of the *cybele* form has a large circular white spot almost occupying the yellow spot between veins 2 and 3. Two others approximating to the *faustina* form have white, in the one occupying the yellow spaces between veins 5, 6, and 6, 7 on one side, and on the other occupying the costal yellow spot. In the second there is white in the right fore-wing only, within the yellow discoidal spot and within the yellow spots beyond the cell.

The very long series of *erato* is equally variable with the *melpomene*, and is chiefly different from the series made in 1915 in that there are no fewer than 45 of the *tellus* form, which was completely absent in the former collection. There were 5 of the *constricta* form then against 25 of the same form now, while the number of *andremona* forms with a varying amount of white overlying pattern is much greater in the present series. One of the *erato* (typical) has part of the yellow group of spots in fore-wing white, for this form we propose the name *albida*. The comparatively large number of the *tellus* form emphasises what we said in our former paper, that the streaked forms of *erato* are essentially the models for *melpomene*, as here there are 45 of this form against 6 *melpomene* ab. *penelope* graduating into ab. *vicinus*. In both collections the percentage of streaked forms is very high, and the present collection is a remarkable confirmation of the deduction arrived at from the

1915 collection; for although the collection is eight times the size the percentage of streaked and black hind-winged forms is quite remarkably close.

The total number of *H. erato*, the companion species of the second great division of *Heliconius*, is 1,123. Only 46 of this large number show a black hind-wing. In 1915 the number of black hind-wing forms was 6 out of 155.

	<i>erato</i> .		Per-centage.	<i>erato</i> .		Per-centage.
Black hind-wing .	1917	46	4.10	1915	6	3.87
Streaked hind-wing	1917	1,099	95.90	1915	149	95.97
		1,123	100.00		155	100.00

It is difficult, if not nearly impossible, to get a really just set of figures for comparing the darkened fore-wing forms of both *melpomene* and *erato*. *Melpomene* in its *cybele* section and its *thelxiope* section shows completely darkened fore-wing in the forms *funebri* and *stygianus* respectively, but in the all-black hind-wing no wholly blackened fore-wing form has yet occurred, this forming a wholly black insect. In *erato* the form *oberthueri* is the darkest known form from this region, but this shows some slight remnant of the yellow, and there are all gradations up to *vesta*. It is thus difficult to know how many *erato* to include, and we fancy we really included too many in our table given at the top of p. 429 of our former paper. Keeping strictly to the VERY DARKEST FORE-WING forms of both species, we get these comparisons:—

Species.	Numbers.		Percentage of Total.	Numbers.		Percentage of Total.
<i>melpomene</i> . . .	1917	14	.47	1915	62	8.48
<i>erato</i>	1917	17	1.51	1915	10	6.45

This as a comparison between the two species is probably approximately correct, but it is hardly right to compare the 1915 figures, as we realise we included too many forms which were not sufficiently extreme. The

comparisons between the BLACK HIND-WING forms of the two species are far more satisfactory.

A COMPARISON BETWEEN THE BLACK HIND-WING FORMS OF
MELPOMENE AND *ERATO*.

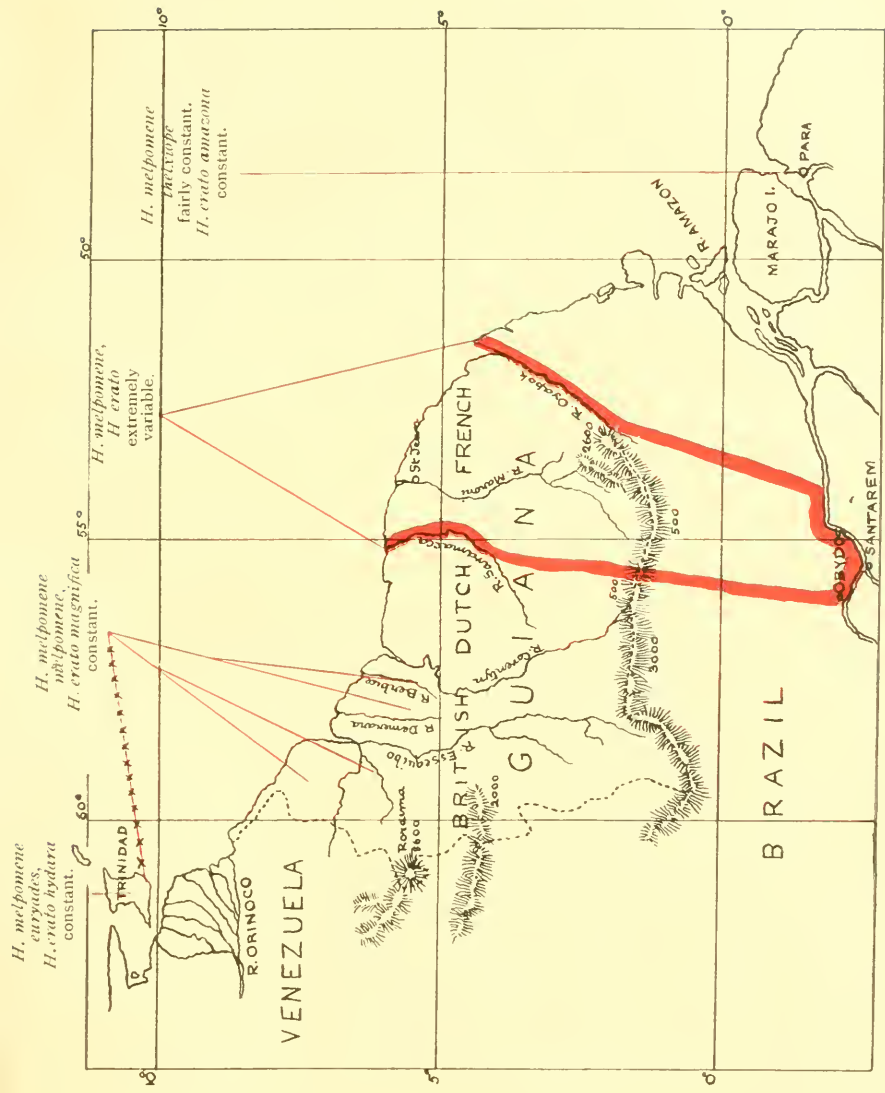
Species.	Numbers with black hind-wing.		Percentage of Total.	Numbers with black hind-wing.		Percentage of Total.
<i>melpomene</i> .	1917	302	10.29	1915	125	17.53
<i>erato</i> . .	1917	46	4.10	1915	6	3.87

A COMPARISON BETWEEN THE STREAKED HIND-WING FORMS OF
MELPOMENE AND *ERATO*.

Species.	Numbers with streaked hind-wing.		Percentage of Total.	Numbers with streaked hind-wing.		Percentage of Total.
<i>melpomene</i>	1917	1,041	35.39	1915	186	25.44
<i>erato</i> . .	1917	1,077	95.90	1915	149	96.10

We have sketched a map to show the range of distribution of the variable *melpomene* with *erato* in relation to other races of the two species which are more or less constant to the south-east and to the north-west. Thus at Para *melpomene* is present as *thelxiope*, while *erato* occurs as *amazona*, and these two forms are more or less constant. The *erato amazona* is very fixed, while the *melpomene thelxiope* varies only in the amount of yellow spotting, but not to any extent. Only rarely are such forms as *aglaope* to be met with. In British Guiana to the north-west the other extreme is met with. *Melpomene* occurs typically and scarcely varies at all, and incidentally is rather rare, while *erato* is represented by the form *magnifica*, is also very constant, but is very abundant.

Further to the north-west in Trinidad the two species are also constant. *Melpomene* is slightly changed to *euryades*, while *erato* becomes *hydara* and is constant. Both species are common, but *erato* is a good deal the commoner. The interesting places to get material from now would be east of the Berbice River in British Guiana



Sketch Map of the Guianas showing the range of variable *Heliconius melpomene* with variable *Heliconius erato*, with fixed races to the South-East and to the North-West.

and west of the Saramacca River in Dutch Guiana. Also the almost totally unexplored country entomologically between the Oyapock River on the eastern boundary of French Guiana and the mouth of the Amazon.

It will be seen on reference to the sketch map that the mountain range that borders the interior boundary of the Guianas descends on the boundary of Dutch Guiana to 500 ft., while to the east and west it rises to the neighbourhood of 3,000 ft. It is thus understandable how the variable *Heliconine* forms can extend across Brazilian Guiana to the north bank of the Amazon at Obydos. It is still to be discovered why the variable *melpomene* and *erato* should not be found in British Guiana, especially in the region of the Berbice River or the Corentyn River, as there do not seem to be any physical barriers. The climate one would suppose also to be substantially the same. There may be differences in the seasons. In British Guiana there are two wet and two dry seasons over a large area. We cannot get information about French or Dutch Guiana in this respect, but at Para there is one long wet and one dry season. From the general climatic standpoint there is great uniformity, heat and moisture prevailing with great uniformity throughout the year, and even if no rain falls for two months the air is always heavy with moisture, and very heavy dews are deposited at night.

MARCH 29, 1919.

THE ENTOMOLOGICAL SOCIETY OF LONDON.

THE FELLOWSHIP AND FEES.

Fellows pay an Admission Fee of £2 2s. The Annual Contribution is £1 1s., due on the first day of January in each year, and payable in advance; or a Composition Fee of £15 15s. may be paid in lieu thereof, the whole payment for Life Fellowship, including the Admission Fee, being £17 17s. Fellows residing permanently outside the United Kingdom pay no Admission Fee.

All Fees should be paid to the Treasurer, Mr. W. G. Sheldon, Youlgreave, South Croydon, Surrey, and not to the Secretaries.

Fellows desiring to pay their Annual Contribution through their bankers can obtain an official form of banker's order by applying to either the Treasurer or to the Resident Librarian.

Fellows whose Contributions for the current year have been paid are entitled to receive the publications of the Society free of charge. Further copies may be purchased at reduced prices by applying to the Resident Librarian.

Forms of application for Fellowship and copies of the Bye-laws and List of Fellows may be obtained from either of the Secretaries or from the Resident Librarian.

MEETINGS AND EXHIBITIONS.

Intending exhibitors are required to signify their names and the nature of their exhibits to the Chairman before the beginning of the meeting, in order that they may be called upon from the chair. Descriptive notes of all exhibits should be handed to the Secretaries at the same meeting for printing in the Proceedings. If the epidiascope is required a week's notice must be given; exhibits to be satisfactorily focussed by this instrument must not exceed 7 ins. square.

Fellows resident abroad, or who are otherwise unable to attend, are reminded that any specimens, notes, or observations they may send to the Secretaries will be considered by the Council, with a view to exhibition or reading at the meetings of the Society.

PAPERS AND ILLUSTRATIONS.

Fellows desiring to communicate papers to the Society must send the full titles of such papers either to the Secretaries at the Society's rooms, or to Dr. Sheffield A. Neave, M.A., D.Sc., 89, Queen's Gate, London, S.W. 7, at least fourteen days prior to the date of the meeting at which it is proposed that such papers shall be read.

Authors proposing to illustrate their papers should communicate with the Secretaries before the drawings are executed. The Council recommend that the size of the work on plates should be limited to $6\frac{1}{2}$ ins. by 4 ins., and in no case will it be allowed to exceed $6\frac{1}{2}$ ins. by $4\frac{1}{4}$ ins.

Attention is called to the Instructions to Authors issued with Part I of each volume, which may also be obtained of the Resident Librarian. Inattention to these regulations may involve an author in considerable expense.

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MEETINGS

TO BE HELD IN THE SOCIETY'S ROOMS

11, CHANDOS STREET, CAVENDISH SQUARE, W. 1

SESSION 1919-1920.

1919.					
Wednesday, March	5
"	"	19
"	April	2
"	May	7
"	June	4
"	October	1
"	"	15
"	November	5
"	"	19
"	December	3
1920.					
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The Chair will be taken at Eight o'clock.

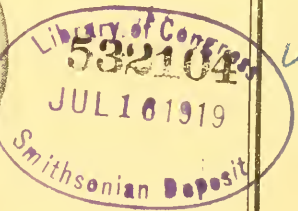
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PART V.

June 20, 1919.

THE
TRANSACTIONS
OF THE
ENTOMOLOGICAL SOCIETY
OF
LONDON
1918.



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TRANSACTIONS OF THE ENTOMOLOGICAL SOCIETY OF LONDON.

Some of the early volumes of the Society's Transactions are out of print, but those which are in stock can be obtained at reduced prices. Any single volume of the present series, 1868-1887, is sold at 10s. to Fellows. The volumes for 1868-1890, in sets of not less than five, as well as the five of the Third Series (1862-1867), can be obtained by Fellows at greatly reduced prices on application to the Librarian. The following is a price list of recently published parts of the TRANSACTIONS—

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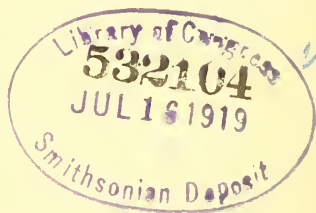
The following may be obtained separately:—

Pascoe's '*Longicornia Malayana*,' forming vol. iii. of the Third Series, published price, £2 12s.; to non-Fellows, £1 10s.; to Fellows, £1.

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The 1893 CATALOGUE OF THE LIBRARY, with Supplement to 1900, is published at 10s.; to Fellows, 7s. The Supplement only, 4s. 6d.; to Fellows, 3s.

THE
PROCEEDINGS
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1918-1919.

THE
PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF
LONDON
FOR THE YEAR 1918.

Wednesday, February 6th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Nomination of Vice-Presidents.

The PRESIDENT nominated Dr. H. ELTRINGHAM, Mr. A. H. JONES and Mr. S. A. NEAVE as Vice-Presidents for the ensuing year.

Election of Fellows.

Dr. JOHN ADAMS COMSTOCK, Curator of the South-Western Museum, 1275 Bellevue Avenue, Los Angeles, California, U.S.A., and Mr. JAMES W. MONRO, Lieut. R.A.M.C., 2nd Sanitary Coy., Duke of York's Head Quarters, Chelsea, S.W., were elected Fellows of the Society.

Exhibitions.

A BEETLE NEW TO BRITAIN, AND ANOTHER HITHERTO VERY RARE.—Mr. DONISTHORPE exhibited a ♂ and ♀ of *Caenocara subglobosa*, Muls., a beetle new to Britain which he had bred
PROC. ENT. SOC. LOND., 1, 1918. A

from a " puff-ball " (*Lycoperdon gemmatum*) taken at Barton Mills, Suffolk, on September 9, 1917, together with a specimen (♀) of *Caenocara boristae*, Hoff., swept at Battle, Sussex, on August 2, 1902, the only species of this genus known to occur in Britain heretofore.

Also specimens of *Cryptophagus lövendali*, Ganglb., which he had found in large numbers in a nest of *Vespa germanica* in a tree in Richmond Park on November 20, 1917; a species of which only two specimens had been taken in Britain before, by Mr. Champion in July 1907, in a hollow in an old beech tree in the New Forest. Mr. Donisthorpe made some remarks on the habits, distribution, etc., of these exhibits.

HEMIPTEROUS OVA.—Mr. E. A. BUTLER exhibited ova of the following species of Hemiptera :—

Two species of Pentatomidae, *Piezodorus lituratus*, Fabr., and *Pentatoma rufipes*, L.; emergence from these is effected by lifting a lid from the anterior end of the egg; according to Fabre the embryo is aided in doing this by an apparatus consisting of a thin membrane strengthened by a triradiate chitinous framework, which could be seen in the group from *Pentatoma*. *Chorosoma schillingi*, Schml., a Coreid bug, emergence from which is effected also by lifting a lid, but without the accessory apparatus. Two species of *Berytus*, in which the ovum is elongate and longitudinally sulcate, and emergence is effected by the longitudinal fission of the egg at the anterior end. Three Reduviidae, *Coranus subapterus*, L., *Nabis major*, Costa, and *Nabis rugosus*, L. The two species of *Nabis* have the shape of a short test-tube bent at the open end and with the mouth placed obliquely. A Capsid bug, *Miris laevigatus*, to which were added the five cast skins representing the five larval instars of the individual produced from the single ovum exhibited; and lastly, the ova of three water bugs, *Naucoris cimicoides*, L., *Notonecta glauca*, L., and *Nepa cinerea*, L.

TWO SPECIES OF CATAGRAMMA, AND A NEW DYNAMINE.—Mr. KAYE exhibited from Mr. Joicey's collection series of the two *Catagramma* species *pastazza* and *excelsior* with races and forms of each pointing out that the two groups of insects were at once separable by the different tips to the antennae.

Pastazza and its forms *speciosa* and *excelsa* having a wholly black club, while *excelsior* and its forms *ockendeni*, *clatior michaeli* and *excelsissima* have the apical half of the club ochre yellow. This point of difference did not seem to have been detected by Staudinger, who first described *pastazza* as a form of *excelsior*, as he differentiated his *pastazza* by wing colouring. The *excelsior* of Hewitson, figured ff. 49, 50, Cat. vii, appears to be, if not unique, excessively rare. As it is close to *excelsior clatior* it might be found in the same localities in Ecuador, notwithstanding the locality given, "Amazon." Other races of *excelsior* are also rare—*michaeli* from the Solimoes River and *excelsissima* from the Madeira as well as *clatior* from Ecuador are all scarce, *ockendeni* alone having been secured in some numbers in the Chanchamayo district of Peru. In tabulated form the two species work out thus :—

Catagramma pastazza pastazza, Stgr., with ab. *speciosa*,
S.E. Peru.

Catagramma pastazza excelsa, Rüb. (nec Stgr.).
Ecuador.

—————
Catagramma excelsior ockendeni, Obth.
S.E. Peru.

Catagramma excelsior clatior, Obth.
Ecuador.

Catagramma excelsior excelsior, Hew.
"Amazon."

Catagramma excelsior michaeli, Stgr.
Solimoes River.

Catagramma excelsior excelsissima, Stgr.
Madeira River.

A striking new species of *Dynamine* from Bolivia was also exhibited, *D. agatha*, recently figured by Oberthür, Lép. Comp., xii, pl. clvi, fig. 3493, but undescribed.* The

* Fore-wing deep velvety black with the base a brilliant blue and a broad outer marginal band of the same colour broadest on the costa, where it forms a sort of nail-head shape and tapering rapidly from

species was wrongly identified by Staudinger in "Iris," vii, p. 225, where he refers to the most splendid of the Dynamine species *perpetua*, going on to describe a black insect with steel-blue bands on the fore-wing and on the hind-wing. *Perpetua*, described by Bates in the "Journal of Entomology" (1865), p. 326, is a green species and has nothing to do with the present insect.

He further exhibited from his own collection an association of Heliconine forms from Para, all taken in the months July and August 1917. There were seventeen *II. melpomene thelxiope*, mostly fairly typical, nine *II. erato amazona* and three *Eueides tales pythagoras*. Although *Heliconius melpomene thelxiope* here appeared to act as the model it was not really so, as *II. erato amazona* was certainly the commoner butterfly of the two at Para, while the *Eueides* always was third in point of numbers, and in any case reinforced the *amazona* owing to the manner of the streaking. It was probably true that *II. erato amazona* appeared a little earlier than *II. thelxiope*, and thus advertised the colour scheme a little in advance, so that it was possible that at the end of the time of appearance *thelxiope* might sustain few attacks, although be present in some numbers. It was obvious from the specimens that *amazona* had been out some time, as all the specimens appeared orange and not rosy red as in fresh specimens.

A second small association was a well-known one in point of species, but little or perhaps unknown as to locality. The species were *II. melpomene nanna* and *II. erato phyllis* and the locality Pernambuco. There were four specimens of the former and two only of the latter; here again the seeming

vein 3 to inner. Hind-wing deep velvety black with a large oval patch lying along outer margin between vein 4 and tornus.

Underside of fore-wing blackish with the greater part of the cell ochreous except for two black marks edged above with blue. Three white spots forming an oblique apical band, a white spot within the cell and a dirty white spot near tornus. A double blue subterminal as far as vein 3. Underside of hind-wing dirty whitish with three nearly parallel oblique brown bands, the two outer ones united above the cell by an interrupted blue band. Two eye spots, the upper, the larger, surrounded with an ochre yellow ring and placed on a purplish patch. A regular ochre narrow submarginal band narrowly edged with blue. The underside is very similar to *Dynamine onias*, underside white, the upperside strongly suggests *Eunica flora*.

model being *nanna*, while in reality it was *phyllis*, for by the condition of the specimens it was probable that *phyllis* was going over, and it was well known that *H. crato phyllis* was always abundant wherever it occurred. *Nanna*, reaching so far north as Pernambuco, was of special interest, and from the four specimens fairly constant, only one showing a horizontal red streak below the yellow transverse hind-wing band.

PSEUDACRAEAS IN MIMETIC ASSOCIATION.—Lord ROTHSCHILD exhibited a series of Pseudacraeas in illustration of a paper on the mimetic associations of these butterflies which would shortly appear.

A NEW FORM OF PSEUDACRAEA POGGEI, DEW., MIMICKING THE DORIPPUS, KLUG, FORM OF DANANDA CHRYSIPPUS, L., IN EX-GERMAN EAST AFRICA.—Prof. POULTON said that he had recently received four letters and three consignments from Capt. G. D. H. Carpenter, who had written from Lulanguru on the Central Railway, 17 miles W. of Tabora, at a height of 3766 ft. From these letters he had arranged the following communications, of which each section bore the date of the letter to which it belonged.

Nov. 5, 1917.—“ I have had a piece of stupendous luck and hasten to tell you. A few days ago, on the small kopje of granite behind the camp, about 300 ft. high, I caught what I took to be, at first, a couple of *Hypolimnas misippus*, L., the ♀ variety [*inaria*, Cram.] without apical black and white markings. When I had caught them I thought they looked a little odd, but as I have not caught a large number of *misippus* and have not handled it much, and it's some time since I caught one, I thought I must have forgotten the details of its appearance, and put the specimens away for a time. (Can you guess what's coming?) Next day I caught a female of the *type* and felt quite sure then that I had got *Pseudacraea poggei*, Dew., and it was soon certain when I caught a genuine *misippus* form *inaria* and then a male *poggei*. I am now sending you, by registered post, in a chocolate box by themselves these most exciting specimens—three of the *type* and two of the variety, together with the *inaria*.

“ I have caught lots more. Yesterday (Nov. 4) I got four more of type and two of the variety, and these will soon be sent in a large biscuit tin, which is almost ready. This morning I caught 10 more of the type.”

Nov. 14.—“ Since then I have been catching some daily and must have got at least 50 specimens with a dozen of the variety, all in prime condition. It seems remarkably uniform—I have caught no intermediates between type and variety.”

Nov. 5.—“ Is it not splendid for me, for I have always longed to meet this most splendid mimic, firstly because it is of the *chrysippus* association and such a beautiful mimic, secondly because it is one of my pet genus! But I had never expected to get it, since I understood it has always been looked at as a *S.* African form—though I don't know how far north it is known to extend. Still, Lulanguru must be some hundreds of miles further north of its previously known area. What excites me most, however, is the unicolorous variety, for I cannot remember that it has been described. If it is really new I shall burst! Put me out of my anxiety as soon as you can!”

Nov. 14.—“ I have only seen them on the top of the kopje and have never seen a *chrysippus* there! [A ♀ of type was taken Dec. 31.] With *poggei* is an occasional *misippus* (I have caught two and seen a third), and the differences are interesting. *Misippus* looks larger, its flight is much more floating and soaring: it is *very* much more wary and hard to catch; it sometimes settles on the underside of a twig, as if to conceal itself—indeed, I find it hard to believe, as I think *you* believe, that it is *Syn-* and not *Pseud-*aposematic.”

Nov. 5 and 14.—“ *Poggei*, on the other hand, in the first place has a richer quality in its colouring which sometimes looks more reddish than brown in a fresh specimen; its flight is heavier and *not* floating, being more like that of *chrysippus*; it is *much* bolder and less wary than *misippus*, and if struck at will nearly always return on its tracks, so that one can be certain of catching it, as it often comes back right up to the net to investigate it. It often settles openly on the tops of low twigs or a branch or on the ground, and waves

its wings slowly up and down. In fact it almost behaves like a true aposematic species. *Chrysippus* itself is quite as easily alarmed, and indeed I think *more* so! I certainly agree with a statement I remember to have seen somewhere that *poggi* is the best of all mimics of *chrysippus*. It is easier to catch than any other *Pseudacraea* I have caught—*hobleyi*, Neave, *lucretia*, Cr., *kuenowi hyporantha*, Jord., or *semire*, Cr.”

Nov. 5.—“There is a Rhodesian here and he says the style of country is exactly like parts of N. Rhodesia—granite kopjes rising out of flat plain, with no actual forest, but small trees fairly close together. The butterfly haunts two foci of circumscribed area on the very top of the kopje. They are nearly all beautifully fresh specimens, whose colouring has a very rich appearance, and in some lights has a more reddish tint than either *chrysippus* or *missippus*.”

“I am more excited over this find than I have been over any butterfly matter since I reared *Pseudacraea terra*, Neave, or my *plumoides*, Trim., family of *P. dardanus*, Brown. I wish it did not take so long to hear from you!”

Nov. 27. —“*Poggi* goes merrily on I continue to catch them, but only the best specimens—and get the variety quite often. It seems remarkably fixed and definite—I have only once taken one that shows any intermediary stage—as you may see in the model where the white bar is not *quite* brown, and there is a little more black at the apex than there should be.”

Dec. 7.—“*P. poggi* is one of the commonest butterflies on the kopje! It is by far the best mimic of *chrysippus*. Not only in close similarity of pattern but in flight is this so—and it is remarkably un-shy! I have had one settle on my helmet—and they frequently come so close to investigate the net that they almost fly into it, and have even settled on it! The flight is slower and more flapping than that of any other *Pseudacraea*, and has very little of the soaring quality shown by *lucretia*, *boisduratii*, Doubl., or the forms of *curytus*, L. It will always return to the same spot, flying backwards and forwards, and sometimes settling quite near to, or even on,

the ground. It is noteworthy how *misippus* differs. It is excessively wary, goes off like a shot if struck at, never settles on the ground, but often on the underside of a spray quite high up, when it waves its wings, a habit to which *poggei* is very little addicted. I have watched with some interest to see whether ♂ *misippus* would be deceived by *poggei*—but have seen nothing that would lead one to suppose he was; but I have seen at Kakindu, most unmistakably, a ♂ *P. dardanus* deceived by *Amauris niavius*, L., which he mistook for his own mimetic ♀, suddenly arresting himself in headlong flight to dally a while with the attractive-looking stranger before finding out his mistake !”

Prof. Poulton said that Fellows could well imagine how interested Roland Trimen, their ex-President and dear friend of so many of them, would have been at this discovery. He had often spoken with enthusiasm of the wonderful mimetic resemblance of the type form of *poggei*, now completed by Capt. Carpenter, to whom Prof. Poulton was sure they would wish to offer their congratulations.

Four examples of the new form were exhibited to the meeting, together with eighteen of the type, including a male captured in the same locality on July 27, 1917, and sent in a previous consignment. This latter specimen, although evidently fresh, had been seriously injured, probably by a bird or lizard, nearly the whole of the left hind-wing having been torn away.

[Concerning this specimen Capt. Carpenter wrote Jan. 25, 1918: “I hope you will publish the fact that I was completely deceived by the first *P. poggei* I caught. I expect I thought it was *misippus*, and not having my attention particularly directed to it put it away without studying it! It is, however, just possible that I noticed its damaged hind-wing, and thought I would send a specimen of damaged *chrysippus*, and did not study it carefully. Whatever the explanation I am delighted to think I've been had *again!* (For the first *P. dardanus* form *planemoides* I sent home from Jinja [captured Aug. 1-15, 1910] and said nothing about it—did not even remember catching it until you pointed it out to me in 1913 when I got home.)”]

Exclusive of this specimen, Capt. Carpenter's captures were as follows :

<i>Pseudacraca poggei</i> , Dew.		
1917.	Type form.	Form <i>carpenteri</i> .
Oct. 29	—	2
Nov. 3	3	—
„ 4	4	2
„ 5	10	—
„ 6	8	1
„ 7	3	2
„ 8	2	1
„ 9	5	2
„ 10	3	1
„ 11	2	—
„ 12	4	—
„ 13	5	1
Totals	49	12

The whole of these were males except two of the type form, captured Nov. 3 and 5 respectively. Thus the proportion of *dorippus*-like var. to *chrysippus*-like type was almost exactly one to four.

[Since the above was written Capt. Carpenter continued to make captures up to Jan. 2, 1918, just before his stay at Lulanguru came to an end. His total captures were 108 males and 3 females of the type form, 31 males of *carpenteri*—a proportion of 1 to 3½. The third female was taken *in cop.*, and carrying the male, on Dec. 6. The female of Nov. 3 shows the most considerable, although very minute, approach towards *carpenteri* of all the 111 examples of the type, as shown in the degree of development of orange along the costa and in two small internervular spear-head-like patches in the angles

of areas 7 and 8. These patches are distinct on both surfaces, but especially on the under. In addition to the specimen taken on July 27, a male of the type form taken Dec. 15 exhibits extensive injuries evidently inflicted by enemies, the anal quarter of both hind-wings being torn away symmetrically. Furthermore, 22 males of the type form and 7 of *carpenteri* exhibit smaller injuries, of which the great majority were inflicted at the anal angle of the hind-wing, and, from their form, almost certainly by birds. Two female *H. misippus* accompanied the *Pseudacraeas*—one of the *ivaria* form "caught at the same time and place as *poggei*" on Nov. 3, and one *misippus* with slight development of white on the hind-wing, taken Nov. 11.]

Capt. Carpenter had not as yet recorded the proportion of *dorippus* to *chrysippus* at Lulanguru and adjacent localities, but further to the east and north it was known that *dorippus* largely predominated. Thus Capt. W. A. Lamborn had written on June 3, 1916:—

"I have been much struck by the abundance of *dorippus*, the type form being almost absent. *Ivaria* also seems to be more numerous than the type, and *eneceidon* is almost invariably a brown form [*daira*] without any subapical bar at all." Out of 40 *D. chrysippus* collected by Capt. Lamborn in north central ex-German East Africa, to be recorded with precise localities by Dr. Eltringham in our Transactions for 1917, 33 were *dorippus*, 3 *albinus*, Lanz. (a more or less white-hind-winged *dorippus*), 3 *chrysippus*, and 1 with less white on the hind-wing than *oleippoides*, Moore. Out of 21 *Acraea eneceidon*, L., 16 were *daira*, Godm. and Salv., 3 *eneceidon* (one approaching *infuscata*, Staud.), and 2 *lycia*, F.

Capt. Carpenter's captures were made on what was probably the border of the area in which the above proportions obtained, and it was likely that if the *Pseudacraea* had penetrated still further into this area the proportion of the new form would be found to be much higher to the north and east.

Mr. S. A. Neave, who had had an extensive experience of the type form of *P. poggei* some three or four hundred miles south and a little to the west of Lulanguru, wrote to Prof.

Poulton from Kambove in the S.E. of the Congo State, Nov. 14, 1907: "I still think *P. poggei* the best mimic of *Danaida (Limnas) chrysippus*, even better than *misippus*—its flight is so extraordinarily like that of the model. It is rather, I think, a significant fact that of all the *Pseudacraeas* I have met with (5 spp.) *poggei* is by far the most abundant; while it is bold, and not afraid to expose itself on the wing" (Proc. Ent. Soc., 1908, p. xv).

Mr. Neave had written on Jan. 15, 1918: "That is most exciting about a new form of *P. poggei*, mimicking *dorippus*. It is suggestive that, from the description of the locality, it must be decidedly more lightly wooded and therefore presumably drier, than those in which the type form occurs in N.E.R. and Katanga. The haunting of circumscribed areas on the top of a kopje is of course a habit of many butterflies, but the only *Pseudacraea* I have seen do it is *P. boisduvali*."

A little later Mr. Neave wrote, after seeing Capt. Carpenter's letter: "I return herewith Carpenter's letter, which I have read with the greatest interest. I myself took *poggei* chiefly at medium elevations, viz. from about 2500–3500 ft., but it occurred up to 4500 ft. on the high plateau S. of Tanganyika. It was most numerous in the valleys of the larger rivers, such as the Lualaba and Luapula in Katanga and the Kalungwisi and Chambezi in N.E. Rhodesia. It is on the wing all the year, but is most abundant toward the end of the wet season, at which time it is to be found in woodland country among comparatively small trees, much as Carpenter describes. At the height of the dry season, I only found it in patches of denser forest with larger timber.* I have not observed any special association of this species with the tops of small hills and kopjes, but there is little of this type of country within the area it frequents in Rhodesia and Katanga.

"With regard to its flight and appearance on the wing I fully endorse Carpenter's statements. At very close quarters one would be perhaps inclined to mistake it for a female of *H. misippus*, but at a little distance, especially when on the wing, I myself found it almost impossible to distinguish

* The habits were also recorded by Mr. Neave, together with the exact resemblance to the model, in Proc. Zool. Soc., 1910, p. 35.

from *chrysippus* except in the case of very fresh specimens, which are a trifle brighter in colour. This superiority of resemblance over *misippus* or the other mimics of *chrysippus* is, I think, mainly due to the *flight* being so much more like that of the model. Though hardly so regardless, or rather unconscious, of danger as *L. chrysippus* appears to be, it is remarkably bold on the wing and decidedly easier to catch than *misippus*.

“The resemblance on the wing between *P. poggei* and its model is so close that it suffices to deceive the insects themselves, and on at least one occasion I have seen one of each species chasing the other, and flirting together for several seconds before discovering their mistake.

“Carpenter’s discovery of a form resembling the *dorippus* var. is of the utmost interest, more especially as his description of the locality indicates a decidedly drier region than those I found the insect in, and therefore one in which this variety of the model may well be the dominant one.”

Pseudacraea poggei, *Dev.*, *forma mimetica n. carpenteri*.—The differences between *carpenteri* and the type form are almost confined to the fore-wing, just as those between *dorippus* and *chrysippus*. In the following description the fore-wing is always to be understood when the hind-wing is not specially mentioned. The essential difference between *carpenteri* and the type form is a reduction in the black fore-wing markings and the replacement of the white by a paler tint of the orange ground-colour, changes which transform the butterfly from a mimic of *chrysippus* into a mimic of *dorippus*.

The reduction of black.—This reduction is chiefly manifest in the apical region of both surfaces and is remarkably complete, leaving no trace of an edging to the vestigial oblique bar such as is often seen in other mimics of the same model, and especially strongly in the *inaria* ♀ of *Hypolimnas misippus*. The black apical area persists as a marginal band nearly uniform with that round the hind-wing and other parts of the fore-wing—as in *dorippus*. Within this apical margin scattered black scales only exist in sufficient numbers to produce a distinct effect in relatively few specimens, and these

are not the individuals which retain the clearest traces of the white bar and white spots.

Reduction of black also occurs at the end of the cell, although the retention of this marking of the type would perhaps have promoted the resemblance to *dorippus*—a resemblance certainly attained in the *inaria* ♀ of *misippus* by the persistence of a part of the black markings of the type, as is well shown in figs. 5 and 4 on Plate XIV of Trans. Ent. Soc. for 1905. At the same time, as is also shown on fig. 3 of the above plate, the black mark placed at the end of the short cell of *poggei* is of a very different form from that which partially surrounds the end of the longer cell of *dorippus*. The resemblance in *inaria* is mainly attained by the retention of part of the black area altogether beyond the end of its cell, but in a position corresponding with the end of that of *dorippus*.

A third black marking reduced in the *carpenteri* form is the short internervular black streak near the base of area 1b (shown faintly in fig. 3 of the above-mentioned plate, but more distinctly in fig. 3a, representing the under surface). This streak, occasionally vestigial on the upper surface of *poggei*, appears to be always absent or vestigial on this surface of *carpenteri*.

In both it remains distinct on the under surface, and when well developed above it is still larger and usually of a deeper black below. In a relatively few of the type form there is a small black spot between the median and the junction of the outermost quarter with the rest of the streak. Below this spot also is more distinct and sometimes fuses with the streak.

The strongly marked blackened veins of the upper surface of *poggei* and its variety may be secondarily mimetic of the ♀ *H. misippus* and its form *inaria*. In both mimetic species they are far more prominent than in the models.

The black spots on the under surface of the hind-wing of both *poggei* and the form *carpenteri* are very variable in shape and often asymmetrical. The two small additional spots in areas 4 and 5 observed in a single one out of seventeen specimens from the sources of the Congo and represented in Trans. Ent. Soc., 1905, Pl. XIV, fig. 3a, were found in one

Lulanguru *poggei* out of twenty-nine examined, and, of a much smaller size, in one *carpenteri*, and still smaller and in area 5 of the right side only in another, out of eight examined. In a few specimens of both forms the lower discocellular is blackened on one or both sides, representing a vestige of the lower of these two additional spots.

The occasional appearance of these minute spots and an additional one in the hind-wing cell, as well as the variable condition of the basal streak in area 1*b* are of much interest, for they represent features strongly marked in *Pseudacraea clarkii*, Butl. In this latter species the spots appear on the upper surface, although more strongly developed, as also the streak, on the under (Trans. Ent. Soc., 1892, Pl. X, figs. 1, 1*a*).

The crumescence of the oblique white bar and white spots.—The transformation is effected by the scales becoming in part of a pale orange colour and in part of a darker orange, like the ground-colour of the fore-wing. In some individuals a relatively few, and in one (out of eight carefully examined) a high proportion, of the white scales are retained—a persistence especially marked in the pair of submarginal spots in areas 2 and 3. The pair of spots or only one of the pair in area 1*b* are quite as often present in *carpenteri* as in the type, and these also, although very small, tend to retain the white scales. In both type and variety this pair is often present or better developed on the under surface when absent from the upper or feebly developed on it. It is probable that the whiteness of these pairs of spots, especially those in areas 2 and 3, is mimetic of the marginal pattern of *dorippus* which is strongly developed in the same areas, especially in 3.

Although always obvious on examination by its paleness as compared with the ground-colour, the oblique bar would be invisible in flight or at a little distance during rest. Its edges, especially the inner, are dyslegnic, contrasting sharply with the eulegnic bar of *poggei*. The costal extremity of the latter bar is formed by a fine white streak, of which traces are often retained by *carpenteri*, suggesting at first sight mimicry of the costal spots of *dorippus*, but it is unlikely that so fine a streak would be visible. In *inaria*, however, the retention of the costal extremity of the same feature,

and of a pale costal spot on its basal side, appears to be clearly mimetic.

On the under surface of the fore-wing the mimicry of *carpenteri* is far closer than that of the type, because of the differences in the apical section. Here the black area of the type is overlaid by streaks of white scales, producing a very imperfect resemblance to the characteristic pale tint of *chrysippus* in the same region of the under surface. In *carpenteri* the white covering scales are retained, and these, combined with the orange scales which have replaced the black (as well as the white over the site of the bar), produce a resemblance to the corresponding part of *dorippus* which is far closer than that between *poggei* and *chrysippus*.

The last point concerns the ground-colour of both fore- and hind-wings, and its resemblance to that of the models. In Ethiopian examples of *chrysippus* the upper surface of the fore-wing is generally of a darker Sienna brown than the hind, and increases in depth of shade towards the costa. The fore- and hind-wings of *dorippus* are more nearly of the same tint and much paler than the usual tint of Ethiopian examples of *chrysippus*, being of a brownish orange and sometimes of a pale, sand-like colour, and the costal darkening is less marked or wanting altogether. In *carpenteri* also the fore-wing is paler than in the type and less darkened towards the costa, producing a more uniform appearance clearly mimetic of *dorippus*.

It is of special interest that, as Capt. Carpenter has remarked, the dimorphism between the two forms of *Ps. poggei* should be so complete—far more so than in the females of *H. misippus* or the *daira* and type forms of *Acraea eucedon*. The only mimic of *chrysippus* which approaches *poggei* in this respect is *Mimacraea marshalli*, Trim., with its *dorippus*-like race *dohertyi*, Rothsch., but this latter has not yet been found in the same locality as *marshalli*, so that true dimorphism has yet to be proved for the species.

Among the fifty examples of the type form from Lulanguru, a single one, a female captured Nov. 3, exhibits a slight but distinct trace of orange scaling on the black apical area beyond the white bar of the fore-wing upper surface (see p. ix).

[The above description, although originally drawn up from the specimens captured up to Nov. 13, is applicable to the entire series, now carefully examined. Specimens with traces of the extra black spots on the hind-wing under surface were as numerous in the later captures as in the earlier. A few of the later *carpenteri* showed interesting vestiges of the type pattern towards the apex of the fore-wing.]

A comparison between the details of the mimetic likeness borne by *poggei* and the ♀ *misippus* to their model, and between the patterns of the co-mimics themselves, was published by the present writer in Trans. Ent. Soc., 1905, pp. 265-7. At that time I was not aware of the critical comparison between the same forms which the late Mr. Roland Trimen, F.R.S., had published at a much earlier date, in Proc. Zool. Soc., 1891, p. 79, based on a single male from Omrora, Angola, which corresponded in size "with the smaller than usual *D. chrysippus* from the same locality." Mr. Trimen found that *poggei* was a closer mimic than the ♀ *misippus* in three features: "On the upperside of the fore-wings the much narrower costal black and the absence of the apical white spot, and on the upperside of the hind-wings the narrower, less diffuse, inwardly more sharply dentate hind-marginal black border. On the other hand, the greyish-white clouding on the underside of the apex of the fore-wings and the conspicuous spotting of the abdomen are points which lessen *D. [P.] poggei*'s likeness to *D. chrysippus* as compared to the colouring of the corresponding parts in *D. misippus*. These two characteristics and the subbasal black spots on the underside of the hind-wings are retained generic features of *Pseudacraea*, quite peculiar and unmistakable. . . . The rufous-ochreous ground-colour of the wings exactly accords with that of *Danais chrysippus*, and the paler tint of the hind-wings is most perfectly reproduced; while on the underside the creamy ochre-yellow ground and the white neuration and black border of the hind-wings (with also a general resemblance in the few white-edged black spots) are precisely simulative of the *Danais*."

The distribution of the type form of Pseudacraea poggei.—The exact distribution of this beautiful mimic becomes a

subject of the greatest interest now that Capt. Carpenter has discovered the appearance of its new form on the borders of the very region where *chrysippus* is mainly replaced by *dorippus*. The distribution of the type form of *poggei*, as given by Aurivillius in "Seitz" (vol. xiii, p. 197), is Angola, Southern Congo and Rhodesia, a summary in every way confirmed by the following data kindly supplied by Lord Rothschild, Mr. S. A. Neave and Mr. J. J. Joicey, as well as by the material in the Hope Department.

ANGOLA.—At Tring, 13: collected by Dr. Ansorge, Mjene Indale, 2 (also 3 at Witley); Guimbungo, 2; Samba Acenda, 2; Mikenge, 1; Makweha, 1; Marimba, 1; Bang Ngola, 1; Camba Caquenje, 2; Katole, Jinga Country, N. Centr. Angola, 1.

At Tring also from the following localities: Loanda, 1 (ex Homeyer Coll., co-type); Ceramba, Bihé, 1 (W. C. Bell); Bihé, 3 (Edw. Sanders); also 3 at Witley.

Quoted by Roland Trimen in P.Z.S., 1891, p. 79: Omrora, Ambuella Country, 1 (Erikson); Central Angola (Pogge), 2.

Among the above examples of the type a single one, from Ceramba, Bihé, is a faithful mimie of a *D. chrysippus* with hind-wing pattern intermediate between the type and *alcippus*.

S. CONGO STATE AND N.E. RHODESIA.—Mr. S. A. Neave has kindly added the following account of the distribution of *P. poggei* in the above area, in amplification of his brief note in Proc. Zool. Soc., 1910, p. 35: "I have been looking up my notes on *Pseudacraea poggei*. I should describe it as by no means uncommon throughout Northern Katanga (in the southern portion of the Congo State), and the plateau of N.E. Rhodesia N. of a line somewhere about the S. end of L. Bangweolo. In my experience it does not occur on the Zambesi side of the watershed, though I should not be surprised to hear of it being found in Northern Nyasaland. I have an idea that I have seen or heard of examples from the Karonga district of Nyasaland, *i. e.* the extreme N. of the protectorate, and one would expect it round the shores of Tanganyika."

The following account of the model and co-mimics of *P. poggei* was published by Mr. Neave in his memoir "Butter-
PROC. ENT. SOC. LOND., I, 1918.

flies from Northern Rhodesia and adjacent Territories" in Proc. Zool. Soc., 1910:—

Danaida chrysippus, L.—“A common insect everywhere, but prefers open country and avoids very dense forest. The specimens are mostly of the type form with occasional individuals tending to var. *alcippus*, Cram. I saw one specimen of the *dorippus*, Klug, form in the mid-Chambezi Valley in May, and found it not uncommon a few miles above the mouth of the Lofu river, near Lake Tanganyika, but did not meet with it to the south of these localities” (p. 7).

Acraca encedon, L.—“I took this everywhere. The type form is perhaps the commonest, though not much more so than *daira*, Godm. and Salv. The *lycia*, Fabr., form occurs rarely in Katanga and more commonly in the valleys of the Kalungwisi and Lofu rivers in N.E. Rhodesia” (p. 27).

Mimacraea marshalli, Trim.—“I took about twenty individuals of this fine species in the Lualaba Valley, iv. and v., and one other later in the year, x. I also saw a few individuals in the Chambezi Valley, iv. and v. These Central African specimens seem to be slightly more heavily marked than those from Mashonaland. I found its habits and the nature of its habitat very much as Marshall describes,* but did not observe it settling head downwards on the trunks as he records. . . . I was lucky enough to capture, on more than one occasion, both this species and *Pseudacraea poggei* as well as their model *Limnas chrysippus* within a few yards of each other” (p. 42). Mr. Neave's photograph of the insect at rest, reproduced on p. 42, was taken in the Chambezi Valley.

Hypolimnas misippus, L.—“Occurs everywhere during the wet season, but is nowhere abundant, especially in Katanga, though fair numbers of males are sometimes seen. The typical and *inaria* forms of female seem to occur in about equal proportions” (p. 31).

Mr. Neave preserved as a separate series and presented to the Hope Department the most striking examples of *P. poggei* and the above-mentioned model and co-mimics, captured

* Trans. Ent. Soc., 1902, p. 472.

Localities in S.E. Congo State and N.E. Rhodesia.		Dates in 1907 and 1908.	<i>Danaïda chrysiptus.</i>	<i>Acræa eneceon,</i> type form.	<i>Pseudacraea poggei.</i>	<i>Mimacraea marshalli.</i>	
SOUTH-EAST CONGO STATE, KATANGA		1907 Apr. 18	—	4 (10 others seen)	1 (1 other seen)	3 (1 other seen)	
		.. 19	—	—	—	2	
		.. 20	—	—	—	1	
		.. 21 (All within ½-mile on same path.)	1	1	—	1 (also 1 <i>M. skoptoles</i>)	
		Apr. 22	1	—	—	1	
		.. 26 (All in about 3-acre of native clearing.)	1 (7 or 8 others seen)	1 (5 others seen)	1	1 (on edge of forest, other species in open)	
		Apr. 27	(Numbers seen)	1 (numbers seen)	6	—	
		.. 29 (Native col- lectors)	7	3	1	—	
		Apr. 30	1	—	—	3	
		May 1	—	—	1	—	
Lualaba Valley, S. Kabuli River, nr. Mazanguli: 3000 ft., April 18-22; about 2500 ft., April 26 and 27.		.. 2	—	—	3	—	
		.. 3	—	—	1	—	
		.. 8	—	—	—	1	
		.. 9	1 (mistaken for <i>poggei</i>)	—	1	—	
		.. 11	—	—	—	1	
		Lualaba River: 2000 ft.	.. 13	—	—	2	—
		Busanga, junction of Lualaba and Lutupa Rivers: 2500 ft.	June 5	—	—	1 (very worn)	—
		.. 10	—	—	1	—	
		Lualaba River, Nzilo Gorge: 3000 ft.	.. 13	—	—	2	—
		Nr. Kam- bove: about 4200 ft.	June 5	—	—	1 (very worn)	—
.. 10	—	—	1	—			
NORTH-EAST RHODESIA.		1908 Apr. 14	5	—	1	—	
		.. 15	4	1	—	1	
		Chambezi R., Mpika- Kasama Rd.	May 1	1	2	1	—
		Luena distr. and E. shore of L. Ba- ngweolo	June 8	3 (seen)	—	1	—
		Luwingu, N. of L. Bangwe- olo: 4000 ft.	Sept. 30	1	—	1	—
		Totals	26	13	23	15	

together, and these were exhibited to the meeting. This series is shown in full on p. xix, in a table to which Mr. Neave has kindly added notes from his journal as well as the record of additional specimens.

With reference to the localities Mr. Neave points out that, in some older maps, the Luapula, after leaving Lake Mweru (it is generally called the Luvua beyond the lake), is named "Webb's Lualaba," which must not be confused with the real river of that name—the one we are dealing with—which is much further west.

In Mr. Neave's opinion the three dates printed in heavy type in the Congo list, viz. April 18, 26 and 29, 1907, are the only ones that give an accurate record of the *proportions* in which the insects occurred. At the same time the other less complete data are of value in confirming the conclusion that the insects are found in the same places, and often at the same time.

A large proportion of the specimens of all the species in this table is kept together as a special series in the bionomic collection of the Hope Department—a series of which Dr. Eltringham wrote: "The general effect of the group as seen together is that they are all alike, and when they are arranged in haphazard manner there is a distinct sense of effort in counting the respective numbers of the different species. I know of no instance which could illustrate more forcibly the reality of the resemblance" ("African Mimetic Butterflies," Oxford, 1910, p. 38).

In addition to the bionomic series many of the other specimens recorded in the table are arranged in the systematic collections of the Hope Department, together with the following examples of *P. poggei* taken by Mr. Neave in N.E. Rhodesia: Lower Chambezi Valley, Kasama distr., 3900 ft., 2; Lawingu, N. of L. Bangweolo, 4200 ft., 1; Lawingu to mouth of Chambezi R. in L. Bangweolo, 2; high plateau between L. Tanganyika and the Lofu R., 4200–4500 ft., 3 (one of these exhibits an injury probably caused by an enemy and noted before capture).

A series of *P. poggei*, taken by Mr. Neave in the Lualaba Valley, Katanga, contains the only examples of this species

in the British Museum. They include some of the specimens recorded in the table on p. xix.

In addition to Mr. Neave's captures the following records from S.E. Congo and N.E. Rhodesia have reached me :—

AT TRING : Riuwe R., Lualaba Valley, near Katanga, S.E. Congo, 1; Fort Rosebery, about midway between L. Bangweolo and the Luapula R., N.E.R., 2.

AT WITLEY : N.E. Rhodesia, 5; Chambezi R., N.E.R., 5; Katonga R., a tributary of the Upper Chambezi R., N.E.R., 1.

THE NEWCASTLE MUSEUM : Johnstone Falls, Luapula R., N.E.R., about midway between Mr. Neave's Congo and N.E.R. localities, 2 (formerly in the collection of Dr. H. Eltringham).

THE HOPE COLLECTION.—In addition to Mr. Neave's series a very interesting collection of *poggei*, its model and co-mimic was presented by Sir Horace Byatt (Trans. Ent. Soc., 1905, p. 263). The proportions of *poggei*, *chrysippus* and *misippus* in the locality—Kayambi, Awemba Country, N.E.R., near the Chambezi R., 9° 20' S., 31° 50' E., at a height of 3950 ft.—are shown with singular completeness, inasmuch as the insects were captured indiscriminately by native schoolboys, collecting, Oct. 1898–Jan. 1899, for Père Guillemé. Out of about 1200 butterflies in the collection the following fell into the *chrysippus*-centred combination :—

<i>D. chrysippus</i> , type form	367
" <i>dorippus</i> form	12
<i>P. poggei</i> , type form	17
(<i>H. misippus</i> , non-mimetic ♂	36)
" type ♀	7
" <i>inaria</i> ♀	2
Total	441

The proportion of *poggei* to *chrysippus* was therefore about 1½ per cent (4·63; the percentage 4·72 is erroneously given in the paper). Sir Horace Byatt's remarks on p. 265 are of much interest in relation to Capt. Carpenter's recent discovery. *P. poggei* is purely a mimic of *chrysippus* and shows no approach to dimorphism. This is explicable on the

ground that it is found only where *chrysippus* is the largely predominant form, and, so far as is known, it does not occur in, or has not yet reached, the parts where *dorippus* is relatively abundant—that is, the desert strip along the E. coast, extending in the E. African Protectorate inland at least to the shores of Victoria Nyanza.”

OTHER LOCALITIES.—Except for Capt. Carpenter's recent captures only two other records are known to me: (1) “a female in the collection of Mr. Hobley which was taken in German East Africa” (Eltringham, “African Mimetic Butterflies.” p. 35). It may be conjectured that the specimen came from near the E. shore of the Victoria Nyanza, for Mr. C. W. Hobley's collection was largely made in the adjacent Kavirondo-Nandi district (Trimen, Proc. Ent. Soc., 1903, pp. xxxviii, xxxix). (2) An example, labelled “Uganda,” at Witley. Its history is, unfortunately, unknown.

THE “FRUIT-FLY” *DROSOPHILA* AND THE INHERITANCE OF SMALL VARIATIONS.—Prof. POULTON said that Prof. H. S. Jennings of Baltimore, U.S.A., who had kindly sent a set of his papers to the Entomological Society, had remarked in an accompanying letter, Jan. 16, 1918: “We feel that we have here in America, in Morgan's *Drosophila*, a sort of machine for grinding out answers to all sorts of questions in genetics, and now that that question of the inheritance of small variations has been put to it, it yields an emphatic affirmative answer.”

MUSCA AUTUMNALIS, DE G. (CORVINA, F.), HIBERNATING IN A LOFT IN THE ISLE OF WIGHT.—Prof. POULTON exhibited examples of 66 males and 80 females of *Musca autumnalis* captured Dec. 14, 1917, in the cistern-loft of St. Helen's Cottage, St. Helens, Isle of Wight. The loft had not been examined in the winter since Jan. 4, 1915, when far greater numbers of the flies were present, as described in Proc. Ent. Soc., 1915, p. xxi. The 146 flies were obtained by sweeping with the hand into a tin box the individuals of two long narrow patches on the close boarding of the roof, each stretching, as in 1915, along the angle made by a rafter with the roof. By sweeping in this way probably $\frac{3}{4}$ of the sluggish flies were secured. In addition to the 146 *M. autumnalis*

a single example of *Pollenia rudis*, F., was swept into the box.

The cisterns had been kept quite free from flies by covering loosely with boards on which layers of newspaper were spread. A large scattered patch of flies was found between two of the sheets. It was probable that the loft had been similarly occupied in the winter of 1916. The repeated choice seemed rather singular, for the loft was formed within the four steeply pitched, slated sides of the roof of a small tower, exposed to the weather and enclosing probably the coldest part of the roof-space.

HYPOLIMNAS (EURALIA) DUBIA, BEAUV., FORM WAHLBERGI, WALLGR., AT REST IN THE SAME SPOT AFTER A WEEK'S INTERVAL.—Prof. POULTON read an extract from a letter written by Mr. W. A. Lamborn, Nov. 5, 1917, from Tanga, East Africa. It would be remembered that Mr. Lamborn had made similar observations on species of *Lycænidæ* in S. Nigeria (Proc. Ent. Soc., 1912, p. xxxiii; 1913, p. xxii). "I noticed one Sunday a *wahlbergi* female, with wings injured in a particular manner, at rest under a mango, and on going to the same spot a week later I found it still there. This caused me to hunt for a possible food-plant, and I found two little nettles of sorts in a fork of the tree. I brought one back with the butterfly, but I handled it so clumsily, thinking at the time of something else, that it escaped, but I feel sure that this must be the East Coast food-plant, and probably that of *E. usambara*, Ward, I expect, so that I feel I made one little advance on that particular Sunday. I think *usambara* the most imposing of them all, and I should so like to do a little work on it."

EPITOLA URANIA, KIRBY, ? = *POSTHUMUS*, F.—Prof. POULTON said that he owed to Mr. J. J. Joicey the opportunity of exhibiting the type of the West African *E. urania* from the collection of the late Mr. H. Grose-Smith, and of comparing it with the series of *posthumus* in the British Museum. It seemed a pity that there should be any uncertainty as to the specific status of one of the most magnificent Lycænidæ in the world, and that Prof. Aurivillius should be obliged to speak of *urania* in the words at the head of this paragraph

("Rhop. Aeth.," p. 292). Some of the specimens in the British Museum were undoubtedly conspecific with the type exhibited to the meeting, but it would be necessary to obtain anatomical data before deciding that the whole series labelled *posthumus* was made up of the variable individuals of but a single species.

Since the above paragraph was written the question has been settled. In a considerable series of specimens like that of the British Museum two groups may be distinguished, especially recognisable by the differences on the hind-wing under surface.

Group 1, including the majority of the specimens. The hind-wing under surface has a golden iridescent ground-colour, and is traversed by long white nervular and internervular streaks, the latter like spear-heads in the areas round the end of the cell. These markings usually extend from areas 2 to 7 and are sometimes also seen (of linear form) in 1a, 1b, and 1c. In some individuals they are yellowish and in some, probably worn, they cannot be traced.

Group 2. In this, the smaller group, the iridescent ground-colour is richer and darker in tint, often deep purplish in certain lights. The white markings are represented only by the spear-heads and nervular streaks of areas 2, 3, and 4, or some of them. These reduced pale markings are far more conspicuous against the dark ground than the more numerous and fully developed markings of Group 1. The line of the median in most specimens of Group 2 marks sharply the edge of a dark streak dividing the hind-wing under surface into two sections. In the darker specimens this streak is deep blue in certain lights; in the less dark it is purplish. This character is especially strongly marked in the males, occasionally evanescent in the females. On the upper surface the males are also distinguished by a greater development of black at the apex of the fore-wing and in the hind by a broader black margin increasing in breadth towards the apex; the females commonly possess a series of very variable blue spots extending from the mid costa towards the centre of the outer margin.

The male type of *clion*, Doubl. and Hew., from Ashanti, and

the female type of *belli*, Hew., from Cape Coast Castle, belong to the first of these groups; the male type of *urania*, Kirby, from Cameroons, is a typical example of the second. The type of Fabricius' *posthumus* is unfortunately lost, but the description is clearly that of a female. Furthermore, Fabricius refers to "Jones' *Icones*" (5, tab. 77, fig. 2), of which copies by Donovan and Westwood exist in the Hope Department. These copies (fig. 2 includes both upper and under surface, etc.) represent a female of the first group—apparently a rather worn specimen showing no trace of the white radiate markings on the hind-wing under surface. Some slight confirmation is afforded by the fact that the early West Coast material was mostly from Sierra Leone, where members of the first group are common and those of the second rare. Taking the whole of the evidence together there can be no doubt that Aurivillius was right in sinking both *clion* and *belli* to *posthumus*.

If, then, the two groups described above represent two species, *urania* stands as distinct from *posthumus*. Considering the great variability of both groups and the occurrence together, especially in the southern part of the range, of individuals from both of them, the differences in pattern are insufficient to determine the question. I therefore sought the help of Dr. T. A. Chapman, who kindly consented to examine the male genitalia of (1) a typical example of the first group (*posthumus*) from Old Calabar; (2) a specimen of the second group, also from Old Calabar, closely resembling the type of *urania*; (3) another example of the second group collected by Mr. S. A. Neave in the Mpanga Forest, Toro, Uganda. Dr. Chapman reported that (1) was quite distinct from (2) and (3): "The Epitolas are very distinct; the most obvious differences are in the *cedocagus*, with a remarkable serrated projection on the ventral side in *posthumus*, very straight and smooth on this aspect in *urania*; the dorsal projections much longer in *urania* (folded in mounting in both specimens). The falces also differ very decidedly; the clasps also differ, etc."

The differences of pattern here described are recognised in the arrangement of the British Museum series, but apparently

no attempt was made to determine the position of *urania*, both groups being arranged under *posthumus*.

In the British Museum, examples of Group 1 (*posthumus*) are included from Sierra Leone, Cape Coast Castle, Gold Coast, Ashanti, Kumasi, Accra, Calabar, Old Calabar; examples of Group 2 (*urania*) from Sierra Leone, Old Calabar, Cameroon, and W. Uganda. In the Hope Department, 4 males from Oni, 70 miles E. of Lagos (W. A. Lamborn), and 1 from Old Calabar are *posthumus*; 1 male labelled "trop. Africa" is *urania*.

Both species occur together on the West Coast, but *posthumus* predominates to the N. and *urania* to the S. So far as at present known *urania* is the only species in W. Uganda, this locality being represented by one male and three females collected by Mr. Neave. Of these, the male (Mpanga Forest, Toro) exhibits an increase in the black parts of the upper surface pattern as compared with W. Coast specimens, while all three females (Buamba Forest, Semliki Valley) possess the above-mentioned series of blue spots on the fore-wing upper surface.

It has not been deemed necessary to repeat the full references to the literature given by Aurivillius in "Rhop. Aeth.," p. 291-2.

THE HABITS OF ETHIOPIAN SPECIES OF SARANGESA AND OTHER HESPERIDAE.—Prof. POULTON read extracts on the above subject from a letter written by the Rev. K. St. Aubyn Rogers from Kongwa, in ex-German East Africa, near the Central Railway and due W. of Zanzibar:—

"Nov. 22, 1917.

"I have been intending to give you my experiences of the habits of the genus *Sarangesa* for some time. They are certainly not exclusively nocturnal, as they fly and visit flowers quite freely at all hours of the day at all seasons even up to dusk. I rather fancy the peculiar habit of resting during the day in dark places is characteristic, perhaps exclusively, of places with a marked dry season and only in that season. I remember at Taveta noticing *S. eliminata*, Holl., in numbers down a well shaft, and here I have observed a more variegated

species, ? *S. plistonicus*, Plötz (it is not *S. motozi*, Wallengr.), in some numbers under the verandah at Kirokwe. This house has a thatched roof and the verandah is very dark. I have also seen the dry form of *Precis sesamus*, Trim., resting there. At the same time I have found this last species quite freely at flowers at all times of the day, even the hottest hours.

" I fancy the habit of resting on rocks, and by no means exclusively dark rocks, is even more universal in *Sarangesa* at all seasons. I have little doubt that there are nocturnal Hesperidae, e. g. *Cocnides cylinda*, Hew., and more particularly *Ploetzia cerymica*, Hew., which only appear at the same time as the Hawk-moths come to light (see my note in Ent. Mon. Mag., June 1913, p. 130). All the species of *Rhopalocampa* fly at least up till dark, though they are also on the wing by day. I am inclined to the opinion that all this group are more truly nocturnal than *Sarangesa*, though I should agree that this last has to some extent adopted nocturnal habits in extended dry seasons.

" It looks as if the rains were near, but we have had nothing more than quite light showers here yet, not enough to make any difference. I have been up to Kiboriani this week and saw several much-worn dry-season forms of *Precis sesamus*, and *P. antilope*, Feisth., and one or two *P. artaxia*, Hew., but have not seen a single wet form of this genus yet."

Prof. Poulton said that a similar observation on *P. cerymica* had also been made by Capt. G. D. H. Carpenter, who had captured the insect coming to light at 9 p.m., although there was evidence that the species was by no means exclusively nocturnal or even crepuscular (Proc. Ent. Soc. Lond., 1915, pp. xlv, xlv).

THE CONSPICUOUS CATOCALINE MOTH *EGYBOLIS VAILLANTINA*, STOLL, SEIZED AND DROPPED BY A BIRD, AT DURBAN.—Prof. POULTON said that Mr. C. N. Barker had sent to him the following observation recorded by Mr. Harold Millar, who had written, Nov. 27, 1917, from the Zoological Gardens, Mitchell Park, Durban :—

" I was in scrub bush yesterday, sitting quietly watching a ' Noisy Bush-Chat ' [*Cossypha bicolor*, Sparrm.], when another of same kind came along, perched itself about 12 in.

off the other and started chatting at a great pace; then there came flying along loosely a common old 'peach-moth' [*Egybolis vaillantina*], which eventually floated towards the 'Chat,' which, perched as it was, suddenly seized it, crushed and killed it, and then quietly let it drop to the ground as though saying, 'What do you mean by disturbing me while at song?' I was not more than 10 feet away and could see all that took place. Quite interesting and instructive."

In the accompanying letter, dated Nov. 28, from the Durban Museum, Mr. Barker spoke of the extraordinarily wet season of 1917. It would be interesting to know whether the butterflies exhibit any marked effects:—

"The weather still remains persistently wet: one only gets a few hours' glimpses of the sun at rare intervals, and this condition has been continuing since the middle of June, previous to which we had almost a decade of droughty years. In all my 41 years' experience of S. Africa I have never met with conditions even approaching those of this year."

[In a later letter dated Feb. 20, 1918, Mr. Barker writes: "We have had nearly 80 inches of rain within the last 7½ months, and I have been hoping to come across something abnormal in the melanic line. The black bordering of white Pierines is extremely developed almost throughout, but I have met with nothing quite abnormal so far. Insects, except the hardy common forms, are also unusually scarce, probably due to the lack of warmth caused by these extraordinary rains. *Papilio dardanus*, *hippocoön* and *trophonius* ♀ forms up till just now appear to have been quite as numerous as *cenca*. Last Sunday, however, I observed 4 *cenca* and not a single example of the other forms. The males are especially plentiful this season."]

[These remarkable rains were also prevalent much further north, for Mr. C. F. M. Swynnerton wrote, Feb. 2, 1918, from Chirinda in S.E. Rhodesia: "A wonderful season here. We have had some very wet ones before, but this beats them all. We have had rain practically daily since about the 4th of November: over 45 inches in January, and February threatening to beat it. The effect of such a season on insect life should be interesting to note. It must *indirectly* have been

favourable, as there is bound to have been a great mortality amongst young birds. Two young owls, full-fledged and feeding for themselves, that frequented my coffee plantation were both found dead, emaciated and with empty stomachs. *Directly* it must have been very unfavourable to butterflies at any rate: it will be interesting to note the numbers in which they appear later.”]

THE SESIAS MIMICS AND NOT MODELS OF THE HYMENOPTERA.

—Prof. POULTON said that he wished to draw attention to an unfortunate misconception in the recently issued part of M. Charles Oberthür's beautiful work, “Études de Lépidoptérologie comparée,” Fasc. xiv, 1917. On p. 131 M. Oberthür makes the following statement in a passage kindly translated by Mr. E. A. Elliott:—

“All insect hunters have testified (constaté) that the *Sesias* are imitated by a considerable number of insects of various Orders, especially Hymenoptera and Diptera, but also Orthoptera. These insects, mimicking the external appearance of the *Sesias*, live at the same time and in the same places as they do. When searching at Monterfil for that same *Sesia urociformis* which I have already mentioned several times, I have been entirely deceived by the flies and even by grasshoppers which, when among the clumps of furze, present an appearance analogous to that of the Lepidoptera. I fancied first that I saw a *Sesia*, but was never long before I detected the deception caused by this mimicry.”

Prof. Poulton said that it was important to correct this statement as promptly as possible. So far from the view expressed above being the generally received one, it was the first time he had heard of it, and it was contradicted by all the names ending in *-formis* which were so plentiful in the group. It was unnecessary to refer to the number of memoirs in which the *Sesias* were spoken of as mimics of the Hymenoptera.

HARPAGOMYIA AND OTHER DIPTERA FED BY CREMASTOGASTER ANTS IN S. NIGERIA.—Prof. POULTON said that he had just received a letter from Mr. C. O. Farquharson, dated Dec. 13, 1917, from Ibadan, describing this most remarkable association in an entirely new part of the world. Mr. Donis-

thorpe had kindly informed him that, so far as he was aware, the only published record was that of Edward Jacobson, who observed *Harpagomyia splendens*, Meij., fed by the ant *Cremastogaster difformis*, Smith, in his garden at Batavia—Tijd. v. Entom. 52, 158-74 (1909); Notes from the Leyden Museum, 31, 246 (1909)—and subsequently at Samarang, Central Java—Tijd. v. Entom. 54, 158-61 (1911), 3 Plates. Jacobson figured the larva and pupa and reproduced photographs of the gnat being fed by the ant.

It was to be hoped that specimens would soon arrive so that the Nigerian species of *Cremastogaster*, as well as the other Diptera which Mr. Farquharson observed being fed by them, might be studied and if possible determined.

“ Many things remain incomplete, but I can honestly tell you that I have never described what I was not certain that I actually did see. At times, indeed, I have seen such curious things that I was afraid to describe them on one observation in case I were wrong, for I could scarcely credit the evidence of my own senses. On one occasion, for example, I was certain that I actually saw a mosquito (at Agege) obtain regurgitated food from a *Cremastogaster*. I am sure it was a *Stegomyia*. . . .

“ I’ve just come back from my evening stroll. I went down to our old haunt (Lamborn’s and mine) to look into the welfare of two Lycaenid larvae that have, for the last few days, been slowly devouring a happy family of Coccidae (? *Lecanium*) on a young plant of *Imbricaria maxima*. Of them more anon. Having still a little daylight to spare I went to the old ‘*Hewitsonia* tree,’ and there saw at least half a dozen mosquitoes hovering over the *Cremastogaster* ‘campus.’ There was light enough clearly to see three of them at the same game—not *Stegomyias* and not *Anophelines*. I had no tubes to collect them; I was tired when I went out and didn’t expect to get the length of the old tree, but I know now that I’ll see them again. But I wish I’d been in time for the mail. I took the *Stegomyia* at Agege in a tube which I failed to notice at the time to be moist. When next I looked at it I found it dead and sticking to the wall of the tube. I had a reaction, doubted my eyesight, left the tube

lying about, and saw the mosquito next floating in the alcohol between those *Catochrysops* pupae. These I had accidentally put into the same tube a day or two later, and the observation must have been made about that time."

Dec. 19, 1917. "I had to go to Agege to pay the labour there; on Friday, Dec. 14, the day before I left for there, I thought I'd like to go down to the famous *Cremastogaster-Hewitsonia-Argiolans* tree (I forgot *Iridopsis*) just to have another look at the mosquitoes, to make sure that they really were there. I captured two, easily enough, in little glass tubes, one with its precise ant and the other not. The precise ant, finding itself imprisoned and annoyed, attacked the unfortunate mosquito and killed it. (In a confined space they will kill the softer *Lycaenid* larvae.) Hence I had to forego the precise ant in the case of the other. On the tree I could make out what looked like white banding on the mosquito, and went home to look more leisurely at my find. Landed there, I got a bad attack of what is known as 'cold feet.' I knew little or nothing about mosquitoes, but had vague recollections of a picture in a wonderful official compilation known as the 'West African Pocket Book,' that of a *Stegomyia*, described in the accompanying letterpress as exhibiting the pattern of a football jersey. (No wonder the unfortunate animal is a victim of yellow fever!). But somehow the proboscis of my myrmecophile didn't seem to fit into the scheme of things. Its proboscis wouldn't, anyhow. *It* produced the local 'chill,' for I couldn't recall any mosquito like it. I began to wonder if it could really be a mosquito after all, but its 'poise' when alive, with its hind legs *en l'air*, and everything else appeared to be unimpeachable. None the less I decided that I couldn't wait till I heard from England, so I decided to take it down to my friend Mrs. Connal at Yabe when I went to Agege. This I did. I sent it down a day ahead of myself with solemn injunctions not to treat the matter with levity, it being no common mosquito, being in fact a myrmecophile. When I reached Yabe I found that there is next to nothing new under the sun! I'm quite sure *now* that what I'll get back from Lamborn will be a callous recommendation to go to his old office library cupboard, find

therein a work of somewhat forbidding exterior described as 'A Monograph of the Culicidae of the World,' by F. V. Theobald (vol. v), in which, on pp. 517 *et seqq.*, I shall find out all about it. Mrs. Connal assures me that it is at least a new *Nigerian* record. She had never met a *Harpagomyia* before—it is *H. trichorostis*, Theobald—but there can be no doubt that that is the correct identity of my find. And there, on p. 548, it is set down without comment, 'They are myrmecophilous insects'! If the British Museum hadn't bound that work in such a cover, I'd probably have found it out for myself. I am ashamed to confess that I had never even looked inside it. The book, of course, is devoted to melancholy facts of existence out here, which is one reason why I didn't care to look into it, but really publishers ought to exhibit a little more psychological insight. It really is a pity that it has not as worthy a cover as, for instance, 'Wheeler on Ants.' I am puzzled about the name *Harpagomyia*, which I take to be derived from ἄρπάζω, to seize, and μύια, a fly. The name suggests a synechthran rather than a symphile. From my observations I should class it as a symphile rather than a synechthran. Wheeler's bibliography makes no reference to Meijere, but the latter's description of the genus would, I imagine, have just about synchronised with Wheeler's publication. At the worst it is a mild ἔχθρα, in the form of highway robbery without violence, if not indeed mere alms solicitation by a sturdy beggar."

Dec. 23, 1917.—"I reached *the* tree just after ten; I had seen an *Iridopsis* larva yesterday which I thought I might safely leave for a day or two, and went along to see that it was all right. I hope it is, for I regret to say I couldn't find it again. I may, however, find the pupa on further search. I saw quite half a dozen *Argiolaus* pupae (the 'gall' species). I saw their larvae coming down a day or two ago. One I found to be parasitised by a *Cordyceps*, only the conidial (*Isaria*) stage being present. I next examined a half-calabash of water that I had placed in a hollow of the tree to see whether any mosquitoes had oviposited—I am in hopes of inducing *Harpagomyia* to do so. I failed to get one in the house. I found a number of 'rafts,' but I don't think they

are those of *Harpagomyia*. I am in hopes, too, that I may get ova of a very large mosquito, I think a *Tororhynchites*, at the same time, for I frequently see them near the tree. They do not bite man, and I am wondering whether they have anything to do with ants. I then had a look at some Lycaenids (Epitolas, I think) feasting on Coccid secretions on a shrub hard by the ant tree, the Coccids being *Cremastogaster* attended. I noticed a few small Dipterous flies apparently trying to get a share of the Coccid good things, but just then decided that they didn't look very interesting. Hard by the ant tree are one or two Funtumias (native rubber—*Apocynaceae*), on the stems of which the ants also run about, and on which I captured on previous evenings some of the *Harpagomyiae*, 'in flagrante delicto.' I thought I'd have a look at that too, and to my surprise found quite a number of the mosquitoes as busy as could be, I think more of them than I have seen at dusk. I didn't leave the neighbourhood till a little after noon, and they were still there. The place is moderately shady, but by no means 'forest' shade. I was there again at three this afternoon, and they were still busy. They are unquestionably day fliers [also observed by Jacobson]—like *Stegomyia*, curiously enough. But for the time they became of secondary interest. For almost the first thing I saw was a small fly [2 species of *Milichia*] apparently 'chivying' an unwilling ant in a very daring manner. The ant stopped, apparently in despair of shaking off the importunate Dipteran. Immediately there occurred the usual osculation which signifies that one ant is about to offer, or at any rate part with, a drop of regurgitated food to another, but in this case to the fly. At first I thought the fly might be predaceous and was about to attack the ant much as a *Bengalia* attacks the Driver pupa. When a *Harpagomyia* solicits food of the ant it stands directly in front, but this fly, having induced the ant to stop, or rather in order to induce it to stop, comes up from the side, and the ant, if willing to oblige, turns its head half round. The flies—for I saw quite a number of them at it—frequently, having got a little at one side, rush round to the other before the ant has time to move away, and get a little more. They are

astonishingly active and expert at getting out of the way of ants that come up behind them. They rarely settled outside the track of the ants. I concluded that one or two that I saw in that position were, for the time, replete. When I brought a little glass tube up to them—to within a quarter of an inch, and not with any great caution either—they flew an inch or so over the stem of the tree, and if their flight took them once more amongst the ants, they simply, as it were, ‘watched points,’ taking care not to let an ant get them from behind, but making no attempt to importune them as they passed. I saw several, presumably hungry, flies alight right in the ‘busiest’ part of the track and immediately begin ‘chivying’ the ants—that is really as good a descriptive term as I can find. An ant coming up to meet a fly would dodge to the side. The fly immediately turned round and ran after it. Their actions were extraordinarily like those of the importunate beggar. If the ant took no notice, further than to keep on dodging out of the way, the fly didn’t waste much time, but turned round and importuned another. Those that refused to be ‘bled’ or ‘touched’ seemed to show no serious resentment and made no attempt to drive off the beggar by force. Cremastogasters running up and down a tree are constantly making little regurgitory exchanges, a momentary ‘osulation,’ and each hurries on its way. If anything the fly and ant exchange lasted rather longer, but the ant continued on its usual hurried way just as if it had met one of its own kind. It is just the same when *Harpagomyia* is the other party in the transaction. *Harpagomyia*, however, hovers an inch or less over the line of ants (at times resting on the stem and dodging out of the way when necessary), till it sees what is presumably a likely ant. If the ant is running downwards the mosquito drops down (in flight) also, keeping a little in front of the ant—as near as possible without touching it. The ant tries to evade it, but the mosquito as a rule declines to be put off, and the ant at last stops. The mosquito quickly settles and the usual rapid exchange begins, the mosquito thrusting out its proboscis—which when not in action is carried bent under the body much like the rostrum of a Reduviid bug—so that the swollen

end is practically within the ant's jaws. I have seen the ant's palpi (*not* the antennae) vibrating on it. The swollen portion of the proboscis is undoubtedly capable of independent movement. I may say that the mosquito is not 'nervous,' and I have had no difficulty in several cases in standing with my eyes sufficiently close to the two insects to make out the ant palpi and the proboscis movement in the mosquito. The ant raises its head slightly when the exchange takes place."

Dec. 27, 1917.—"On Xmas Day also I made another quaint observation. I have been looking about for other Dipterous myrmecophiles. In my search I came on a large crowd of *Cremastogaster* sp. on the trunk of a Saman tree (*Enterolobium saman*)—an introduced shade tree. I thought from the appearance of them that they were about to start up a new nest. All were workers, but I think they came from another large nest not far away. On closer examination I was astonished to see that there were a large number of dead ones sticking to the rough bark of the tree in all sorts of attitudes, but looking as if they had died there and had not been carried up and afterwards 'dumped' by tired workers. Some were in fact still moribund. I soon noticed some curious little Diptera [*Rhynchopsilopa* sp., *Ephydriidae*] which I thought might be the same as those I had seen on the *Harpagomyia* hunt. They are, however, quite different. I soon became interested in their doings, for they settled among the ants, dodging about when a worker approached them, but refusing to go far away. I thought I had only to wait and see more able-bodied beggary. What I saw was something quite new. I saw it repeatedly, as often as I liked, and so tame were they that I could actually study their doings through my pocket lens. When they saw a dead ant, that had expired in such a position that its abdomen was easily accessible, they alighted on it. For such small flies they have a huge proboscis. This they thrust into the appropriate orifice and fed, not this time on stomadeal food, but on proctodeal. Pirouetting neatly on the abdomen of the dead ant, they were themselves—but for the wings, which when in rest stick up from the body at rather a high angle—not unlike ants. When in the act of ingesting the abdomen

was raised and lowered gently, and I could also make out the brilliant white halteres in motion upwards and downwards. When the abdomen was raised the halteres were depressed together. I really think their association with ants is not accidental. I got two or three pairs, and have been trying to induce the females to oviposit on stale fruit, but without success. I cannot account for the death of so many ants. Hundreds of a *Pheidole* were running about, in many cases carrying off dead *Cremastogasters*, with little or no molestation. I do not for a moment think the *Pheidoles*, numerous though they were, could have caused the slaughter. I am inclined to think the ants must have come from a 'foul' brood. I have put up a lot in spirit for examination, and am keeping the nest under observation. They are still in the same place, and the little flies are still busy in their curious and rather unpleasant way."

Dec. 29, 1917.—"I have been laying traps for *Harpagomyia* ova in the form of bits of calabash with water placed in the hollow stem of the ant tree. I've got hosts of larvae of different sorts, but four have outstripped all the others—great red forms with white undersides which are predaceous on the others. I feel sure they are *Toxorhynchites*; I think the other larvae are *Stegomyia*."

Mr. DONISTHORPE said it was of the greatest interest that Mr. Farquharson had observed in S. Nigeria the same extraordinary phenomena that Mr. Jacobson had first discovered and described in Java. He stated that the behaviour of the gnat as described by the two observers, although on the whole similar, differed slightly in some respects. Jacobson records that the Dipteron stood in the track of the ants, and that when an ant ran between its legs it supplicated for food, and was then fed as described by Farquharson. During the process the wings of the gnat were so rapidly vibrated that the nervures of the wings did not appear in photographs taken of them while feeding. Jacobson had discovered and figured the larva and pupa of the *Harpagomyia*. He says, however, that the eggs, which he does not figure, are laid in branches of trees which the *Cremastogaster* had deserted on account of their having been flooded by rain. The eggs may

also be laid elsewhere, inasmuch as the larvae appeared in the bowl of water in the glass case (containing the captive ants) into which he had introduced a number of gnats. The larvae are easily recognised by their yellowish-white colour and by their habit of lying on the bottom of the vessel. Jacobson records that those nests of *Cremastogaster* which were most freely attended by the *Harpagomyia* consisted almost entirely of the small type of workers, and he considered that this was brought about by the amount of food taken from the ants, and therefore diverted from their larvae. He furthermore states that he had never found females, but only males and workers, in such nests. Mr. Donisthorpe said that this observation was of special interest to himself, as he had been working for some years on the causes by which females are produced in ants' nests. He had, for three years running, bred winged females from eggs laid in captivity by a community he had kept in an observation nest for over seven years, and for the first time last year in another community he had observed during five years, and he was of opinion that these positive results had been brought about by the amount of food with which these two nests had been supplied. Ants have been kept in captivity by very many myrmecologists for over 100 years, and in all that time winged females have only once before been produced from eggs laid in captivity, viz. when Lord Avebury bred five winged *fusca* females in an observation nest in 1880. The last-named observer also thought that his success might be accounted for by the fact that this community had been very well fed.

Some authorities also considered that the presence of pseudogynes in ants' nests was brought about by the ants taking too much interest in the beetle *Lomechusa* and its larvae, and in consequence neglecting their own brood. It will be of much importance if Mr. Farquharson should find that those nests of *Cremastogaster* which are most attended by the *Harpagomyia* in S. Nigeria are also unable to produce females.

Mr. Donisthorpe had also found flies of the genus *Milichia* associated with ants in this country, viz. *M. ludens*, Wahl., with *A. (D.) fuliginosus* at Darent Wood in 1909, and again

at Oxshott. It was always so scarce that there was no chance of watching its habits.

Mr. F. MUIR said that he first saw *H. splendens* at Mr. Jacobson's house in Batavia at the time when he was making observations on them. His published figures and photographs of them and his description of their habits were very accurate. Mr. Muir afterwards saw them in the field in Buitenzorg and Pasoeroean (East Java), and in the latter part of 1915 discovered another species (still undescribed) in Taihoku in N. Formosa. Charles Banks had described similar habits in a mosquito in the Philippines. *

[Since the meeting of Feb. 6, Prof. Poulton had received an answer from Mr. Farquharson to some of the questions suggested by Mr. Donisthorpe :—

Mar. 22, 1918.—“ You wish to know whether the associated ant-nests produce winged forms. They do. There's no doubt of that whatever. I should say that it is entirely unlikely that the *Harpagomyias* would have any effect at all, for their numbers are relatively very few. I may say that of five *Cremastogaster* nests known to me, I mean intimately, that I visit regularly, all are frequented by the mosquitoes, but one doesn't see more than half a dozen at a time. Besides, the ants, if not omnivorous, are certainly at times carnivorous, and at other times—regularly almost—frequent the glands of plants, collecting nectar all day long, in addition to ‘farming’ *Coccidae* of different kinds. I doubt if even the largest colonies, which must contain enormous numbers of inhabitants, ever experience anything like famine conditions or even moderate scarcity of food. I should think there would always be enough and to spare. You know how worker ants stop each other and exchange a little regurgitated food, a momentary transaction almost, both passing quickly on their way. The mosquitoes do exactly the same. They will drop downwards just over an ant that is hastening along in the usual way. The ant may stop and give an alms to the beggar, passing on a moment or two later as if it had just met a friend, and the mosquito flies up and down again till another obliging ant is met. At times the selected ant simply ignores the mendicant, but shows no resentment, nor does the mos-

quito press his or her attentions. (By the way, I haven't verified whether the habit is confined to either sex or not. I must look into that.) I had Dr. and Mrs. Connal here on a visit not long ago, and was able to demonstrate them at the top of their form. I also had the pleasure of showing them at work to Mr. H. N. Thompson (the Chief Conservator of Forests), a useful array of witnesses for any doubters to tackle. I was also able to demonstrate the other Diptera."}]

Wednesday, March 6th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Election of Fellows.

Col. WILFRID WM. OGILVY BEVERIDGE, R.A.M.C., C.B., D.S.O. (on active service), c/o J. H. Durrant, Esq., Natural History Museum, S. Kensington, S.W., and Messrs. PATRICK AUBREY HUGH SMITH, Scomer House, St. German's, Cornwall, and 28, Bruton Street, Berkeley Square, W., and LIONEL JULIAN WALFORD, The Cavalry Club, Piccadilly, W., were elected Fellows of the Society.

Exhibitions.

MYRMECOPHILE DIPTERA COLLECTED AND THE CULICID TOXORHYNCHITES BRED BY MR. C. O. FARQUHARSON IN S. NIGERIA. Prof. POULTON exhibited the specimens referred to in Mr. Farquharson's notes communicated to the last meeting of the Society (p. xxix), and received at a later date. The accompanying letter, written Jan. 26, 1918, contained the following paragraph: "I've sent two little sets of the 'ant-flies' and some Harpagomyias, besides the huge *Toxorhynchites* with a larva of the species. The larva is red dorsally and white ventrally like a tiny fish. They are predaceous as larvae on things like Stegomyias and even Psychodid larvae. As imagos they don't bite, but are said to be anthophilous.

I've had no luck in getting *Harpagomyia* bred, except that the *Toxorhynchites* oviposited in my calabashes."

The specimens exhibited included 2 ♂ and 2 ♀ *Toxorhynchites brevipalpis*, Theo., with their pupa-cases, 3 ♂ and 3 ♀ *Harpagomyia trichorostris*, Theo., one of the males being specially associated with a ♀ ant—*Cremastogaster buchneri*, Forel, near the r. *alligatorix*, Forel. The two *Culicidae* had kindly been compared with the types by Dr. G. A. K. Marshall, the ant with specimens named by Forel by Mr. A. H. Hamm. The "ant-flies," also exhibited, had been kindly examined by Capt. J. E. Collin, who found that the "mendicants" were represented by two distinct species of *Milichia*, while the "proctodeal feeder" was a new species of the genus *Rhynchopsilopa*, Hendel (*Ephydriidae*). The type species was from Formosa. It was of much interest that the males and females of *Harpagomyia* appear equally to solicit the ants for food. Jacobson mentioned the males and females occurring together in Java, but did not record this fact.

THE NIDIFICATION OF *OSMIA AURULENTA*, PANZ.: A CORRECTION.—Prof. POULTON said that he had recently received a letter from Dr. G. Arnold, in Bulawayo, correcting the statement, on p. xxxiii of the Proc. Ent. Soc. for 1916, that he had bred *Osmia aurulenta* from whelk shells, on the Wallasey sand-hills. The shells were a species of *Helix*, probably *nemoralis*.

CAPT. W. A. LAMBORN'S JOURNEYS WITH THE EAST AFRICAN VETERINARY CORPS IN 1916.—Prof. POULTON said that he felt sure that Capt. Lamborn's letters, written from the localities at which he took the butterflies mentioned in Dr. H. Eltringham's paper in our Transactions for last year (p. 322), would be of interest, not only in relation to the insects but also because of the brief descriptions of a part of late German East Africa :—

" c/o Veterinary Department,
" Nairobi, British East Africa.
" 12. 4. 16.

" I left Nyasaland in late Jannary and only reached Mom-basa in the last week of March, having had to wait a considerable time both at Beira and at Chinde for steamers. It

has been a most grievous waste of time, for at neither place was any economic work possible, the country round being swampy and uncultivated, and being in daily expectation of a steamer's arrival I was unable to go farther afield. However, I took a few butterflies at each place, just the ordinary common varieties. I have had no letters except three for the past five months and so am feeling quite out of touch with every one.

“ There is still further delay here in regard to my commencing work. The Army Council wrote out that I am not to have a Commission and so I joined the forces, the only civilian among thousands. The position was absolutely untenable, and my experiences unenviable, and I am now in Nairobi while the Colonel of the Vet. Section, to which I am to be attached, is endeavouring to adjust matters. The Govt. Entomologist was given a Commission at the start.

“ The work required appears to be simply to map out fly areas in German East Africa as the country gradually falls into our hands. Research work will probably be entirely out of the question, but I shall do my best to continue along the lines I followed in Nyasaland.

“ The general opinion seems to be that the campaign here will only last a few more months, and it is said that the native troops on which the Germans are so much relying are already disorganised and out of hand.”

“ *New Moshi* [37° 24' E., 3° 24' S.],
“ 7. 5. 16.

“ A wet Sunday morning gives me an opportunity of writing you a line. I have been attached to the East African Veterinary Corps with rank as Captain, and have now made a definite start on my duties by surveying for tsetse a horse camp in the vicinity of this place.

“ I am now about to trek away towards the west along the foot-hills of Kilimanjaro, searching for the flies along the road. It is by no means pleasant just now because there is a constant drizzle of rain, and there is an appalling amount of liquid mud.

“ I have made already a small collection of Lepidoptera on the mountain slopes, but, as you will understand, one cannot

put much heart into such work in these anxious and trying times.

“*Acraea encedon* is fairly plentiful and I got one large *lycia* form, a splendid specimen, which I did not recognise as such on the wing, and there are various species new to me but which are doubtless common enough.

“It is perhaps early days to express an opinion, but I am by no means sure that my services are going to be of any real value to the military authorities. However, I shall of course see the matter through, hoping to justify my transfer here by the discovery of the breeding-grounds of the local tsetse, *Glossina pallidipes* and *longipennis*, pupae of which have been urgently needed for a long time for trypanosome work in the laboratories.

“Carpenter has just written me his usual cheery form of letter from the S.W. corner of Uganda.”

[Ufioni, 35° 50' E., 4° 16' S.].

“3. 6. 16.

“Most of my days are spent in steadily trekking along military paths in search of tsetse, and I have now covered so much ground that I am no great way behind the sphere of operations. I have defined several large fly areas, but beyond that have not been able to do a great amount of entomological work. However, I try to add a few insects daily to a collection, and am not forgetting Lepidoptera, *Acraeinae* in especial, which seemed to me to be probably of most interest.

“The country as a whole where I have been was arid in the extreme, lack of water being a serious trouble at times, but every now and again there has been a good river with insects fairly numerous in the vicinity.

“I have been much struck by the abundance of *dorippus*, the type form being almost absent. *Inaria* also seems to be more numerous than the type, and *encedon* is almost invariably a brown form [*daira*] without any sub-apical bar at all. I have twice met *dardanus* ♀s. The first settled with outspread wings on a flower, and I said to myself at once, ‘What a huge *psyttalea*,’ and until I had it in the net I did not realise it was a *Papilio*. It had a white pattern on a black background just like the *Amauris*, but unfortunately the specimen

will not be forthcoming. I put it alive under my helmet while considering the feasibility of trying to breed from it, and in the meantime it escaped. The second female—I forget the name of the form, but do not think it is quite *trophonius*—has light sulphur subapical markings and light brick-red on the hind [or inner] margin of fore-wing and centre of hind-wing, with black margin [the new form *lamborni* described in Trans. Ent. Soc., 1917, p. 335].

“ I trust that when this letter reaches you the news will have got through to you that the campaign is over.

“ Some of the ♀ tsetses here have a puncture or cicatrix in the centre of the abdomen, the causation of which I am hoping to be able to investigate. It will be almost out of the question when the war here is over, the country being very thinly populated indeed, and so inhospitable in the regions where I have been.

“ I am longing to be able to have a good butterfly talk with you and to see the recent additions—all by other people this time—in your department. I have only some ten months to do to the end of my tour.”

“ *The Front, German East Africa,*
[Ufioni was the last halt before reaching the Front],
 “ 15. 6. 16.

“ I reached some days ago the scene of actual warfare, and am now held up indefinitely behind the trenches until such time as a move takes place. Apart from the excitement produced by the German shelling—they put fifty-three shells about two miles behind my tent yesterday morning—life is very dull, for the district is so arid that insect life seems almost non-existent, and I have to try and console myself by perusing Sharp’s ‘ *Insects* ’ and the last volume of Gibbon.

“ Here no one seems to know at all what developments are likely to take place, though further back the people seem much better informed.

“ At my last halt I found a well-watered fertile valley in which were a fair number of Lepidoptera, some of which I was able to collect. A species of *Amauris* [*A. albimaculata*, Butl.] was quite common—I must have taken at least thirty—and with it a *Euralia* [*dubius mimia*, Trim.]—a most perfect mimic

—of which I took three. I shall despatch all this material directly I get back to B.E.A. [Of the above *Amauris* model and *Hypolimnas (Euralia)* mimic, Capt. Lamborn took, in the wooded river gorge at Ufiomi, on June 4th, 15 models and 1 mimic; on June 5th, 6 and 0; on June 6th, 3 and 2, respectively.]

“ I hear little news of the outer world, and have no mails, but hope all is going well elsewhere.”

[*Handeni*, about 38° E. and 6° S., on 23. 7. 16],
“ 24. 7. 16.

“ I continue to trek mile after mile defining tsetse areas, but without, I am afraid, any benefit resulting thereby, and the only consolation I have is that I am carrying out such instructions as the military authorities have given, and can do no more.

“ I have collected now a considerable number of insects, including long series of *Acraeinae*. One or two look really interesting, but apart from them the butterflies are just the ordinary things.

“ You probably hear more than I do as to the progress of this campaign. We seem, thanks to the energy of the South Africans, now to be making good headway, but I am no longer so hopeful as to a speedy conclusion to it.

“ I have not been able to get any letters at all bearing this year's postmark, which is a great anxiety, as there must be many for me at Nairobi. My life is too nomadic for them ever to find me, and so, at my desire, they are not sent on. I long for a return to my own researches, as life seems so utterly empty these days.

“ In about seven months my tour will be up, and if all is well by then, I should be thinking of returning.”

DR. TH. MORTENSEN'S OBSERVATIONS ON THE “ FALSE HEAD ” OF LYCAENIDAE AND OTHER BUTTERFLIES, ETC.—Prof. POULTON drew attention to “ Observations on Protective Adaptations and Habits, mainly in Marine Animals,” published, in English, as one of the papers on Dr. Th. Mortensen's Pacific Expedition, 1914-16 (Vidensk. Medd. fra Dansk naturhist. Foren., Bd. 69, pp. 57-96, Pl. I), and especially the “ Observations on Insects ” (p. 83). The author,

Dr. Mortensen, had made no special study of mimicry and his "observations are made entirely independently, so to say unintentionally, without any preconceived ideas or wishes to find instances of mimicry, protective resemblance or the like." This detached attitude gave a special value to the conclusions on the extraordinary phenomenon of the "double" or "false head" in *Lycaenidae*, reached by the author during his residence in the island of Taboga, Panama, Nov. 1915–Feb. 1916. Here he observed on the hind-wings the antenna-like tails, the associated eye-spots, the alternate movements, the outward bent lobe of certain species giving "the most wonderful likeness to a real broad head," and, with all this, the inconspicuous real head and motionless real antennae. The Lycaenids observed—at least a dozen species—were never seen to rest head downwards but always horizontally on leaves or flowers. The species figured were *Thecla acis*, Drury, *T. phaleros*, L., *T. battus*, Cram., *T. marsyas*, L., together with four unnamed species. The Nymphaline *Gynaecia dirce*, L., also figured, was stated always to rest head downwards, usually on tree-trunks, and seeing it in its natural position "one cannot resist the impression that it is the head turned upwards, and that the meaning of it must be, that lizards are thereby induced to direct their attack at this non-vital part." Attention was also directed in this species as well as in certain Lycaenids such as *Thecla phaleros* and *T. battus* to the convergence of the lines of the under surface pattern towards the "false head" and the greater brightness of the colouring near it. Hence "the eye is involuntarily directed towards this spot. This is a curious analogy to the honey guides in flowers."

Although the author accepted the interpretation that enemies are thus "induced to attack this non-vital part, while the butterfly escapes with the loss only of a part of its wings, unessential for the flight," he never found a specimen "with the false head partially or completely bitten off"—perhaps a consequence, as he suggests, of the limited vertebrate fauna of so small an island; for precisely these injuries were known to be very common, and dozens of examples from all kinds of localities existed in the Hope Department.

After his return to Denmark the author failed to observe the movement of the hind-wings in *Thecla w-album*, Knoch., of which the false head was observed by Dr. R. C. L. Perkins in 1888 ("Colours of Animals," Poulton, 1890, p. 208). Prof. Poulton had observed that the movements, which Dr. Chapman had aptly compared to those of the eccentricities of an engine, only occurred under certain conditions—viz. the short rests, generally on flowers, between flights in hot sun. Dr. Perkins had kindly recalled the circumstances under which his observations were made thirty years ago:—

"Feb. 16, 1918.

"It would have been on hot sunny days that I saw the *T. w-album* moving the wings one over the other in the way described, as I used to go to the place to catch a particular Fossor on the same plant, which was a tall yellow-flowered Umbellifer—the species I forget. It has a strong scent and I have seen as many as half a dozen of the *w-album* on a single head. The month would be July (after summer term at Oxford). The place was a small quarry cut out in the middle of a thick wood and a very hot place, being an opening surrounded by trees, wych-elms, near Badminton, the seat of the Duke of Beaufort, and on his estate. I went past there a year or two ago after a lapse of about twenty-five years and found the wood cut down and I could not detect the quarry. I am sure I *often* saw the butterflies behave as reported, and occasionally I saw one attacked by wasps (*Vespa*), which frequented the same flower-heads. I have seen other British Lycaenids make the same movements, and also Lycaenids of most diverse kinds, in Mexico, Australia, etc. It must be a very general habit.

"The *T. w-album* used to sit very quietly for a long time together on one head of the flower, if not frightened. I used to find them elsewhere in Gloucestershire and Wilts in abundance on the common small-flowered pink thistle and on blackberry, but I cannot now remember whether I saw them move their wings in those places. My memory is most clear as to what I saw in that particular quarry near Badminton."

Dr. Chapman wrote Feb. 20 and 27:—

“The ‘eccentric’ appearance is due to the margin of the opposite wing appearing and disappearing, much as one disc of a pair of eccentrics does behind the other. It is most remarkable as being the only case I can call to mind of the wings of opposite sides moving asymmetrically. Wings of opposite sides in other cases move in an identical manner.”

“I certainly associate the movements with rest in a warm sun, but I don’t think a flower is essential. After a short flight the butterfly settles for some seconds, hardly minutes, apparently really for a rest, not for basking, makes these movements whilst resting, and then goes off. The rest is a brief interval between flights, not a rest for the night or when the sun is obscured.”

Although as a rule the eccentric movements were performed with the wings nearly or quite closed, Prof. Poulton felt sure he had seen them with the wings partially expanded so that the upper surface was distinctly visible, and he remembered Dr. Chapman suggesting, at a meeting of the Entomological Society many years ago, that these movements, when made by the males of some of our common species, perhaps promoted the resemblance to a blue flower slightly twisting and untwisting on its stalk in the breeze.

The question arose as to whether the movements now observed in tailless *Lycaenids* had persisted from some ancestral time when tails were present—a view adopted in “Colours of Animals,” pp. 208, 209. Prof. Poulton still thought that this was the most probable interpretation in view of the prevalence of tails throughout the *Lycaeninae* of nearly all groups, and the fact that the associated variations in the nervous and muscular systems were in every way likely to persist longer than variations in colour and pattern, and in such structural features as the tails and lobes. If this view be correct the eccentric movements of the non-tailed *Lycaeninae* had some secondary meaning, probably directing attention to the conspicuous marginal pattern of the hind-wing under surface which is often strongly emphasised and often exhibits one or more eye-spots in the region of the tail even when the tail itself is wanting; when the wings are open perhaps having the meaning tentatively suggested by Dr. Chapman.

And in the tailed forms secondary meanings appear to have developed in genera such as *Argiolanus*, *Oxylides*, etc., in which these appendages are too large and conspicuous to resemble antennae. Mr. S. A. Neave had informed Prof. Poulton that the African Lycaenid in which he had been most struck by the eccentric movements was *Oxylides faunus*, Drury, f. *albata*, Auriv.—one of the species in which the appearance of a “false head” seems to have been to a large extent lost in the promotion of excessive conspicuousness in the same region of the hind-wing. It was interesting to note that the underside pattern was such as to direct attention to the exaggerated tails and eye-spots of *Oxylides* and many of its allies, no less than to the far more perfect “false head” of other species.

It would be of extreme interest to observe whether the eccentric movements were ever made by the *Lipteninae*, or indeed by any Lycaenid outside the *Lycaeninae* (in the broad sense, as employed by Aurivillius) and *Theclinae* (also in the broad sense and including all kinds of “hair streaks”). Prof. Poulton was inclined to believe that such movements are not made outside these two groups and that other Lycaenids were originally tailless. Mr. G. T. Bethune-Baker had kindly drawn his attention to the fact that, although the *Lipteninae* were always without tails, the end of vein 3 was distinctly notched in *Epitola miranda*, Staud. Mr. Bethune-Baker differed from Prof. Aurivillius in separating from the *Lycaeninae* the great, mainly Holarctic group of untailed species as a separate subfamily, the *Plebeinae*, allied to the tailed *Lampidinae* (*boeticus* group) also separated from the *Lycaeninae*. The prevalence of eccentric movements of the hind-wings in the *Plebeinae* was probably associated with the former presence of tails, as maintained above.

A mode of protection analogous to the “false head” of the *Lycaenidae* had been observed by Prof. Poulton in an example of a S. American Struthious bird, a species of *Rhea*, in the Zoological Gardens at Perth, W. Australia (July 1914). When the bird was running away it seemed to be directing its gaze backwards at an enemy. The effect was produced by the appearance of an eye-ball-like convexity devoid of feathers over the ear. He had wished but had been unable to examine

the appearance at close quarters and determine how far the effect was due to form and how far to colouring. On returning from the visit of the British Association he wrote to his friend Mr. R. I. Pocock, F.R.S., who had kindly observed the Rheas in the Zoological Gardens and had seen the same effect in some of them. It seemed likely, however, from Mr. Pocock's account that the example at Perth was an exceptionally favourable one: there was even suggested the appearance of a dark iris on a paler eye-ball. It was quite probable that the effect deteriorated under the conditions of captivity.

[Shortly after the above paragraph was written, the following observation was received from Mr. C. F. Swynnerton, writing March 29, 1918, from Chirinda, S.E. Rhodesia. To give an enemy the impression that its eye was upon him would probably be advantageous to both *Rhea* and owl.—

“Talking of owls, I saw a very interesting thing once. I had a live *Glaucidium perlatum*, an owl the size of a thrush. One day, just after I got it, I offered it food in the forceps through the wire of the cage. It did not take it, and looking close, I found I was offering it to the back of the owl's head! The owl was asleep with its bill buried in its mantle-feathers, but on the back of the head had appeared instead the semblance of a bill and two great eyes, particularly the latter, which were formed by two oval patches of black feathers on the nape. I have little doubt that it is a case of mimicry, though the resemblance is to such an owl as *Syrnium woodfordi* rather than to the *Glaucidium* itself. The latter is pale round the eyes, the other dark. I sent an account of it to the S.A. Biological Society's Journal a long time back, but don't think they have yet published. My idea is that, while it might make the *Glaucidium* more liable to be mobbed, it will be useful in relation to birds of prey; for an owl that I tested on my carnivorous mammals proved unpleasant to them—not, of course, that this is conclusive.”]

Many other observations on insects were contained in Dr. Mortensen's paper. Thus it was extremely interesting to read of the Membracid genus *Sphongophorus*: “I saw them often alighting on leaves; they always fell on the side and then looked in the most wonderful way like a small piece of rotten

leaf, of which only the irregularly anastomosing ribs were left" (p. 85).

Mr. G. T. BETHUNE-BAKER said that on the edge of Dartmoor last year he took one or two *Strymon w-album*, Knoch, settled on the ground in the shade with wings closed over the thorax, and the hind-wings were quite still; again in the same month he took one *Zephyrus quercus*, L., on the ground with its wings well opened but with its hind-wings motionless: this also was in the shade. In both these cases the insects were on the road, and it was well after 6 p.m. He supposed that in each instance some shock had occurred in the trees above and that the insects had fallen to the ground. On the other hand, years ago at Tintagel he well remembered watching a ♂ *Polyommatus icarus*, Rott., sunning itself on the cliffs with partially opened wings and being struck with the seemingly rotatory motion of the hind-wings, and in the same sojourn he observed a ♀ ovipositing and the same motion occurring during oviposition. This latter point he recorded in the E.M.M. for 1901, p. 227.

A MIMETIC ASSOCIATION OF ITHOMINE BUTTERFLIES AND A RARE DIOPTID MOTH.—Mr. W. J. KAYE exhibited, on behalf of Mr. J. J. JOICEY, an apparently very rare Dioptid moth, *Dioptis pellucida*, Warr., (Nov. Zool., viii, 438,) very imperfectly described from a poor specimen from Rio Dagua, W. Colombia. Mr. Joicey's specimen, only the second known to us, is described as follows by Mr. Prout: This specimen of *Dioptis pellucida*, Warr., is a ♀ from El Tigre, Rio Jamana, Choco, and shows on the hind-wing a broad brown distal border (partly worn off in Warren's type but apparently there duller and less broad), which brings it into beautiful mimetic association with several Ithomiines occurring in the same district.

Mr. KAYE contributed the following notes on the mimetic association: The group of small Ithomiine species consisting of *Leucothyris amalda amaldina*, *Pseudoscada lavinia troetschi* and *Hypoleria vanilia vaniliana*,* nov., occurring with the

* *Hypoleria vanilia vaniliana*, sub-sp. nov.

Fore-wing-like *vanilia vanilia* except that the interspaces between the veins are clearer and less suffused with dark smoky colour. The black discoidal spot, apical band and margin sharper black and the five

Diopiid moth *Diopis pellucida*, all having a narrow hind-wing margin of reddish brown, is a West Colombian development of the better-known Bogota group with a much broader area of hind-wing colouring extending nearly up to the costa and covering the greater part of the wing. The Bogota species in association are *Leucothyris amalda amalda*, *Pseudoscada lavinia lavinia*, *Hypoleria vanilia vanilia* and *Pteronymia laura*, the last genus not being represented as far as is known in the former group. Whether any of the species could be called dominant in numbers it is difficult to say. None are common, but some other species of the genus *Pseudoscada* are abundant, and one might suspect in either case that the forms of this genus were commonest.

Two other species of the Bogota or Eastern group form a sub-group by themselves with a very heavy discal black band. These two are *Hypoleria aelia* (Hew., "Ex. Butt.," i, *nee* Hensch. in "Seitz," p. 142) and *Ithomia centromaculata* (Wey., Berl. Ent. Zeit., xlv. p. 300, fig. 2). Both of these two, of which there has been such confusion as to their identity, are rare species, and the exact locality of either (it will doubtless be the same for both) is not known for certain. Hewitson's locality for *Hypoleria aelia* is River Amazon, and he says in the collection of Bates, but this is probably erroneous, and if Bates had it, it is most likely that it came from a Colombian locality. Of the Ithomiines surrounding the Diopiid moth the *Leucothyris* (*L. amalda amaldina*) is the closest in pattern, as it is the only species that has a black mark across the cell.

WASPS' AND ANTS' NESTS FROM JAVA.—Mr. FRISBY exhibited an ants' nest, sent to him by Mrs. M. E. Walsh, F.E.S., from Soekaboemi, Java.

She wrote: "This nest was found on the ground with all the inhabitants dead. As everything was still fresh, an accident must have happened—but what?"

The nest, which is attached to the underside of a leaf, is of soft papery material, about $3\frac{3}{4}$ inches long, with the opening

white marginal spots clearer and whiter. Hind-wing with a brown patch between outer margin and cell, but not reaching the cell.

Hab. W. COLOMBIA, Rio Tamana, Rio San Juan, Choco, 400 ft., Feb. 1909 (*G. M. Palmer*) [W. J. K.].

or entrance at the end nearest the leaf petiole. The ants, which were sent in spirit, appear to be a species of *Polyrhachis*.

Mr. FRISBY also exhibited three cells of *Zethus cyanopterus*, a wasp of the family *Eumenidae*, also sent by Mrs. M. E. Walsh, F.E.S., from Soekaboemi, Java, and read the following note :—

Mr. H. O. Forbes, in "A Naturalist's Wanderings in the Eastern Archipelago," figures a nest of this species, with apparently a number of openings, which he says was composed of a number of chips of leaves glued together, the whole nest being protected from rain by a projecting roof of the same material, this roof itself being shaped like a leaf. In the specimens I have here the cells are simple. The question arises as to whether these cells would have been added to at a later period, or whether this wasp sometimes makes a communal nest and at other times only solitary cells.

LONGEVITY OF A COLEOPTEROUS LARVA.—The PRESIDENT exhibited a coleopterous larva, together with the box in and on which it had been living for some years. He said that it was the larva of a longicorn beetle, but was unable to state the species, and observed that similar instances of longevity were on record. He read the following letter which he had received with the exhibit :—

"DEAR SIR,

"I venture to send you a wooden pencil-box, which has been badly ravaged by the larva of some boring insect, as it may perhaps be of some unusual interest. The box has been in my possession for many years—probably over twenty-five, possibly still longer. The insect first made itself known—at least six or eight years ago, possibly more—by a loud ticking sound; so loud that it has often woke me at night, if I omitted to place the box in a cupboard or drawer. The sound was a clicking sound, like that of a cricket in the wall. I am unable to say in what country it first made itself manifest. The box has travelled with me widely—in India (including the Himalayas); in the Persian Gulf, Mesopotamia and the Turco-Persian frontier; around the shores of the Red Sea; in Egypt, Palestine and Syria; in Arabia (down

the Hedjaz Railway); in Asia Minor; in Greece, Turkey, Russia and many other European countries. Until about three months ago there was no visible sign of the insect's ravages; a hole then appeared in the body of the box; soon a large amount of white powder was produced; and very soon the box showed signs of rapid disintegration. I was then in Southern Russia. About two or two and a half months ago, while on the journey home, I found the larva loose in the box. It is enclosed in the box, separately wrapped in paper. Pray keep the box if it is of any interest, and in no case trouble to return it. I should be glad to hear the result of your observations on the larva, if it is not causing you too much trouble.

“ Yours faithfully,

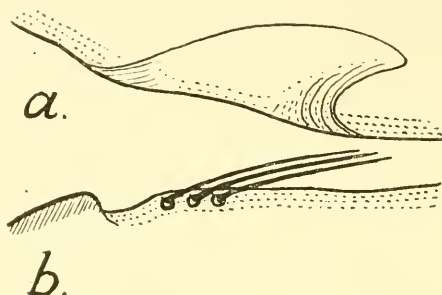
“ F. G. CLEMON.

“ January 8, 1918.”

JUGO-FRENATE GENERA OF MICROPTERYGIDAE.—Dr. TURNER read the following note on Mr. Tillyard's discovery in the wing structure of certain Australian Micropterygidae:—

While carrying out his researches upon the Phylogeny of the Panorpid Orders, Mr. R. J. TILLYARD, M.A., B.Sc., F.L.S., F.E.S., Macleay Fellow in Zoology of the Linnean Society of New South Wales, has made a careful study of the Jugate Lepidoptera. The result of the study of five genera of the family *Micropterygidae* (sens. lat., including the *Eriocraniidae*) is that he finds them all to be, not of the *jugate* type of the *Hepialidae*, but of a more primitive *jugo-frenate* type, in which the wing-coupling apparatus closely resembles that of the Planipennia, Megaloptera and Mecoptera. On the hind-wing, near the base of the costa, there is a strongly developed frenulum of from two to six bristles (usually three or four), which becomes engaged, during flight, in the sinus formed between the dorsum of the fore-wing and the so-called jugum; this latter is bent *under the fore-wing* with its apex pointing outwards and forwards, and acts as a retinaculum for the frenulum, and not in any way as a jugum or “yoke” for the costa of the hind-wing, as it does in *Hepialidae*. The accompanying figure will explain these points clearly. Mr. Tillyard will shortly publish a full account of his researches,

and only sends this short note because of the present-day difficulties and delays in sending communications from Australia to other parts of the world.



Explanation of text-fig.:—(a) Base of dorsum of fore-wing of *Micropteryx aruncella*, Scopoli, ♂, to show jugal lobe (jugum) turned under the wing. Viewed from beneath ($\times 120$). (b) Base of costa of hind-wing of same, to show frenulum of three strong bristles. Viewed from above ($\times 120$).

Appeals.

By resolution of the Council an appeal was read from the Essex Field Club in behalf of a Pension Fund for their Curator and Secretary, Mr. William Cole, A.L.S., F.E.S.

An appeal for subscriptions towards the upkeep of Wicken Fen, forwarded by Mr. Rowland-Brown, was also read to the Meeting.

Wednesday, March 20th, 1918.

Dr. T. A. CHAPMAN, M.D., F.Z.S., in the Chair, in the absence of the President and Vice-Presidents, and on the motion of the Rev. G. WHEELER, seconded by Mr. COLLIN.

Election of Fellows.

2nd Lieut. WILLIAM PROCTOR SMITH, F.Z.S., Haddon House, Ashton-on-Mersey, and MESSRS. JOHN HENRY WATSON, 70 Ashford Road, Withington, Manchester, and RONALD

SENIOR WHITE, Suduganga Estate, Matale, of the Board of Agriculture, Ceylon, were elected Fellows of the Society.

Election of an Honorary Fellow.

DR. PAUL MARCHAL, President of the Entomological Society of France, 89 Rue du Cherche-Midi, Paris, was elected an Honorary Fellow of the Society.

There were no exhibits.

Paper.

“ Observations on the Lepidopterous Family *Cossidae*, and on the Classification of the Lepidoptera,” by A. JEFFRIES TURNER, M.D., F.E.S.

DR. TURNER gave an abstract of his paper illustrated by drawings of neurulation, shown in the epidiascope. DR. CHAPMAN, the Rev. G. WHEELER and Mr. BACOT commented upon it.

Wednesday, April 3rd, 1918.

DR. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Election of a Fellow.

DR. ALLAN CHILCOTT PARSONS, M.R.C.S., L.R.C.P., D.Ph., Sanitary Officer West African Medical Staff, and Temp. Capt. R.A.M.C., School of Army Sanitation, Aldershot, was elected a Fellow of the Society.

Exhibitions.

BLACK FORM OF PUPA OF PARARGE MEGAERA.—On behalf of Mr. PRIDEAUX the Secretary exhibited two black and two green living pupæ of *P. megaera*, and read the following note :—

Of four larvae that have so far pupated from a few specimens of this species that have been reared from the egg during the winter, two are of the sooty-black colour, the other two

being normal green ones. These examples, all from S. Devon parents, were kept in warm rooms, and though sluggish in cold weather, the larvae never entirely ceased feeding; they all seem undersized, and have evidently fed up to maturity prematurely. The colour of the pupae of between twenty and thirty examples, reared several years ago from Isle of Wight parents, was in every case the typical light green.

LICE AND TRENCH FEVER.—Mr. BACOT gave the following account of experiments as to the distribution of trench fever by lice :—

That this disease is spread by lice has been generally suspected since the second year of the war, and several isolated experiments have been recorded in which the infection has apparently been conveyed by lice that had recently fed on patients suffering from the disease. The number of instances, however, was too small and the conditions not definite enough to constitute a proof. Now, however, the work of the War Office Trench Fever Committee in this country, as well as that of the Joint American-British Committee working in France, has definitely proved that the disease is actually conveyed by the body louse (*Pediculus humanus*).

In England two volunteers allowed lice that had been fed on patients suffering from trench fever to feed upon them three times a day over a period of one month. The bites received were about 500 per day. Neither of them contracted the disease, but five volunteers, one of whom allowed infected lice to be crushed on a scarified skin area, and four who allowed the excreta of infected lice to be rubbed over a scarified patch of skin, suffered from the fever. In France the disease has been conveyed to a number of American volunteers by lice, but the method adopted differed somewhat from that employed here, and it is not possible to say with certainty whether the infection resulted from the bites or contact of excrement with abraded skin.

ANDROCONIA IN ORDERS OTHER THAN LEPIDOPTERA.—The Rev. F. D. MORICE inquired whether androconial scales were known in insects other than Lepidoptera. He thought that he had discovered them among the Sawflies in the Australian genus *Perga* in one species of which there was on the underside

of all the wings, and in several others on that of the forewings only, a sort of fovea densely packed with hairs showing considerable structural detail. So far as he knew this character did not exist in any but male specimens. Dr. Dixey, Prof. Poulton and Lord Rothschild, to whom he had shown them, agreed with him that the hairs were probably of an androconial nature.

THE "TAPPING" OF *ANOBIUM STRIATUM* AND *A. PERTINAX*.—The PRESIDENT said that he had found the authority for Kirby's statement that Latreille had witnessed the "tapping" of *A. striatum* with its mandibles, but he suspected there was some error in identification of the species. Also that in the "Wiss. Zeit. für Insektenbiologie" for 1910 the Danish naturalist Jensen Haarup spoke of *A. pertinax* as tapping most vigorously before a storm and being regarded in Jutland as a weather prophet. As this was described as taking place specially in autumn and winter, the President considered it probable that the tapping was really made by the book-louse.

COMM. WALKER felt sure that he had heard *A. striatum* tapping where no *X. tessellatum* were present.

Wednesday, May 1st, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Time of Meeting.

The President asked for an expression of opinion as to altering the time of meeting to 5 p.m., in view of the inconvenience caused by railway restrictions, as a guide to future action. MESSRS. E. E. GREEN, BACOT, WILLOUGHBY ELLIS and TURNER spoke, and on a show of hands it appeared that the majority would be in favour of such a change.

Exhibits.

A SERIES OF *AGRIAS NARCISSUS*, STAUD.—Mr. W. J. KAYE, on behalf of Mr. J. J. JOICEY, exhibited a series of 8 ♂♂ and

1 ♀ *Agrias narcissus* from French Guiana. He said that from the time Staudinger described the species in 1892 till now, the insect had remained very rare and little known, which in the case of such a conspicuous species was remarkable. Outside French Guiana specimens had been taken in Surinam and at Obydos on the Amazon, but it now appeared as if French Guiana, from whence the species was originally described, was the real home of this gorgeous insect.

ANDROCONIAL SCALES IN SAWFLIES.—The Rev. F. D. MORICE exhibited three photographs showing scales apparently of an androconial nature in Australian sawflies of the genus *Perga*.

Prof. POULTON, Dr. DIXEY, Mr. BETHUNE-BAKER, the PRESIDENT and Dr. LONGSTAFF discussed the function of androconia generally, the latter speaking especially of their probable association with scent, especially in the *Lycaenidae*.

OBSERVATIONS ON THE SEASONAL FORMS OF BUTTERFLIES, ETC., IN EX-GERMAN EAST AFRICA.—Prof. POULTON said that he had received the following interesting letter from the Rev. K. St. Aubyn Rogers, written at Kongwa, 20 miles N.N.W. of Gulwa Station on the Central Railway, due W. of Zanzibar, and about 200 miles from Dar es Salaam. High hills lie to the south between Kongwa and the railway.

“ Jan. 14, 1918.

“ I am quite sure that the seasonal forms of butterflies would repay a good deal more research than they have yet received. It is a very curious thing that the food-plant of *Belenois severina*, Cram., etc., grows freely in the dry season, but it is even more surprising that it does *not* make fresh growth in the *wet* season. Moreover, this bush is also the food-plant of *Teracolus eris*, Klug, as I have seen this species ovipositing on it at both seasons. Now *T. eris* is abundant here, and its seasonal forms are quite distinct and follow the seasons as every properly constituted butterfly should do, so that in its case larvae feeding on old leaves produce a wet form and those on young leaves dry forms!!

“ Our rains here began at the end of November, and we had heavy thunderstorms on the 23rd and 27th. We had

some very light showers a week or two before. In December we had occasional thunderstorms only amounting to about $3\frac{1}{2}$ ins., but this last week we have had lots of rain.

“ The first wet *Precis* did not appear till the end of December—*P. antilope*, Feisth., Dec. 27, and *P. sesamus*, Trim., Dec. 29, are my first records. Previously there was nothing but much-worn dry forms, so the wet forms have a very short season here. You will see that the seasons here are very similar to those in S. Africa—6 months wet and 6 months dry, but both begin later, so that the hottest months of the year are at the end of the dry season and beginning of the wet season. It is very curious that *Precis archesia*, Cram., produces the *limmoria*, Klug, form under these conditions. A good many Lycaenids and Hesperids seem to be confined to the wet season.

“ I was up at Kiboriani for two days last week, but the weather was not at all satisfactory, so I did not get much. *Acraea anacreon bomba*, Gr.-Sm., was plentiful and *A. acrita manca*, Thur., just coming out. I have quite 30 of *A. anacreon*, Trim., of both seasonal forms showing a considerable amount of variation. During the last three days down here I have taken 2 specimens of a form of *A. acrita*, Hew., or *A. chaeribula*, Oberth. (specimen sent *), with a heavy black tip and no subapical spots, so this form is found on the same ground as *A. acrita manca*, of which I have a long series taken at all seasons.

“ On my way down I got a real prize, my first specimen of a *Mimacraea*. It seems to be intermediate between *M. marshalli*, Trim., and *M. dohertyi*, Roths., so far as I can judge. I am now quite sure I missed another on the same spot about 2 months ago.

“ I have a long series of *Belenois picta*, Neave, but only one specimen is like Neave's figure of his dry form. I have a good number taken in the dry season, but all except one have a quite different underside. Moreover, both seasonal forms show a good deal of variation in the amount of black

* Determined by Dr. H. Eltringham as *A. acrita ambigua*, Trim., ♂. Dr. Eltringham considers it very interesting that this form, originally described from N. Rhodesia, should have occurred in the area of *A. acrita manca*.

at the apex of the fore-wing, and in some specimens it is very much reduced, and the subapical spots of the underside of the fore-wing are in some cases quite obsolete.

* “The *Charaxes theocles*, Cram., I took at Mamboya was ♀ form *phaeus*, Butl. [mimicking the ♂ of *Ch. bohemanni*, Feld.]. I enclose a small piece of food-plant of the *Argiolaus* I wrote about. I have little doubt that it is *A. silarus*, H. H. Druce, but it is remarkable that it is so common here, as I believe it is generally a rare species.”

Prof. POULTON said that he had sent the piece of *Loranthus* to Dr. Otto Stapf of the Kew Herbarium, who had kindly written: “The *Loranthus* you sent is probably a new species closely allied to *L. proteicola*, Engl., from the Kinga Mountains. I have not been able to match it exactly with any of our specimens. *L. proteicola* has been collected only once, and we have merely a fragment of it. I can therefore not say what its range of variation is, and whether your specimen may not come after all within that range. Mr. Sprague, who has monographed the African species of *Loranthus*—over 200 species in tropical Africa alone—is at present in India on military duties.”

THE CONFIRMATION OF DR. R. C. L. PERKINS' CONCLUSION THAT THE EARLY PALE SPRING FORM OF PARARGE AEGERIA, L., RACE EGERIDES, STAUD., IS PRODUCED FROM OVER-WINTERING PUPAE.—Prof. POULTON exhibited the specimens of *egerides* collected and bred by Dr. Perkins in 1917 together with the 1918 material, which confirmed the prediction published last year (*Ent. Record*, vol. xxix, p. 202, 1917). The former series had been kindly handed to him by Mr. H. J. Turner, who had exhibited it at the South London Entomological Society. The interesting evidence obtained in the present year was described in the following extracts from Dr. Perkins' letters and in his note:—

“April 5, 1918.

“In a few days now I shall, I hope, be sending you the new lot of ‘Speckled Woods’ bred from over-wintered pupae. I had very few of these pupae, and of these two died, one produced a cripple, and one shows no sign of hatching. The

series consists of 14 examples only, but they are quite enough, and I think you will find when you place them alongside of my last year's 'over-wintered larva' lot, bred last spring, that they will quite confirm my conjecture that the 'early' or 'pale spring form' is produced from wintered pupae, and the 'late' or 'dark spring form' from wintered larvae. I feel quite pleased at reaching a conclusion, as it has taken me three years to do so.

"One of the ♀♀ of this lot is quite a lovely thing, finer, I think, than that very nice one (in the pale spring lot) that I caught at Teignmouth last year. It is the most extreme form I have seen. The other chief point of interest, which remains an enigma and which I cannot solve by experiment, I can guess at the solution of. In several years I have noticed that although the light spring form antedates the dark one, yet before, and *even considerably before*, the first light form is seen at large, one or two dark specimens, closely resembling the dark spring form or the 2nd or summer generation of the butterfly, will be taken. I feel *quite sure* these are from *over-wintered pupae* also, but that these pupae are ones which *should* have hatched, to form part of the summer brood of the *previous year*. A year or two ago I had pupae from spring butterflies (the larvae pupated in July) which had not hatched in early November, but when brought indoors into a more or less heated room they produced butterflies that month. These would never have hatched out of doors till the spring, and I feel sure the few *dark*, very early specimens belong to this class. Probably it largely depends on climatic conditions in different years whether any of these or how many are seen in the spring. I took one in a Paignton lane this year on March 24th, and a torn one (which must have been out a week or more owing to the bad and cold weather we have had) to-day. Also to-day the first specimens of 'the pale spring form' were out in the lanes, but I don't suppose there will be any of the true 'dark spring form' (from wintered larvae) for 3 or 4 weeks yet, although the grass is now in splendid condition, and when this becomes really nutritious after the winter the caterpillars grow pretty quickly with good weather."

“ April 16, 1918.

“ In addition to the 15 *aegeia*, bred from over-wintered pupae, I am sending an example of the first wild spring form seen in 1918, one of several met with in a very short walk. It is a ♂, captured on April 5, the day on which one of the bred males emerged. They are very considerably like each other. I also send a dark wild male resembling a 2nd brood (summer) form. As referred to in the accompanying paper, it probably is a 2nd brood specimen, which, owing to retarded emergence, has over-wintered as a pupa, and should have been a last summer's butterfly.”

FURTHER NOTES ON PARARGE AEGERIA, RACE EGERIDES, BY DR. R. C. L. PERKINS.—With butterflies which emerged at the end of August 1917 (these being part of the summer brood bred that year), pairings took place in the cages and eggs were laid from the first to the third week in September. As the weather became colder the larger caterpillars were placed in the warmest situation procurable (but not exposed to any artificial heat), and fed on the most luxuriant grass. In spite of this, many of them grew very slowly indeed, and consequently, there being no chance of their pupating, these were liberated, as had been already done with the greater number of the smallest larvae obtained from the September eggs. Eighteen pupae in all were obtained at the end of October or early in November. It was a noteworthy fact that of the 18 caterpillars from which these resulted, not one pupated on the growing grass within the cage, but all left this and attached themselves to the dry bark of the uprights or crosspieces that supported the covering. In this respect they contrasted very strongly with the pupae obtained in the early summer, for a large proportion of these were attached to the blades of grass. Also some of these winter pupae were extraordinarily dark, appearing almost black to the naked eye before the emergence of the butterflies. Two pupae died during the winter and one produced a cripple, the butterfly having, on emergence, fallen from the pupa-case, to which it was clinging, on to the damp earth beneath. The other 15, except that one or two were insignificantly damaged by

fluttering in the cage, were perfect specimens, several indeed might be called beautiful.

The reason why these pale spring forms are, all but two, ahead of the wild ones is because they were treated exactly the same as the last year's dark spring forms, or some of these. The pupae were exposed in their cage to the outside air in an eastern aspect during the (comparatively) severe weather of the past winter, but on February 18th four were brought into my study, where there was the usual temperature of a room heated through the day from an open fireplace. These four produced butterflies on the 6th, 8th (2) and 9th of March, all being males. The rest of the pupae were brought indoors about March 7, some already showing slight signs of approaching emergence, and the butterflies appeared from March 23rd to April 8th. Counting the crippled example, above alluded to, six in all were females. Although I have no specimens of my previous captures or bred examples for comparison, it seems clear to me that this bred series belongs to what I have called the "early" or "pale" spring form of *egerides*, and that my supposition, that this form must be the produce of over-wintered pupae, is correct.

There is, however, still one point in connection with the spring butterflies that I have not alluded to. Even earlier than the "pale spring form" in several years I have noticed, as a rare occurrence, the appearance of casual dark specimens, that look quite out of place amongst these more conspicuously spotted ones. A dark example of this sort I caught in a lane near my house on March 24th this year, and a tattered specimen, that must have been out for a week, at the beginning of April. The first wild specimens of the "pale" spring form were seen (several in half an hour) on April 5th, and these quite resembled my bred series. The occurrence of the very early dark butterfly is, I believe, to be explained in this way. In some seasons I have every reason to believe that some of the pupae that would normally result in a second brood fail to do so, and remain over till the following spring and then produce these dark butterflies, which much resemble some males of the 2nd or summer generation. One year, pupae that were obtained by me in July from spring butterflies had

not yielded *imagines* at the end of October, but on being brought indoors produced these early in November. Had they been left out of doors they would certainly not have hatched till the following spring. Consequently in S. Devon, so far as I can judge from three years' experience of breeding specimens and from special observation of living specimens, as well as from more general observations of these during earlier years, the following facts seem to be true:—

(1) There are always or generally two forms of the spring brood of *egerides*, a lighter (earlier) and darker (later) one.

(2) The former is from over-wintered pupae, the latter from over-wintered larvae.

(3) In some seasons a dark form appears even before the lighter (earlier) spring form, and probably results from pupae which normally should have hatched (as a second brood) during the preceding summer, but have failed to do so.

(4) As the spring forms overlap in their time of appearance, no doubt interbreeding between them takes place.

(5) No definite tendency to dimorphism, such as is seen in spring, has been observed in the second generation.

(6) Owing to the facts stated above, perfectly fresh examples of the spring butterflies can be found from March till well into June, the later ones not being a second brood, but the *imagines* from larvae that have hibernated, when still very small. It follows from this that the true second or summer brood is likewise very protracted.

(7) Whether there is a third brood, except as an entirely abnormal occurrence, is doubtful, at least under natural conditions.

(8) The second brood specimens resemble the darker (later) spring form rather than the earlier one.

How far these observations apply to the butterfly in other localities I do not know, but in Somerset and Gloucestershire I do not think the facts will prove greatly, if at all, different.

A FLIGHT OF WINGED TERMITES AT BARRACKPORE.—Prof. POULTON said that he had recently received the following letter from Mr. G. A. James Rothney, referring to Dr. G. B.

Longstaff's note on p. 37 of Shelford's "Naturalist in Borneo" (London, 1916) :

" Page 37. Termites.—' The flight of the Winged Termites is a great event in the animal year.'

" I can fully endorse this. I have had several flights of Termites in my different bungalows at Barrackpore, but one in particular at 33 Park Road is worthy of record. The bungalow was raised on low arches. These were bricked up and ventilations left, and various jungle animals—'Janwar'—used to scrape out the ventilators and use the arches as a sleeping abode.

" One night in the Rains a big flight of Termites took place in the corner of my dining-room—they came out from the brickwork in thousands, shedding their wings all over the place as thick as leaves in a winter storm. I was soon driven from my dinner table, as dishes, plates and glasses were soon filled with them. Very soon—a few seconds it seemed—the following collection of 'Janwar' appeared on the scene, all devouring white ants :—

" 1. Bats—in numbers, several species hawking them about the room.

" 2. Lizards—on the wall and floor, shikaring them.

" 3. The Indian Crow—picking them up right and left.

" 4. The Indian Mynah—picking them up right and left, but more gently.

" 5. A Musk Rat.

" 6. The Indian Cockroach.

" All the above within the dining-room.

" In the verandah within the sphere of light :

" 7. Pariah Dogs—several.

" 8. Jackals—several.

" 9. Jungle Cats—several.

" 10. Mongoose—two.

" On the steps of the verandah :

" 11. Bull-frogs—several.

" And outside in the Compound in the half-dark were certain other 'Janwars' of sorts that appeared to be Civet Cats of some kind, and an uncouth figure looked like a

Hyena. The nuisance became so great that I was driven to my bedroom to seek the protection of the mosquito curtains with the lights turned low, and in Biblical language 'they took up of the remains several baskets full,' that is, the 'Meliter'—sweeper—in the morning swept up a huge quantity of wings. I have experienced several incidents of this character, but this was a real 'Brock's Benefit' in White Ants."

MESSES. NEAVE, GREEN and BACOT commented on the edibility of Termites.

BRITISH CAPTURES OF *POLISTES GALLICA*, L.—Prof. POULTON said that he had received the following note from Mr. G. A. James Rothney, referring to the captures of *Polistes gallica* reported in the Entom. Proc. for 1916, pp. lxvi, lxvii:—

"The following note may be of some interest. Charles Horne, B.S.C., of Mainpuri, the author of a joint paper with Frederick Smith on 'Aculeate Hymenoptera of the N.W. Provinces, India,' is reputed to have captured *Polistes gallica* in the West of England in 1870-71. Frederick Smith told me of the capture in 1871, and evidently believed in its being genuine. He showed me at his house, 27 Richmond Crescent, Islington, a box of captures of English Aculeates made by Horne. I remember it distinctly; it was a rough square box of Indian make, and in one corner were several specimens of *Polistes gallica*—said by Horne to be English. Frederick Smith evidently believed in Horne's statement. At the same time he wished to follow it up further in case Horne might have mixed his English with Continental captures, as he had been staying on the Continent. Horne was quite positive about their being English and West of England—either Devon or Dorset. Frederick Smith arranged with me to go down the following year, 1872, to search for it thoroughly, and promised me he would get further particulars of the exact locality from Horne. It was a general custom with Frederick Smith to follow up his lead in this way, when his own Museum holidays would not permit his visiting the locality at the right time, as in the case of the sexes of *F. exsecta* at Bourne-mouth in 1868, but in Feb. 1872 I left for India, and the plan fell through."

Prof. POULTON said that Dr. R. C. L. Perkins, who possesses the F. Smith British Aculeates, had informed him that the collection contains 4 *Polistes gallica* of both sexes, with the note beneath them in Smith's handwriting: "Mr. Horne thinks that he took it near Swanage (Dorset)?" The existence of these specimens was recorded by Dr. Perkins in E.M.M., 1917, p. 229. Dr. Perkins had written: "I suspect *Polistes gallica* has been not infrequently brought over with shrubs or in other ways, and has once in a way started a colony only to be sooner or later exterminated by our climate. Three species of *Polistes* (one American and two Oriental) have become fully established in the Hawaiian Islands from accidental importations, and many specimens of a S. American species were brought in steamers to England (1866-1869). These also are in F. Smith's collection."

GIGANTISM IN MALE BEES.—Prof. POULTON exhibited the illustrative specimens and read the following paper for Dr. R. C. L. Perkins, who, he much regretted, was unable to be present. Extracts from two letters by Dr. Perkins threw further light on this interesting and difficult problem, and explained how Dr. Perkins came to study it.

" March 13, 1918.

" A few years ago, when writing my unpublished account of *Andrena* and its parasites, I puzzled much over the giant males, and could think of nothing but the suggestions I have written in the accompanying note. It seems very curious that neither Saunders nor Smith nor any others, so far as I know, seem to have paid any special attention to this subject."

" April 16, 1918.

" I begin to think that difference in size of *Andrena* must be somehow due to the amount of food. It is very hard to investigate the matter here. I got out about a dozen cells of *Andrena clarkella*, Kirby, the other day, and all the pollen lumps appeared to the naked eye about the same in size. When my boys came home and saw these they both exclaimed at once, 'What small lumps, much smaller than the ones we got the other day!'—from a neighbouring colony. They did

not bring these home, but I feel sure they were right. Still, I cannot understand the uniform size of the ♀♀. The ♂♂ are *all* sizes, with occasional *gigantic* ones. The ♀♀ all uniform in most *Andrena*, with very rarely one about half the proper bulk.

“ The most favourable (*i. e.* for variation) species to investigate do not make compact colonies like *clarkella*, but burrow singly, scattering over perhaps a whole field—I mean the favourable species in this locality. A very easy one to investigate would be *A. fulva*, Schr., which produces gigantic ♂♂ freely in ‘the Parks’ at Oxford and makes big colonies, but unfortunately it is not here at all. Also our soil is not very easy to dig in—an extraordinarily wet clay at the roots of trees, where the *clarkella* were nesting.

“ I may chance on some better colony soon. I badly want larvae of the bees *Nomada* (parasitic on *Andrena*). No one knows whether both host and parasite lay eggs on the same pollen mass, and the latter larva kills the other, or what happens. The want of *exact* information as to the habits of the cuckoo-bees is simply astonishing.”

Giantism in Male Bees, by Dr. R. C. L. Perkins.

No one who has examined a considerable collection of bees of the genus *Andrena*—or, in fact, of some other genera—can have failed to notice the occasional occurrence of individuals of the male sex of gigantic size. This giantism has been observed by me in nearly all our British species of *Andrena* and probably occurs in all. Great variation in size, whether this be in excess of the average or in decrease, is of course a very familiar phenomenon in many insects, but owing to the nature of the nutriment of the larvae and the manner in which this is provided, it is of particular interest in the case of the solitary bees. So far as we know the amount of food stored in the bee’s cell to serve as food for the larva varies little, though certainly it is desirable that accurate investigations should be made on this point. At the same time the comparatively uniform size of the females, excepting in special cases to be noticed, confirms the impression made on me by the examination of actual stored pollen

masses, that the mass of food stored is not subject to much variation. As just stated, the size of the female of a species is not very variable, except as a rare occurrence, and this rare variation appears always to consist in great diminution of size, so that the individuals affected are comparatively dwarfs. In looking through a large number of such individuals I find that these dwarfs appear, as far as one can judge, to be about half the weight of normal examples, and one is led to suppose that they are produced from two eggs having been laid in a single cell of the bee, a fact which is known to take place in some instances.

The variation in the males is less regular, dwarfs occur as in the females, and specimens both notably above or below the mean size are frequently observed, but amongst these there stand out conspicuously the giant individuals, as a phenomenon quite distinct from anything observed amongst the females. We may note that these huge males frequently approach closely in bulk that of the average-sized female, but it is a matter of great doubt how they are produced. It can hardly be a question of a simple surplus over the usual amount of food, since gigantic females do not occur, unless we suppose that the surplus nourishment goes to form superior size in the case of one sex and some other development in the other. This is not inconceivable, since we know that the drain on the strength of *Andrena* by the parasite *Stylops* is such as to cause almost invariably, if not always,* a degeneration of the ovaries in the females, these organs requiring much nutriment, while in the males, according to my own observations, practically confirmed by those of Geoffrey Smith and A. H. Hamm, little or no degeneration of the comparatively small genital glands is produced. Consequently a surplus of food might in the case of the females be used up in the nutriment or growth of the important ovaries, while this might be used for a general increase in size in the males.

We know, from observations on cells superimposed one on the other and with only one exit, that the eggs which will produce males and those which will produce females are not

* According to the observations of Geoffrey Smith and A. H. Hamm.

laid indiscriminately, but, when both sexes are present, that the upper cells produce males, which emerge first, the lower, females, which emerge later, and it is conceivable that the food supplied to these cells is different in some respects. A male bee in such a case might conceivably be changed in size, if bred on food normally supplied to a female, but there is no evidence that the food in different cells of one species varies in quality, although the proportion of pollen to honey varies greatly in the case of different kinds of bees.

The following facts seem to be almost or quite constant :—

- (1) Giantism is only exhibited by the male sex.
- (2) Truly gigantic males are a very small percentage of the total number of individuals.
- (3) A gigantic male may be taken from the same burrow as normal ones.
- (4) There is no striking development of secondary sexual characters in such males. Thus when there is a special tooth on the mandibles, or the cheek is armed with a special spine in the male, these do not undergo any extraordinary development in gigantic individuals. There is, for instance, no change comparable with that exhibited by the teleodont and other forms of Lucanid beetles or in the horns of Dynastids.
- (5) Though they approach the normal female in bulk, and consequently in some cases somewhat resemble that sex in superficial appearance, there is really no accession of female characters in any respect.
- (6) They fly with and behave like normal individuals and appear perfectly healthy.
- (7) The presence of the parasite *Stylops* does not necessarily prevent giantism, as gigantic males have been found containing this parasite.

THE PAIRING OF STYLOPS AND "ASSEMBLING" OF THE MALES OBSERVED BY DR. R. C. L. PERKINS.—Prof. POULTON said that he had received the following three letters and the accompanying specimens and drawings from Dr. Perkins, who was unfortunately unwell and unable to be present and give an account of his most interesting and important discoveries. All were written at Paignton, S. Devon.



Half-Tone Eng. Co. Ltd.

STYLOPS ATERRIMA male (legs omitted) IN COPULÂ
with female.

** April 22, 1918.

" I think the following may interest you, as I believe I told you I was taking exception to Geoffrey Smith and Hamm's conclusions (in the Quart. Journ. Microscop. Sci., vol. 60, Pt. 3, Sept. 1914, p. 435) as to the impossibility of fertilisation of ♀ *Stylops* and the uselessness of the ♂ ♂! In the continuation of my papers on *Stylops* in E. M. Mag. (1918, pp. 67 and 73) I have given strong arguments of a theoretical character against these conclusions, but this morning at 8.30 a.m. I bred a ♂ *Stylops aterrima*, Newport, and soon afterwards obtained an evident pairing between it and a ♀. It is curious that I should have succeeded at the first attempt. I was astonished at the extraordinarily rapid manner in which coupling was effected. Twice the ♂ *Stylops* was brushed off by the bee (*Audrena trimmerana*, Kirb.) before it properly mounted it, but the third time it got fairly on and in a second or two was coupled with the minute projecting part of the ♀. I had to carry it to another room and find a cyanide bottle to kill it, so that it remained coupled in life for probably 1-2 minutes, and in addition it took say 30 sec. to 1 min. to kill the bee. In spite of this, it still remains attached to the ♀ in the manner shown in the sketch, reproduced in Plate A.

" *ob. pl.* is the (generally reddish) oblong abdominal apical ventral plate of the ♂, from which the aedeagus may be seen entering the 'brood opening' *b. op.* of the ♀ cephalothorax (*i. e.* really an opening between head and thorax).

" *m.* is the rudiment of the mandible of the ♀ puparium (for of course what one sees is not really the actual ♀ but the puparium in which it lies).

" *ap. m.* is the apical margin of the bee's 4th segment, from beneath which the ♀ cephalothorax projects.

" The cephalothorax of the ♀ *Stylops* is seen from the side, so that only one of the mandibular rudiments is visible.

" The drawing was made in lateral aspect by camera lucida many hours after death, so that contraction of the long slender ♂ body had taken place.

" If the ♂ *Stylops* does not become detached in the great

contraction that takes place in drying it might be worth while exhibiting *in situ* on the bee.

“ The ♂ *Stylops* is in lateral view, the legs are omitted, only the left antenna and maxilla (or palp), the clavate (rudimentary) front wing or elytron and the hind-wing being shown.”

April 24.—“ This morning, though changed in position from great contraction of itself and also partly from that of the *Andrena*, the ♂ *Stylops* was still attached to the ♀. To-night, on taking it out of the box, it became detached, no doubt from the slight jerk caused by withdrawing the bee's pin from the cork. I have therefore mounted it on card in such a way as to give a good enough view of the pick-like aedeagus in some aspects. I have no other specimen of this *Stylops* so satisfactory for examination, though I shall not have time to make preparations of parts till after you exhibit it, if this is now worth while.

“ The bee from which it emerged contains the ♀ with which it copulated, so they may be brother and sister.

“ When the fog cleared at midday to-day and the sun shone brightly, I went up to the *Stylops* locality. I did not get any ♂ *S. aterrima*, indeed it is now late for that here, but immediately I got to the place, where (it being entirely sheltered from the E. wind) it was very hot indeed, I saw 2 ♂ *Stylops* hovering close to a very dense and stiff flowering head of gorse. I netted these, hitting the bush in doing so, and found a number of *Stylops* in the net! While I was boxing the first (they were extraordinarily wild and active in the net and difficult to box), I distinctly saw one or two get out through the meshes of the *mosquito* net which I use for bees, and I know not how many escaped. Anyhow I secured 4 fine specimens. I cannot doubt these ♂ ♂ were ‘assembling,’ for in two long hours along that hedge of gorse I saw no other specimen, and in the thousands of bees that were out I saw only 3 styloped individuals.

“ One of these 4 ♂ ♂ paired with a ♀ on my return home, but it parted or the bee got rid of it before I could kill them. This species was *Stylops willkellae*, Perkins, a species excessively close to *S. melittae*, Kirby, that Hamm investigated.

" I expect the ♀ has to be very fresh to attract the ♂ ♂, for if not fertilised the eggs start developing parthenogenetically, and then probably she will not call the ♂ ♂."

" April 27.

" I have to-day had another go at *Stylops* in the field, and this will probably complete my observations for this year, as most of our *Stylops* are now over for the season.

" On the 25th I took my eldest boy to Churston, between here and Dartmouth, as *Andrena nigroaenea*, Kirby (host of *Stylops melittae*—Geoffrey Smith's and Hamm's species, common in the Parks at Oxford) is commonly styloped there. Unfortunately we only found a few, from which the ♂ *Stylops* had emerged, and some with ♀ ♀, and we saw no *Stylops* on the wing. However, my fever was still high and the sun was very hot, and consequently I had to sit down in the shade for a considerable part of the few hours I was out.

" On the 26th I did no *Stylops* work. To-day I started about 9.30 (*i. e.* 8.30 a.m. old time) to the *Stylops* field near my house. The gorse hedge was still partly in shade and the grass very wet with the heavy dew, but at the very same bush where I found the other 'assembly' I saw one or two *Stylops* hovering and struck at these. I boxed 6 ♂ ♂ from this stroke, and some escaped through the meshes! One of these I caught in my hat as it flew off (this being included in the 6). This was about 10 a.m. (9 a.m. *vere*). I saw no more for more than an hour, when at the other extremity of the long field several were seen hovering above and behind the gorse (which forms the front of the hedge) about a lot of briars and brambles. On a dead stiff stem of briar I saw a space of several inches *absolutely white* with a moving mass of ♂ *Stylops* just close to where the others were hovering. I struck at these, but got hopelessly caught up in the thorns, and I could see many of the *Stylops* escaping from the net. When I got free, I boxed 7 ♂ out of the net, and still some others escaped through the meshes. I distinctly saw a styloped ♀ *Andrena wilkella*, Kirby, fly heavily off when I struck at the *Stylops* on this occasion. There could not

possibly have been less than 50 ♂ *Stylops* in the original assembly, but when I looked up after boxing the 7 (which took some minutes, as they are so wild in the net) I could see no trace of any remaining. At about 11.45, having seen no more, I went away from the hedge into the field to see if any ♂ *Stylops* might be seen about the burrows of *A. wilkella*, and if the bees themselves were in any numbers. So far I had only seen two of the *Andrenas* on the hedge—both styloped. The burrows did not appear numerous, being scattered over most of the field, one here and one there, and not forming a compact colony, such as I have often seen in the sandy lanes near Shotover. I captured every *wilkella* I saw, 26 in all, of which 25 were styloped and 1 ♂ bee only healthy!

“ It must not be supposed that practically all the *A. wilkella* in the field are styloped—there is a strong tendency for styloped examples to emerge a week or even two weeks before the average date of appearance of the healthy ones. Therefore one may go to this field a fortnight hence and very likely get plenty of healthy and very few styloped ones. Also styloped bees are much easier to catch than healthy ones. For this reason the percentages of styloped to healthy bees given by various authors on particular occasions is of very little real value.

“ Except in one case all the 25 styloped bees contained either ♀ *Stylops* or empty puparia of the ♂. One contains a full ♂ puparium, but the protruded part of this is daubed over with a patch of the red soil, which has prevented the emergence of the insect. I took several of these styloped bees and placed them in slightly opened boxes in the gorse bushes, but nothing was attracted, as I had hoped might happen. While collecting these bees, I saw a single ♂ *Stylops* pass high overhead (I could not reach it with my net, which was on a 3 ft. stick) in the middle of the field, flying straight across, but I lost sight of it after a while.

“ At 1.15 p.m. (12.15 *vere*) I captured a ♀ *wilkella* containing 2 ♀ *Stylops* more than usually extruded. I held this in my hand by the head and thorax with the abdomen fully exposed to the sun. Within five or six minutes I caught

5 ♂ *Stylops* flying about 3 ft. above the grass towards me, and one other escaped, being carried off by a sudden and rather strong puff of wind. Whether these were actually attracted by the ♀ *Stylops* I had had in my hand I do not know, but I strongly suspect that they were.

“ It is extremely probable, I think, that the ♀ *Stylops* at a certain (perhaps very brief) period of its life is highly attractive to the ♂. It is quite possible that this attractive stage may be sometimes lost before ever the bee leaves the burrow, and in that case the eggs develop parthenogenetically.

“ It is noteworthy that on this lovely summer-like day, from 9.45–1.15 being spent in the *Stylops* locality, only one ♂ *Stylops* was seen singly, all the others were actually in ‘assemblies’ or flying in one direction and one after the other, as if to form one.”

Dr. DIXEY commented on the physiological significance of “giantism” and its possible cause.

Paper.

The following paper was read :—

“ The *Charina* group of *Pinacopteryx*,” by F. A. DIXEY, M.A., M.D., F.R.S., F.E.S.

Dr. DIXEY illustrated his paper by the exhibition of specimens. He pointed out that this assemblage of species or subspecies differed from the remainder of the genus by the character of its scent-scales, and also, as had been noticed by Dr. Eltringham, by the possession of a single posterior spine to the clasper instead of two spines as in the *pigea* section of *Pinacopteryx*. The uncus also exhibited distinctive features. The various forms included in the group might be most conveniently ranged under the following heads :—

1. *P. charina*, Boisd., inhabiting Cape Colony, Natal and the Transvaal.
2. *P. simana*, Hopff., originally described from Mozambique, and occurring throughout Rhodesia, Portuguese and “ German ” East Africa, British East Africa (with the exception of the district surrounding Mombasa), and Uganda.

3. *P. liliana*, Gr. Smith, the form peculiar to Mombasa and the immediate neighbourhood.

4. *P. gerda*, Gr. Smith and Kirby, a form closely allied to the preceding, but separable, and inhabiting an adjacent region of British East Africa.

5. *P. venata*, Butl., originally described from the White Nile, and found also in Abyssinia, Southern Kordofan and the Southern Sudan.

The type of *P. doxo*, Godt., belongs to this group, but being a female of unknown locality and in bad condition, it cannot be determined with certainty. The forms above mentioned are probably best regarded as geographical subspecies; at present they appear to be distinct, but further information may show that they intergrade in certain localities.

Wednesday, June 5th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Election of a Fellow.

Mr. AUBYN R. D'ALBREU, 3rd Divisional Signal Company, Mesopotamia Expeditionary Force, was elected a Fellow of the Society.

Proposed Alteration of Bye-law.

The Secretary announced that it was proposed at the request of the Treasurer to amend Chapter VIII, clause 5, as follows :—

The Council shall nominate a Chartered or Incorporated Accountant annually who shall audit the Treasurer's accounts. The Auditor shall be paid a fee, the amount of which shall be agreed by the Council on behalf of the Society. The Treasurer shall furnish the Accountant with all the facilities he may require for auditing the Accounts.

Exhibitions.

PUPATION OF *TIMARCHA TENEBRICOSA*.—Mr. HUGH MAIN exhibited subterraria with larva and pupa of *Timarcha tenebricosa*, and called attention to the colour of the pupa, which was similar to that of the red fluid emitted by the imago, and of the ova and newly moulted larvae.

A DIPTERON NEW TO THE BRITISH LIST.—Mr. J. E. COLLIN exhibited specimens of *Eumerus tuberculatus*, Rdi., a Syrphid new to the British List of Diptera; also specimens of *Eumerus strigatus*, a species under which it may easily have been placed in collections. Both species had been reared by Mr. J. C. F. Fryer from larvae found in *Narcissus* bulbs grown at Taplow (Bucks.).

He pointed out that though *E. strigatus* had been recorded from the Continent as attacking onions and potatoes, in addition to *Narcissi*, no such attacks had been noted in the British Isles, indeed at Taplow onions grown between the rows of the infested *Narcissi* remained uninjured. In 1917, however, *Eumerus* larvae were found in a previously unrecorded food-plant, viz. parsnips, grown in the Evesham district of Worcestershire, and the specimens of *E. strigatus* exhibited were some of those reared from these larvae.

The headquarters of the genus *Eumerus* is the Mediterranean region, and *E. tuberculatus* is an Italian species which has remained unrecognised ever since it was originally described in 1857.

THE MODERN USE OF THE WORD "CAMOUFLAGE."—Prof. POULTON said that he wished to enter a mild protest against the modern use of "camouflage" for Protective and Aggressive Resemblance (Procrypse, Procryptic, and Anticrypse, Anticryptic). "Camouflage" did not appear as an English word in Murray's Dictionary, but "Camoufflet" was in use in 1836, with the following meaning:

"A mine containing a small charge of powder, placed in a wall of earth between the galleries of besieged and besieger, so as, in exploding, to bury, suffocate, or cut off the retreat of the miner on the opposite side; a 'stifler.'

"1836 in *Penny Cycl.* VI, 197/I, *Camoufflet* or *Stifler*."

“ Camouflage ” might therefore be properly used for the defensive discharge of the Bombardier Beetle and many other *Carabidae*, and for the use of suffocating or irritating secretions generally, but was a most inappropriate term by which to express a concealing coloration.

BUD-AND-FLOWER-LIKE FLATIDAE (HOMOPTERA) FROM EX-GERMAN EAST AFRICA.—Prof. POULTON exhibited beautiful examples of the green bud-like *Ityraea speciosa*, Melich., and the many-coloured flower-like *I. nigrocincta*, Walk., collected by Mr. A. Loveridge at Mrogoro, on the Central Railway, about 100 miles W. of Dar es Salaam; also specimens of the orange-red, flower-like *I. gregoryi*, Dist., taken at Kibwezi, British East Africa, by Mr. W. Feather. All these specimens, which had been kindly sent by Mr. E. C. Chubb of the Durban Museum, were bright and fresh and gave an unusually striking impression of the bud-and-flower-like appearance.

The flower-like *nigrocincta* were, in the resting position, scarlet anteriorly, passing into a narrow zone of orange followed by a broad one of very pale blue, and this by a still broader terminal area of very pale ochreous. The forewings of the green *speciosa* were encircled, except near the hinge, by a narrow red line enclosed within a narrow marginal black one, with a much stronger development of both red and black on or near the costal border, accompanied by bright yellow markings and a vivid bluish green modification of the ground-colour. In spite of the obvious differences between the patterns there were resemblances between the black markings which suggested, as Mr. Loveridge believed, that they were the dimorphic forms of a single species; and the same element in the pattern rendered it probable that the more northern *gregoryi* was the flower-like form of another dimorphic geographical race of the same species, separated from the southern race by colour differences only.

Among other interesting observations on the *Ityraea* made in 1917-18 in the ravine of the river at Mrogoro, Mr. Loveridge noticed that the green forms were much rarer—at first about 1 to 11, later 1 to 10—and much easier to catch than the blossom-like forms. The latter were often found *in cop.*: once the two different forms were thus taken, and on the

same occasion a green pair and a blossom-like pair were also captured *in cop.* Mr. Loveridge also took individuals exhibiting a gradation between the two forms. With this evidence, and especially that furnished by the pairing of the different forms, there could be no reasonable doubt that Mr. Loveridge was right in concluding that the Mrogoro forms were the same species.

A full account of the observations had been communicated by Mr. Loveridge to the Zoological Society of London. It should be added that neither Mr. Loveridge nor Mr. Feather had seen the insects arranged in the manner represented by Prof. Gregory in "The Great Rift Valley," an arrangement which, however, had been confirmed by other naturalists.

S. NIGERIAN LYCAENINAE BRED FROM LARVAE FEEDING ON A SINGLE SPECIES OF LORANTHUS. *CATOCHRYSOPS PHASMA*, NOT *PARSIMON*, PROVED TO BE MYRMECOPHILOUS.—Prof. POULTON exhibited the following eight species bred in 1917–18 by Mr. C. O. Farquharson at Moor Plantation, near Ibadan, S. Nigeria. Except when otherwise stated both sexes were present. Mr. G. T. Bethune-Baker had kindly helped in the determinations, some of which were difficult.

(1) *Epamera iasis*, Hew.; (2) *Epamera* sp.; (3) *Epamera laon*, Hew., ♂ only; (4) *Argiolaus alcibiades*, Kirb.; (5) *A. julus*, Hew., ♂♂ only; (6) *A. moesa*, Hew.; (7) *A. paneperata*, H. H. Druce; (8) *Taruethaira timon*, F.

Mr. Farquharson had thus greatly extended the investigations briefly alluded to in Proc. Ent. Soc., 1917, p. lxi. The species of *Catochrysops* of which the pupae were found by Mr. Farquharson in the subterranean nest of *Camponotus maculatus*, F., was not *parsimon*, F., as stated on the page referred to above. Mr. Bethune-Baker had examined the male genitalia and found it to be *C. phasma*, Butl.

NEW MIMETIC FEMALE FORMS OF *CHARAXES ETHALION*, BOISD. AND *ETHEOCLES*, CR., AND BRED MALE-LIKE FEMALES OF THE LATTER. Prof. POULTON exhibited examples of the following forms:—

Charaxes ethalion, Boisd., new ♀ forma mimetica *swynnertoni*.—This is the ♀ form *d* described and figured but not named by Lord Rothschild and Dr. Karl Jordan in Nov. Zool., vol. vii,

1900, p. 479, pl. xii, fig. 6. It is defined by the "band and spots" of the upper surface being "pale blue except the upper postdiscal spots," which are generally white as in ♀ form *a*, but sometimes buff as in *b*, or blue though paler than the rest of the markings. The admarginal spots of the H.W. upper surface are dull red above, olive green below (viz. towards the anal angle). Now that this form is so much better understood, its mimetic relations clear and genetic relations partly so, it is convenient that it should be named, and I propose to dedicate it to the naturalist to whom we owe nearly the whole of our knowledge on the subject.

Type in Hope Department: one of the females (with white upper post-discal F.W. spots) which emerged Dec. 13-14, 1917, of the family recorded on p. lxxxii. Chirinda, S.E. Rhodesia.

Within the limited area of Chirinda forest in S.E. Rhodesia the males of this species of *Charaxes* are accompanied by females of the form *rosae*, Butl., mimicking the females of *Ch. cithaeron*, Feld., one of the dominant larger species in the forest, by *swynnertonii* females, mimicking the males of *cithaeron*, and by the usual female found wherever *ethalion* occurs, i. e. the ♀ f. *ethalion* which probably mimics another large species, *Ch. brutus*, Cr. Inasmuch as *rosae* has been, in other localities, accepted as a female form of *etheocles* the question arose as to whether the Chirinda forest harboured this species or *ethalion*, or a mixture of the two. Dr. Jordan therefore kindly examined the armature of 4 males and found all to be *ethalion*, rendering it highly probable although not certain that at Chirinda the *rosae* ♀ f. belongs to this species.* Mr. Swynnerton's two families bred from known females do not throw any light on this question, although they prove that *ethalion* and *swynnertonii* belong to the same species and render it nearly certain that the relationship between them

* Since the above paragraph was written, Mr. H. Dollman has exhibited, Dec. 4, 1918, bred specimens of the *manica*, Trim., and *phaeus*, Butl., females, from N. Rhodesia, and has proved that these forms, both hitherto regarded as *etheocles*, belong to distinct species. I believe that the genitalia of the accompanying males will show that *manica* is *ethalion* and that *phaeus* is *etheocles*. If this be confirmed there can be little doubt that *rosae*, which resembles *manica*, is also a form of *ethalion*.—E. B. P., Dec. 28, 1918.

is Mendelian, although which female form is dominant and which recessive remains unsettled.

The first small family, bred in 1913 from the eggs laid by the ♀ f. *ethalion*, produced males, 2 *swynnertoni* females and 1 *ethalion* ♀ of form *b*. The second family from the eggs of a *swynnertoni* female produced 17 males and 14 females of the same form as the parent. The tendency for the males to emerge earlier is well shown in the tabular statement:—

Dates of Emergence in 1917.	Males.	Females (all <i>swynnertoni</i>).
Dec. 10	4	3
„ 11–12	7	1
„ 13–14	4	3
„ 15–18	2	7
Totals	17	14

It is much to be hoped that Mr. Swynnerton may be able to breed from the ♀ f. *rosae* and also succeed in making the Mendelian relationship perfectly clear—for the first time in a *Charaxes*.

Charaxes etheocles, Cr., new ♀ f. *m. rogersi*.—Differs from the ♀ f. *m. kirki*, Butl., in the discal band of the H.W., which instead of being “white, slightly bluish proximally, and with a faint trace of ochraceous at distal edge” (Rothsch. and Jord., *ibid.*, p. 486), is, in the typical form, orange-ochreous throughout, thus transforming a mimic of the ♂ *ansorgei*, Rothsch., into a mimic of *saturnus*, Butl. This latter resemblance is also promoted by the tendency of the F.W. bar in some individuals to broaden and suffuse the dark ground-colour with orange-ochreous.

Type, in Hope Department, from Dabida, about 100 miles W.N.W. of Mombasa, June 22, 1916. A similar form from Maketao, between Taveta and Voi, July 14, 1910. Four examples from Dabida (1916), and one from Taveta (*in cop.*, Apr. 26, 1905, with a ♂ of the f. *chanleri*, Holl., determined

by Dr. Jordan), are transitional between *rogersi* and *kirki*, but the development of orange-ochreous is such that the resemblance to *saturnus* would probably be strong. Of 2 further examples from Dabida (1916) one is very nearly and the other fully the ♀ f. *kirki*.

This interesting change in the mimetic likeness as *kirki* ranges eastward in the southern part of British East Africa was recognised by the Rev. K. St. Aubyn Rogers (Trans. Ent. Soc., 1908, p. 507, footnote), who captured the whole of the above-mentioned examples (see also Proc. Linn. Soc., 1915-16, pp. 32-33).

C. ethocles, new ♀ f. *m. carpenteri*.—Differs from the ♀ f. *m. regalis*, Rothsch., in the following points: (1) the more angulated direction and more distal position of the blue band crossing the H.W., so that it is continuous into the series of post-discal F.W. spots; (2) the disappearance of the two last blue discal F.W. patches which form so conspicuous a feature of *regalis*; the two last small blue patches of *carpenteri* follow the post-discal and not the discal series, of which only the upper spots in areas 2, 3, 5, 6 are represented; (3) the discal and upper post-discal F.W. spots are not buffish but white with an intermixture of blue scales; (4) the greater size and prominence of the white submarginal spots, and far smaller development of dull red in the admarginal spots, of H.W. The red in these spots is restricted to a narrow line with peacock-blue borders; then follow peacock-blue spots, becoming olive green at the anal angle.

The wings within the discal spots of F.W. and blue band of H.W. are faintly iridescent dark blue-black as in *regalis*. The effect of the above differences is to produce a mimetic likeness to the ♂ of *Ch. etesipe*, Godt., of which examples were taken in the same forest on July 8 and 13, 1915.

Type, in Hope Department, taken by Capt. Carpenter in the forest near Kakindu, 31° 30' E., 1° 10' S. (Proc. Ent. Soc., 1915, lxxv, lxxv; 1916, cx), Aug. 3, 1915. Another worn specimen, taken May 19, 1915, differs in the H.W. blue band being represented by a series of separate spots, in the whiteness and greater size of the discal F.W. spots, and in the greater development of red in the admarginal H.W. spots.

In the fresh condition this specimen was probably an even better mimic than the type.

Bred C. ethocles with male-like females from S. Nigeria.— Eight remarkable females have been bred by Capt. W. A. Lamborn and Mr. C. O. Farquharson, who first found the larvae on *Adenanthera pavonina* (Mimosoidæ) at the Agricultural Department, Moor Plantation, near Ibadan, S. Nigeria. The period of pupation is shown in the following table:—

Larva Found.	Date of Pupation.	Date of Emergence.	Sex.
Dec. 2, 1913	Dec. 8	Dec. 16	♂
.. 5, 12	.. 21	♀
.. 10, 15	.. 26	♂
.. 11. 17	.. 26	♀
Unrecorded	.. 21	Jan. 1, 1914	♀
..	.. 21	.. 1, ..	♂
..	Unrecorded	.. 5, ..	♂

In addition to these specimens sent to me by Capt. Lamborn, I have received 3 males and 5 females, bred, except 3 without records, July 31–Aug. 6, 1915, by Mr. C. O. Farquharson.

Considering the rarity of male-like females in *ethocles* it is astonishing that all these should be male-like. Indeed Dr. Jordan, after seeing them, suggested the possibility that they had been affected by the artificial conditions. On the other hand, the 1913 females were only in confinement as larvae for a few days, while the size of nearly all the specimens proves that the conditions were quite healthy. On the whole I think it probable that the dominant females of this S. Nigerian locality are male-like and co-mimics, with the males of *Ch. nuneus*, Hew., of the males of *Ch. tiridates*, Cr. I have not as yet received any captured females from the locality.

No one of these bred females is very like the form *alladinis*, Butl., or *virilis*, Rothsch., although nearer to the latter. But among themselves they differ so widely in detail that I

hesitate to name them, preferring to consider them, at any rate for the present, as forms of *virilis*. In most of them the upper discal F.W. blue spots (whitish in one example) are distinct in areas 2, 3, 5, and 6, being the most prominent markings on the wings except the submarginal white spots of the H.W., the only markings that are not blue in most specimens. The F.W. post-discal spots can generally be made out, although very faint. The blue band of the H.W. is more outwardly placed than in *carpenteri*, although very similar in its angulated direction: within it the H.W. as well as the basal third of the F.W. is a steely blue of great brilliancy in certain lights in some of the specimens. The females differ from *virilis* and many other female forms in the faint linear development or absence of red in the admarginal spots of the H.W., which are peacock blue (in one female pale grey), generally becoming olive green at the anal angle, but sometimes persisting unchanged. The upper surface markings are very elusive and very variable. Although developed to a much fainter degree they greatly resemble those of *carpenteri*, a form which could probably be easily derived from variable male-like females such as these.

Now that Mr. Swynnerton, Capt. Lamborn, Mr. Farquharson and the Rev. K. St. Aubyn Rogers (who in 1916 bred the ♂ and what is probably the ♀ form *a* of *ethalion* from a known ♀ parent of the same form, at Dabida) have shown that it is not difficult to rear these most interesting of all species of *Charaxes*, it is to be hoped that more will be done in breeding from known female forms in the same and other localities. It may perhaps be possible to pair in captivity and thoroughly test the Mendelian relationships.

BUTTERFLIES CAPTURED IN NATAL DURING THE EXTRAORDINARY RAINS OF 1917.—Prof. POULTON exhibited the specimens referred to in the following letter written by Mr. C. N. Barker in continuation of his notes in Proc. Ent. Soc., 1918, p. xxviii. All had been taken in the neighbourhood of Durban.

“ Mar. 11, 1918. Durban.

“ I am sending you herewith a box containing a lot of this season's *Belenois sererina*, Cr., which may perhaps interest

you, as showing some effects on butterflies of the abnormally wet weather experienced out here since the middle of June last. I am enclosing a monthly record of the rainfall. It has varied a great deal in localities only a few miles apart, as you will notice in the printed record for October, which I enclose. The four *Acræa petraea*, Boisd., which I took on the 16th of June, just after a heavy fall of rain, show considerable signs of melanism. The dry-season forms had been in evidence for some time before the rains fell, and although there was the usual seasonal modification towards the dry forms, none of them throughout the winter took on the extreme dry phases. I went out the following and any available week-end, but after taking these four *petraea* found no more in evidence for a month or two after. In fact, they only began to come into evidence again in the full wet-season form at their usual time of appearance. I have been disappointed in not finding any extreme cases of melanism, but I think this may be due to the unusual coolness of the season, due to protracted rains. Moisture must be accompanied with heat to produce fullest results.

“ The tattered *P. lycæus*, Dbl., covered with fungoid growth I found feebly flying through the bush after heavy and protracted rains that fell in January 1917. I had a great chase after it, for the orange growth upon it gave it the appearance of being some strange exotic species. The *Pseudacraea tarquinia*, Trim., has been mutilated by some enemy. I should infer that it had been seized by one of the large *Agama* lizards which are very plentiful about our coast bush. The pair *in coitu* may also interest you.”

The last-mentioned pair was a dry-season ♂ *in cop.* with a wet-season ♀ of *Byblia goetzius*, Herbst., taken Oct. 16, 1916. The *tarquinia* was an excellent example of symmetrical injury to the hind-wings. The orange powder plentifully covering the under surface of the hind-wings of *lycæus* was found to be pollen by Dr. A. B. Rendle, F.R.S. The quantity was very remarkable, and nothing like it had been seen by any of the African naturalists to whom the specimen had been shown. Dr. Eltringham had compared the *petraea* with the Hope series from Natal, but considered that they did not

differ from the average of other years. Dr. Dixey had written the following note on the *Pierinae*:—

Pierinae captured at Durban, Natal, by C. N. Barker.

The dates of the captures are from July 7 to Dec. 2, 1917. Mr. Barker notes that the season was abnormally wet after mid-June.

The species are *Belenois gidica*, Godt., and *Belenois severina*, Cram.

B. gidica.—One specimen, Sept. 2; two specimens, Nov. 18 and Nov. 30 respectively. An early September example would generally be dry; this one is wet, though with a trace of the dry-season character about it. The November specimens are wet, as would be expected in ordinary seasons.

B. severina.—Four caught in July, two in August, one in September, five in November, one in December.

The July and August examples are of the full dry-season form, as they would be in ordinary seasons. The November and December examples have the wet-season ground-colour and the dry-season veining; this is a usual condition at this time of year in ordinary seasons. A similar condition was produced in 1905 by Dr. G. A. K. Marshall at Salisbury, Mashonaland, by exposing a brood of *B. severina*, which would normally have emerged as the dry-season phase, to artificial conditions of moisture throughout the larval and pupal stages (see Proc. Ent. Soc. Lond., 1907, p. xiii).

On the whole, the abnormal character of the season appears to have had little or no influence on these Pierines.

EX-GERMAN EAST AFRICAN BUTTERFLIES AND THEIR RELATION TO THE SEASONS.—Prof. POULTON said that he had received the following information, supplementing that communicated to the meeting of May 1st last (p. lviii), from the Rev. K. St. Aubyn Rogers at Kongwa:—

“ Feb. 28, 1918.

“ The wet season this year has been much less heavy than last year, and the ‘break’ has been much more pronounced. We had heavy rain in January (about 8½ in.) and the first

week in February, but the last three weeks have been dry and sunny and rather windy.

" I am sending you the little *Alaena* which occurs here. It is not uncommon, but very local, and I have only found it in the forest on the hills behind the house, which is completely deciduous in the dry season. I make a guess that it is *A. reticulata*, Butl. [It is *A. johanna*, E. M. Sharpe.] I am also sending a specimen of the *Belenois*, which cannot, I think, be separated from *B. picta*, Neave. [Dr. Dixey agrees with this opinion.] It is extremely variable here, and some specimens are much more like Neave's figure, and others much less like it.

" I took about eight males of the form of *Acraca acrita* I sent you in my last letter [*acrita ambigua*, Trim.: Proc. Ent. Soc., 1918, p. lix, n.], and this week I have two females.

" Mar. 7, 1918.

" I have not yet seen Dr. Dixey's paper in which he described *Teracolus rogersi*, so I cannot be certain, but I believe I have specimens from these parts. It does not occur on the low ground, but well up on the hills, and is by no means common. [Dr. Dixey has found three ♂ examples of *rogersi* in Capt. Carpenter's collection from St. Michael's; see p. cli.] I am quite convinced that my specimens do not belong to any of the common orange-tipped species of *Teracolus*. Last Saturday I got another orange-tipped *Teracolus*, which puzzles me. On the upperside it looks like an extreme dry ♀ of *T. phlegyas*, Butl., but the underside does not agree at all with the dry forms of this species I took last year. I captured a similar specimen on my way to Mamboya in February last year, but as it was much shattered, and I took it for a ☉ *T. phlegyas*, I did not keep it.

" Though we have had a month's fine weather now all *Teracolus* and *Precis* are still ⊕, and we expect more rain any day. There have been some thunderstorms about lately, but we have not had any here.

" I enclose a small Lycaenid which I think must be *Alocides takosama*, Wallgrn. It is common here locally in the rains, and varies a great deal." A long series of the same form,

taken in the rains by Capt. Carpenter at Itigi, between Mar. 21 and Apr. 6, 1917, showed such marked variation that it seemed doubtful whether *takosama* was not the same species as Cramer's *pierus*. Structural investigations were required.

“ Mar. 21, 1918.

“ The rains have been very deficient this year except during January, and the crops will be very poor; in fact, unless rain comes soon there will be famine in some districts.”

CAPT. G. D. H. CARPENTER'S FURTHER NOTES ON EX-GERMAN
EAST AFRICA, ALMOST EXCLUSIVELY EAST OF LAKE
TANGANYIKA.

Owing to the loss of letters from Capt. Carpenter between July 16 and Oct. 5, 1916, there is some inaccuracy in the account published in Proc. Ent. Soc., 1916, p. cxxviii. On July 16 he was at Namirembe Bay at the S.W. corner of Lake Victoria. In the first half of August he was at 32° 20' E., 3° 20' S., in a temporary camp in flat, dry country with thin, deciduous bush, arriving about the 18th at 32° 45' E., 3° 45' S., in the neighbourhood of St. Michael's Mission, in country of similar type with granite outcrops. This was the “ place of rocks ” (*ibid.*, cxxviii), where he remained until about the middle of October, reaching Muanza, the well-known port on the S. coast of Lake Victoria about Oct. 20. The following extracts, arranged regardless of date in what seemed the most convenient order, give some of the information recorded in the missing letters.

“ Mar. 6, 1917.

“ I gather from your saying that you didn't understand the allusion to ‘ the place of rocks ’ that a long and, if I may say so, an interesting letter * of mine has got lost — very probably it went down in the ‘ Persia,’ which contained a large E. African mail. It described a camp at St. Michael's about half-way between Muanza and Tabora, among piled-up granite boulders which sheltered countless *Hyrax* (the first

* After reading Proc. Ent. Soc., 1916, p. cxxviii, Capt. Carpenter wrote on May 20, 1917: “ At least two letters written between July 16 and Oct. 3, 1916, never reached you.”

time I had met them) and Caracal cats (or rather Lynxes, I suppose) and interesting birds and lizards and things. I cannot now remember what I said, but it was probably written early in September or end of August. I think.

“ Oct. 6, 1917.

“ No, I fear I can't re-write the missing letters about St. Michael's: the enthusiasm of the time is gone!

“ Aug. 9, 1917.

“ What's coming may interest you. It got lost in a previous letter that didn't reach you. *Firstly*, about a Jumping Shrew (Macroscelid?), which I found, dead, on safari, about this time last year. I asked my boy the native name for it, for apparently they know it quite well and differentiate it from Rodents. In Kiswahili it is called Kasanji (or Kasangi): my own boy said it was crepuscular rather than nocturnal. A Muganda called it Musonso, and said it lives in very long burrows underground and ate white ants, but *also said it ate the same as rats and mice* (so there is probably confusion here). Both boys said this—that these (apparently feeble) animals entice mice to come to them by squealing, and then kill them, but do not eat them. My Swahili boy also said that two or three will collaborate in attacking a snake, or lie in ambush for it, and kill it—probably mere folk-lore!!

“ Nov. 30, 1917.

“ It was on July 5, 1916, at Namirembe Bay that I saw the first ‘Jumping Shrew.’ I saw three large ones here [at Lulanguru, 17 miles W. of Tabora] one evening, quite close. They did not actually jump, but their quick gait was much like that of a rabbit when it moves from one spot to another with powerful thrusts of the hind-legs. I was near enough to see how the absurd tubular noses were constantly wrinkled up. They sat on the ground with the tail straight out behind them.”

Dr. Oldfield Thomas, F.R.S., to whom the description has been submitted, considers that the “Jumping Shrew” is no

doubt a member of the *Macroscelididae* and most probably an *Elephantulus*, but the genera are very closely allied.

“ Aug. 9, 1917.

“ Now about *ants*. I was talking about *Megaponera* to a C.M.S. missionary from Toro, and he said in that part of Uganda they are well known for their Termitivorous (!) habits. But he added this curious tale. There is another, ‘small, red,’ ant which the natives call ‘Nabi,’ and they say it comes into a house and eats all the Termites, but *doesn't go away until it has ‘sown its mushrooms.’* I asked the missionary what he meant by that, and he said that the departure of this ant is followed by a crop of tiny fungi in the Termite runs. I can only explain it by some fungus which the Termites keep under restraint, flourishing rampantly in their absence. For the natives did not say that the ‘Nabi’ comes back to eat its mushrooms!!”

Having thus, as far as possible, filled up the gap in the series of letters published in Proc. Ent. Soc., 1916, the correspondence is continued in order of date—with here and there a passage inserted, for the sake of convenience, out of its chronological position. The last letter published in 1916 (p. cxxviii) is dated Oct. 5 of that year; the present series begins only a month later.

These letters, like the earlier ones, include many observations and descriptions that are not Entomological, but throw light on the interesting and little-known country in which the Entomological work was done and the unique conditions which now prevail.

Many of Capt. Carpenter's observations on mimicry are on the lines of Dr. Marshall's work published in our Transactions for 1902, but the species are nearly always different, and in such a difficult and controversial subject the independent testimony of another observer, who from the force of circumstance was unable to study the work of his predecessors, is of great value. Furthermore Capt. Carpenter has done far more than confirm; he has added new conclusions of much interest.

In the variety of inquiries involved in the study of Capt.

Carpenter's letters and material I have received kind help from the following friends:—Mr. H. E. Andrewes, Mr. G. J. Arrow, Mr. G. T. Bethune-Baker, Mr. K. G. Blair, Dr. G. A. Boulenger, F.R.S., Mr. G. E. Bryant, Dr. F. A. Dixey, F.R.S., Mr. J. H. Durrant, Dr. H. Eltringham, Dr. C. J. Gahan, Sir George Hampson, Dr. G. A. K. Marshall, the Rev. F. D. Morice, Mr. S. A. Neave, Lord Rothschild, F.R.S., Dr. Oldfield Thomas, F.R.S., and Mr. Rowland E. Turner.

“ Nov. 3, 1916. *Ndala* (33° 15' E., 4° 45' S.).

“ By this time you should have received a box of interesting specimens collected in the country between our start-off point at the N.W. tip of ex-G.E.A. and the S.W. corner of the lake.

“ I forget when I last wrote, but since then my connection with the Belgian troops has come to an end, as when they had got to Tabora all the Uganda porters who had been loaned, to get them there, were recalled, and we all reached Muanza at the end of October. Muanza is as different from Entebbe as it can be. It is a place of granite rock which crops up everywhere, forming islets in the sound at the mouth of which Muanza lies, and hills of small size ashore. These are all grown with bushes, now bright green, and it all looks very pretty, but absolutely different from Entebbe with its forest growth, papyrus swamps, banana plantations, and flat-topped hills. Rice and millet are the crops at Muanza. I was only there two days, as I was ordered off at once to my present post along the Lines of Communication between Muanza and Tabora (200 miles out, which I did in a car in two days: it would otherwise have been a fortnight's safari). It is only 40 miles from Tabora, which I hope to see some day. There is *very* little to do here, and I have a much bigger staff to help me to do it than I ever had when we were on the march. It's rotten country, very very flat (extremely hot and dry, though all the trees are brilliant with young green, possibly because water is very near the surface), and with thin bush, and a great part of it has been cultivated at one time or another, so that it's pretty hopeless for butterflies. When I have read my last batch of papers and finished my Xmas letters I shall have very little to do

except think about the treasures I *have* caught, and wonder when I shall have a chance of working them up. At one time I thought I *might* be coming home this winter, but they are not letting any doctor men home on leave.

" I hope I shan't be kept here long. I am now nowhere near any kind of 'front.' All the future fighting will be in the S.E. part of the country, south of the railway, which is now entirely in the hands of the allies and being used by us.

" Dec. 14, 1916. *Ndala.*

" Yes, I had thought that the smaller yellow, orange-tipped Pierine [*Teracolus incertus*, Butl.] might be associated with *Eronia leda*, Boisd.

" I went about 150 miles along the 'Central Railway' to a case of Blackwater Fever, about a week ago and have only just got back. I was glad to see the railway (which is, naturally, of great use to us now). It seems to have been built 'regardless,' and everything is most solid and expensive. Every little station (about 10 miles apart) has a stone and concrete building. But what the stations are *for* no one can tell: they are just islands in the midst of most hopeless thick bush—mile after mile of it—and it's the most extraordinary contrast between a journey on this line and one on the Uganda Railway. There *are* giraffe and a few big antelope and lions, but I saw none of them. The bush can't even produce butterflies! I am sending to Wiggins a small box of sundry insects and asking him to forward it to you. I hope the few butterflies may be of interest: perhaps the skipper that frequents ant-bear holes may be so, also a Liptenine [*Teriomima pallida*, Trim.] which looked like a ♂ Lymantrid (*e. g.* 'Vapourer') on the wing." The species of *Sarangesa* mentioned in Proc. Ent. Soc., 1916, pp. cxxix, cxxx, were included in this box. Two *S. pertusa*, Mab., and 4 *S. synestalmenus*, Karsch, were labelled "In ant-bear hole; noon, July 23, 1916," at Namirembe Bay, S.W. Victoria Nyanza, and 1 *synestalmenus* "In ant-bear hole, noon, 32° 20' E., 3° 20' S." Capt. Carpenter was in a temporary camp at this locality and the date was Aug. 8-14, 1916. A little earlier on Aug. 1, at 32° E., 3° S., he found a male of

the remarkable Liptenine *Epitola miranda*, Staud., floating dead and headless on a forest pool—a noteworthy extension of the range of this species.

“ Jan. 3, 1917. Ndala.

“ You will see that I have hitherto had no chance of replying to the late Colonel Manders’ remarks on my Pseudacraeas in Proc. Ent. Soc., 1915, p. xxiii, so I am writing something here.

“ Firstly—the *bird question*. I certainly do not agree that ‘the bird population on the mainland and on Bugalla is practically the same.’ One striking exception at once leaps to my mind:—the extraordinarily greater abundance of Flycatchers, of two types, on Bugalla. The most noticeable of the two is the one I called ‘Kunguvu’ in my Report on *Glossina*. I think it must be a *Terpsiphone* [considered by the authorities of the Natural History Museum to be *T. cristata*, Gmel.]. It is red-brown with blue-black head, and the cock has very long floating white tail plumes. This is immensely more abundant on the islands than at Entebbe on the mainland, and its ringing call was the first bird note in the forests at daybreak, so that I soon got very familiar with it. When, in 1914, I visited other islands, I noted that the call varied in pitch very slightly from that of the Bugalla birds, and thus one is almost forced to conclude that some islands have their own *race* of this bird, and that they do not cross from mainland to islands. They are retiring birds, are not seen in the open, and have the typical Flycatcher habits.

“ The other of the two is a black and white species [*Platystira jacksoni*, Sharpe, according to the Natural History Museum and Mr. S. A. Neave] with red fleshy protuberance over the eye. Its call, totally different from the other’s, I also have deeply rooted in my memory, and learnt to whistle it and make the bird answer. I think this bird also was more abundant on the islands than at Entebbe. In 1914 I noticed that the call of the birds on the group of islands I was then working on was different in pitch—though really the same call—from that of the Bugalla birds.

“ Again—one striking feature—I never saw a Drongo on the islands. I should think they must live on the mainland round Entebbe, but have not seen one, though I have not done any work on the mainland. [Mr. Neave does not remember whether he saw Drogos at Entebbe, but thinks the locality unlikely for the common species.]

“ As regards the passage to and fro of birds from mainland to islands, Col. Manders appears to think that such a passage must be an objection to my explanation. But why should it be? A bird passing across 25 miles or so of water carries with it the memories of its last hunting-ground, surely? I know that Bee-eaters fly over wide stretches of water, as I have seen them when canoeing.

“ Now Col. Manders thinks my table in the Sleeping Sickness Reports shows that birds do not eat butterflies. Surely this is hardly justifiable. Firstly, I was not searching for evidence as to what birds eat, but only as to whether they ate *Glossina*; i. e. I was looking for one specific object—the tsetse fly’s wings: so any piece of a butterfly that was not grossly obvious would have been likely to be passed over; for I used only a low-power dissecting microscope and not one high enough to distinguish Lepidopterous scales, which, as Swynnerton has shown so admirably, is absolutely necessary. One could deduce equally well from my table that birds do not eat Diptera!

“ Col. Manders makes some large assumptions. On the evidence of 116 birds he says ‘we may assume that none [*i. e.* no tasting experiments] took place.’

“ He talks about ‘aposematic crimson and blue bodies of Dragonflies.’ On what evidence does he call them ‘aposematic’? Surely a *sine qua non* of an aposematic insect is a method of display by slow gait, feeble flight, sluggishness, etc. Are any of these characteristics of Dragonflies? There is, one would think, much more ground for ascribing these colours to sexual selection (if this hypothesis holds good at all), seeing that the males are often so much more gaudy than the females.

“ Lastly, a propos of his quotation from Fabre, was not that great observer’s objection to the mimetic explanation of

the colours of *Volucella inanis*, L., due to the supposition—in those days, before its habits were fully known—that its appearance protected it from the wrath of the wasps in whose nests it was supposed to be *parasitic*? I understand that now it is known to be *beneficial* in the nest rather than otherwise, the larva feeding on débris. But surely the modern view is not that *Volucella* needs to be protected against the wasp, but against birds that fear the wasp. [See Trans. Ent. Soc. Lond., 1904, pp. 661–665.]

“ I had the rottenest, dullest Xmas I’ve ever had. There was nothing to read of any kind. I have said before what a rotten place this is for butterflies, and no Xmas fare, indeed even rations very poor. We have now no jam, sugar, lamp-oil (but candles *for the present*), or soap issuable! No vegetables for weeks! However, one can get eggs and mangoes abundantly, and milk, and I have some porridge and syrup which helps out. It’s funny what one *can* live on day after day the same. Breakfast is the best meal—porridge with syrup and milk, bacon and eggs, bread and jam (just finishing now). Bread, soup, meat and mangoes form other meals. Luckily I have had some butter, which helps, but it is nearly finished now!

“ We are very isolated—three days from Tabora (where one cannot get anything) and three weeks from Muanza. An occasional motor-car, which usually breaks down en route to Muanza, brings up the belated mails. A parcel of ‘goodies’ which my mother sent for mid-October in *August* is still trying to get to me! Well, that’s *another* long grouse!

“ Jan. 14, 1917. *Ndala*.

“ I am taking the opportunity of a friend going back to Muanza and Entebbe (from here—Ndala, where I still am— $33^{\circ} 15' E.$ and $4^{\circ} 45' S.$) to give him a box of ‘dudus’ for Wiggins to post for me at Entebbe. You may label them Ndala (for it appears on the map, being a Mission Station), with latitude and longitude as above. A few I got recently on a very enjoyable safari (except for *G. morsitans*!) in the neighbourhood. It was quite a joy ride, and I had no respon-

sibilities. It was nice to be able to go as one pleased with just one's own kit. We had (I went with the Political Officer) very fine sunny weather, but now the rains have just begun, and go on until about June or end of May. They say that now it means we can't finish off the boches (who are around Mahenge) until August, as the country is impossible in the rains down there.

“ Well, now, I will look through my journal for notes on any of the insects I send—they are not all butterflies; some are Asilids with prey.

“ To begin with—a Millipede, a giant black species about 6 inches long, I should think, brown-legged, really very handsome. On Dec. 26, before breakfast, I saw one walking along, and I picked it up. Millipedes when picked up coil up in a ring and ‘lie low,’ but this didn't. He was of an original temperament, for he wriggled violently, and when I dropped him, lay on his back and *writhed in such a serpentine manner*—actually making progress thus—that it was quite terrifying! Subsequently, as he walked along, I irritated him with my stick, and he *turned over on his back* and writhed again in serpentine manner. I doubt if any native who was not familiar with these common creatures would have gone near it. I was much interested because I have seen and handled a great many of these handsome armour-clads (they were *very* abundant on the islands, though I think this was the biggest I have seen), and since then have tried to make others of the same size and appearance perform in the same manner on *three* occasions, but I have never met with another performer. Perchance, in half-light, it *might* save one from being eaten. *Some* animal does eat them, I fancy perhaps jackal or mongoose, for one finds their rings in old dried-up droppings.”

[Capt. Carpenter wrote in a letter of June 20, 1917: “ Re the Millipede —I fancy it writhed on its *back* because the movements were so lusty that the delicate legs might have interfered with the freedom of the movement or even been damaged by it. I tried several others of the same species afterwards, but never got another individual to writhe in the same serpentine manner.”]

“ On Dec. 28th I got a beautiful Mutilloid spider. I was collecting on a road through the bush and picked up several Mutilloids. But one turned out on closer investigation to be the spider which I send in a tube with the *Mutilla* it resembles, taken at same time and place. It used its fore-legs to mimic the antennae of the *Mutilla*, just as does a spider mimicking an ant. Its manner of movement was altogether Mutilloid, and its colours exactly (during life) matched the dull red and black of the *Mutilla*. I wonder if Mutilloid spiders have been described before? ”

The specimens in the tube are accompanied by a corresponding note which also states that the “ colours exactly matched.” The *Mutilla* appears to be the same as a ♀ taken, Dec. 1903, *in cop.* with a very different ♂, by Dr. Marshall at Bulawayo, and named by the late Col. Bingham *M. chararans*, Sm. Mr. A. W. Picard-Cambridge considers that the spider belongs to *Prothesima* (*Drassidae*) or a closely allied genus, and that the species is near *P. albomaculata*, O. Pick.-Camb., taken by Dr. Marshall as a Mutilloid mimic, at Salisbury, Mashonaland (1898-99). See Trans. Ent. Soc., 1902, p. 511; Proc. Zool. Soc., 1901, p. 11, pl. v, figs. 2-2c.

Capt. Carpenter took the same species of spider later at Lulanguru (see p. cxxxv). At this locality and at Ndala he also observed and captured several examples of black, white-marked *Carabidae* together with their Cicindelid mimics. All the species are different from those observed and figured by Dr. Marshall in Trans. Ent. Soc., 1902, pp. 511-515, and pl. xvii, and some of them appear to be undescribed. Capt. Carpenter did not comment upon the general Mutilloid effect of the black-and-white pattern during rapid movement. Dr. Marshall (*ibid.*, pp. 511, 512) points out that it is this part of the Mutilloid pattern and not the red thorax which attracts attention in life.

Capt. Carpenter's captures of members of this association are as follows. On Dec. 18, 1916, at Ndala, the Mutilloid Carabid *Piezia* sp. was, together with its Cicindelid mimic *Dromica* (*Myrmecoptera*) *erikssoni*, Horn, “ Taken on a road, almost in the same spot.” The mimic bears the note “ This does not fly as readily as many Cicindelids.” Then, at the

same place, on Dec. 20, and again on Dec. 21, another Mutilloid Carabid *Polyhirma* sp. was captured with its mimic *Dromica* (*Myrmecoptera*) *neumanni*, Kollar. The pair of Dec. 21 bear the note "Taken on same stretch of road." About a year later, on Nov. 20, 1917, at Lulanguru, a large species of *Polyhirma*, and in this case with the black-and-white Mutilloid pattern more sharply and clearly expressed in spite of its disproportionate size, was taken with its mimic *Dromica purpurea*, Bates, and two examples of *Dromica* sp., the mimic of a smaller Mutilloid *Polyhirma* taken the day before. The mimetic associations between the beetles are suggested on the accompanying labels, including the probably synapomorphic relationship between the two Carabid models. In all these *Polyhirmas*, except the largest species, the Mutilloid black and white is dully expressed, as also in the mimics, while in the mimic of the largest species it is evanescent.

The splendid Mutilloid mimic, the Carabid, *Eccoptoptera cupricollis*, Chd., which caused Dr. Marshall "to hesitate more than once before venturing to handle it" (*ibid.*, p. 512, pl. xvii, fig. 11), also deceived Capt. Carpenter, for his note on a specimen of Dec. 8, 1915, on the bank of the Kagera River, near Ngarama, about 37 miles W. of the Victoria Nyanza, is: "Mutilloid! Quite took me in," and again "very Mutilloid" on a Ndala specimen of Dec. 16, 1916. The female of *Dolichomantilla guineensis*, F., a very perfect model, except that its thorax is black instead of the reddish colour so common in *Mutillidae*, was taken at Ndala a few weeks before, on Nov. 13.

"About at the beginning of December we had a burst of rain which left large puddles on the dry roads. Almost immediately after one saw *Crabs* running about! It seemed strange to see them away from any large body of water, though there are permanent water-holes. A large puddle which I had noticed to have been frequented by crabs on Dec. 13th—at which time it had been just formed—was, on Jan. 3rd, reduced to a mere cupful of water, in which I found a young crab, very minute. Its metamorphosis cannot take very long for on Dec. 2nd the puddle had not been formed.

It was probably formed about the 10th. This residue of the puddle was a wriggling mass of tadpoles and *small fish!* How did the eggs get there?!"

[Dr. G. A. Boulenger, F.R.S., kindly writes: "I have often heard before of water-holes in Africa being filled after months of drought and then at once alive with fish, which must have been aestivating in the ground, probably at a considerable depth, where there was just enough moisture to keep them alive. The tadpoles are easily accounted for, as frogs breed at once after rain, their eggs hatch in a couple of days, and the success of their brood depends only on how long water, or at least moisture, will remain to allow the young to complete their metamorphosis."]

"On Dec. 30th I got two Asilids with prey, one a winged ♂ black ant, the other a typically aposematic black and scarlet *Hemipteron* (I think a Reduviid). It was *alive* and unfortunately escaped. That it was *not dead* seems to be another instance of the well-known hardihood and retention of life of aposematic insects in general. I feel sure Asilids must *inject* some poison into their prey when they first thrust the proboscis in, for I have watched one catch an insect and immediately caught them both and found the prey (even a vigorous insect, a Cicindelid, for instance) as collapsed as if it had been stung by a Fossor. [Kirby and Spence (5th ed., 1828, vol. i, p. 274) speak of the instantaneous death of the prey: the injection of poison is suggested in Trans. Ent. Soc., 1906, p. 365, footnote.] On this same date I got a small black and yellow predatory wasp [the Fossor (*Sphex*idæ) *Palarus latifrons*, Kohl, allied to *Astata* and *Crabio*] carrying a stung honey-bee [*Apis mellifica*, L., var. *adansonii*, Latr.]—heavier than itself. I send both."

The observations on *Ammophila beninensis*, Pal. de Beauv. (*lugubris*, Gerst., see p. cxxxvi), made on Jan. 3, are published in Proc. Ent. Soc., 1917, p. xlii.

"On Jan. 4th I saw, about 7.30 a.m., large numbers of winged *Termites* belonging to a very minute species [*Eutermes* sp.] emerging from holes in the ground, on a cleared track. As fast as they came out they huddled together, each one's head beneath the folded wings of the one in front, so that all one

saw was a mass of wings, those of each Termite overlapping another's, so that the appearance reminded one of a piece of butterfly's wing seen under a microscope. They made no attempt to fly away. After a while the mass began to elongate in two directions, and two long lines, headed by workers and soldiers, began to move away. But the Termites very soon stopped and bunched together again. What a meal for a Wagtail had there been one there. This species of Termite comes to light in the evening in a very annoying way. I send you some of them.

“ On *Jan. 5th* I found under bark of a dead tree a small Carabid [*Thyreopterus flavosignatus*, Dej.] and several large Erotylids [*Mimodacne grandipennis*, Fairm.], both species of the same colour scheme—black, with two orange transverse bars. By a very curious coincidence, only the night before some insectivorous animal had been in my hut, and left a dropping behind it in which I found an elytron of this Erotylid, and wondered what beetle it was, as I had not hitherto met with it. The Carabid is a small one, and the other so very much larger that it is difficult to believe that mimicry is at the bottom of the resemblance (unless the Erotylid is distasteful and the Carabid a synaposeme).

“ On *Jan. 9th* I caught a very remarkable-looking large black fly with conspicuous red head. I caught it on the wing—it flew very slowly—and settled conspicuously on a leaf. I send it you—I cannot place it at all.”

The fly is *Bromophila caffra*, Macq., figured as one of a Rhodesian group of insects in *Trans. Ent. Soc.*, 1902, pl. xxiii, fig. 27. Dr. Marshall speaks, on p. 531, of its abundance and sluggishness, and states that “it ejects a yellow liquid from the mouth when handled, and was refused when offered to my baboons and *Cercopithecus* monkey.”

“ On *Jan. 7th* I got a very fine large black Carabid [*Anthia fornasinii*, Bert.] with dull white margin to elytra, running over bare ground in moonlight. As it is a common type of colouring I picked it up to see if it was the most common species, and saw it was one I had not yet seen: I send it to you. I was looking at it by full moonlight, holding it about 18 inches away from my face. The fluid which it

ejected hit my left eyebrow and caused immediately a very severe burning sensation, and though I at once bathed the place in water, the burning sensation did not fully pass off for half an hour. [The defensive secretion of the Anthias is also treated of in Dr. Marshall's memoir: see especially pp. 510, 511.] I may here say that my monkey, when I put down one of the commonest of this type of beetle, showed every sign of *fear* and actually ran away from it.

" On Jan. 10 a number of handsome black-and-white *bees* [*Anthophora nubica*, Lep.] were seen apparently roosting for the night all together on bare twigs of a large *Tamarind* tree. I send you a few. I had not met them before. On the same day I first saw the large and curious Lycids, some of which I send [*Lycus (Chlamydotylus)* sp. nr. *trabeatus*, Guér.; the same as species 5 taken at Itigi, Proc. Ent. Soc. 1917, p. lviii]. The male has enormously expanded elytra. (My monkey won't have *anything* to do with Lycids! This will appear later when I send you my account of 'Taste Experiments'.)

" I think that's all for the present. I am going off to-morrow—perhaps to be permanently there—to Igalula, the nearest station on the railway—about 40 miles E. of Tabora, where there is a recruiting depot for King's African Rifles and porters. I have to examine recruits, but whether I am coming back to Ndala I know not. I am taking the monkey with me, so hope to carry on. I have got records for nearly 100 species now.

" Jan. 18, 1917. *Igalula*.

" I arrived at Igalula to-day, but as there is *not* here the recruiting depot which I understood *was*, I shall presumably have to move further down the line to Itigi—about 150 miles E. of Tabora."

Capt. Carpenter's observations on a *Bembex* attacking Hesperid butterflies (Proc. Ent. Soc., 1917, p. xli) were included in this letter. Other specimens also captured on the journey, Jan. 17, from Ndala to Igalula are referred to in the following letter.

“ Mar. 12, 1917. *Itigi* (34° 30' E., 5° 45' S.),
4278 ft., on the Central Railway, about 150
miles E. of Tabora.

“ On Jan. 17th I got a fine large *Pierine* [*Teracolus dueissa*, Dogn., ♂] new to me, the Belenoid Hesperid mentioned before, a fine rosy *Acraea* [*A. acrita ambigua*, Trim., ♂], only once, I think, caught hitherto, and some other Hesperids new to me.” One of these, *Oxypalpus harona*, Westw., is mentioned in the extract quoted in Proc. Ent. Soc., 1917, p. xli, together with the “ Belenoid Hesperid,” *Leucochitouca hindei*, H. H. Druce. The following interesting note on this latter species accompanied the specimens:—

“ Jan. 18, 1917. *Black and white Hesperid*.—The first I saw, on road through ‘ Xerophilous forest,’ sitting on patch of wet mud with wings outspread. I thought it was a *Belenois* new to me, until I got within striking distance and saw its short antennae *out in front of it*. (N.B.—I at first thought it rather a curious attitude for a *Pierine*!) Subsequently caught others, most with wings closed in *Pierine* attitude. One was closely associated with the two *Belenois* [*B. gidica*, Godt., ♂, and *B. severina*, Cr., ♂] sent with it. I watched them several times. The Hesperid would settle and the *Pierines* come and settle as close as possible to it: some *Catopsilia* also—a pale green species like a ♀ Brimstone [evidently *C. florella*, F., ♂]. I failed to catch all three at one stroke of the net, but caught Hesperid and one, and the other (the identical one which had been drinking with the Hesperid) a few minutes later. When the net is put down over them the Hesperid does not at once fly up with the *Pierines*, but remains calmly sitting. Curiously enough, the first one I saw was the only one that had wings outspread. Its flight is not so dashing and irregular as most Hesperids: indeed one *might* say (but I *won't*, for fear it's only imagination!) that its typical Hesperid flight has become *Pierine*! But I don't think the flight is sufficiently *Pierine* to cause the butterfly to be mistaken for a *Pierine on the wing*: there is still a certain Hesperid touch about it.”

The resemblance of the allied white, black-marked Hesperid, *Abantis leucba*, Wallgr., to the commonest *Pierines* at Taveta,

was pointed out by the Rev. K. St. Aubyn Rogers in Trans. Ent. Soc., 1908, p. 510. The following specimens captured at Taveta, on May 10, 1905, by Mr. Rogers are in the bionomic series of the Hope Department:—*B. severina*, ♀; *Teracolus halimede*, Klug, ♀; *T. celimene*, Lucas, ♀, and *A. lerubu*, ♂. Mr. Rogers considers that at Taveta *B. mesentina* forms, with *severina*, a centre for the convergence of other Pierines, and he writes of the above list, to which *mesentina* might be added, "all these species bear a considerable resemblance on the wing, and all settle in exactly the same way with wings half raised. I think *Teracolus castalis*, Stand., might be added to the assemblage. . . . The Hesperid is of great interest, as mimicry in this group is so rare. The species has a rapid flight as is usual in this family, but its comparatively large size and its conspicuous black-and-white colouring mark it out at once from its congeners and give it a strong superficial resemblance to the forms mentioned above" (*ibid.*, p. 510).

The specimens captured at mud on Jan. 18, 1917, may be compared with 18 male Pierines settled on a patch of cowdung and all under the net together, on Aug. 25 at Itigi in the dry season (from about May 25):—8 *Belenois mesentina*, Cr., 5 *B. severina*, Cr., 2 *Pinacopteryx simana*, Hopff., 1 *Teracolus eris*, Klug, 1 *Herpaenia eriphia*, Godt., 1 *Glutophrissa epaphia*, Cr.

Returning to the letter of March 12:—

"On Jan. 29 I got two Lycaenids new to me, I think [*Epamera aphroceides*, Trim., and *Argiolaus silarus*, H. H. Druce]. Also on Feb. 5, one do. do. [*Castalius hintza*, Trim.].

"*Pinacopteryx simana* is very abundant at Itigi [see Dr. F. A. Dixey in Trans. Ent. Soc., 1918, p. 191]. By the way, the Mud-drinker's aposeme is scarce hereabouts, and I think there are only *Mylothris agathina*, Cr. (commonest), and one *Phrissura*. [In relation to this subject Capt. Carpenter wrote on Nov. 2, 1917, of the Lycaenid *Phylaria cyara*, Hew., "I have never seen it *except* drinking at mud." See Proc. Ent. Soc., 1915, pp. lxxvi, lxxi, lxxvi-lxxix.] *Belenois* is not common: indeed *Teracoli* are the most abundant; but even now Itigi is a poor place for butterflies.

“ Feb. 26, 1917. *Itigi.*”

“ Things drag on here and we are all very sick of the business. But there seems no chance of rounding up the Hums that remain until the rains are *well* over and the marshes have dried up a bit. So for several more months I suppose I shall continue to vaccinate porters, and treat those that are sick, etc., etc. So do we win the war!

“ Mar. 6, 1917. *Itigi.*”

“ I was much interested in your phrase that ‘the African vegetation *anticipates* the wet season.’ Though I had noticed the facts the full meaning had not come to me, and the word ‘anticipates’ brings it home.

“ Mar. 24, 1917. *Itigi.*”

This letter contained the account of the 272 Lycid beetles caught on one plant, Mar. 23 (Proc. Ent. Soc., 1917, p. lvii), also the following note: “I caught my first *A. zetes acara* for many months, here, to-day. It was a very E. specimen as one would expect.” An undated letter, written a little later, refers to the same species as follows: “By the way, I have at last caught a couple of *zetes acara* here, and both were, as would be expected, the most Eastern I have seen. But it is extraordinarily scarce.” Of the powerful combination of large red-and-black Eastern Acraeas Capt. Carpenter caught in 1917, *zetes acara*, Hew., *pseudolycia astrigera*, Butl. and *anemosa*, Hew. They are very much alike, especially the first two, and Capt. Carpenter, who was unfamiliar with the species, speaks of them all as *zetes acara*. *A. natalica*, Boisd., the commonest of the combination in British East Africa (see the Rev. K. St. Aubyn Rogers in Trans. Ent. Soc., 1908, p. 525), and *egina arca*, Mab., are not represented in this ex-German E. African collection. Capt. Carpenter had taken *acara* and *astrigera* more recently than he supposed, the first on Feb. 7, as well as Mar. 28, the second on Jan. 9 and 10 (2), and Mar. 14.

“ There have been lots of a Tabanid here with proboscis about half-way between *Pangonia* and *Tabanus*, and I have

caught a fine *Pangonia* [the ♂ of a very striking new species] feeding, hovering on the wing like a Bombyliid, from a Composite flower. The specimen will be sent you: I think it's not the same as the one which bit me" (Proc. Ent. Soc., 1916, p. lxxxii). Another *Pangonia* caught about the same time is *P. distincta*, Ricardo, ♀.

" May 27, 1917. Itigi.

" The operations in pursuit of a very elusive German force in the neighbourhood are still in full swing. Some of the 'W.A.F.F.s' passed through here yesterday, and I saw a Hansa for the first time. The commander of the force has been taken prisoner, sick, but we have not had much success so far, and the force still continues to run about, and gets lost, and causes a lot of trouble. They cut our telegraph wire this morning, and it is said they have put bombs on the railway! I am much less busy now, as (following the usual custom!) quite a large staff has been sent up here, now that the work is about half what I had to cope with without qualified assistance a little while ago. So I have been able to get out for a bit, but we are now having very fine dry and (in early morning) cold weather, which is bad for butterflies. I am quite fit and enjoy the cold mornings.

" *Pangonia* is very common now, and I have caught numbers of males. They often hover in the air *exactly* like Syrphids (save that their long rostra are conspicuous), and (with females sometimes) may be found on flowers. I caught one male on a patch of white Labiate flowers, visiting flower after flower, and putting his proboscis down each tube like a bee! There was a very curious Tabanid here a little while ago, with proboscis relatively about as long as that of *Glossina*, a large blue-black fellow, with wings marked with bright brown, who never made any attempt to bite, but was only found on flowers or hovering in the air. [This is the new *Pangonia* feeding from a Composite flower, *v. supra*. Three females of another interesting Tabanid (*Pangoniinae*), *Dorcalemus compactus*, Aust., taken Mar. 28, bore the note that when flying their appearance and sound were very bee-like.]

“ June 20, 1917. *Itigi.*

“ We are having very cold nights now—quite delightful— I pile on all my bedclothes at night and even then feel cold in early morning. I believe we are about 5000 ft. up here! [4278·2 feet.]

“ The party of Germans who were in the neighbourhood are still uncaught, and leading us no end of a dance!

“ I have been rather busy lately, as I have Smallpox to deal with (as well as the usual Dysentery, Pneumonia and Meningitis—I've got about 160 natives in hospital), and so have been vaccinating and revaccinating all and sundry, having to make a house-to-house visitation of the village near here. Up to date not quite 20 cases—two (haemorrhagic) died.

“ July 9, 1917. *Itigi.*

“ Still fine dry weather with cold nights.

“ Continuing on Smallpox, I had 19 cases, 9 of which died, one of them vaccinated and with a few poek marks on his face from childhood. It seems to have been a very virulent form. The last man to develop it was only vaccinated 5 months ago—true, he did not get very large marks. What with Smallpox and Meningitis I've seen quite a lot of the more interesting diseases. There is still Plague which I haven't met yet!

“ I am now rearing some *Pierines* from eggs, and have got an egg from *Pinacopteryx simana*, which is nice, as I presume the larva must be undescribed, it having been so rare till now that I have found it so abundant here. It has a well-marked 'dry' form characterised by general suffusion with brownish grey scales beneath, so that resting among dry grass it is very procryptic (*as are other dry forms*). Indeed I think the explanation of the colours and shapes of dry *Precis* as being procryptic receives great support from the marked procrispis of dry *Pierines*, *Teracolus*, for instance: the pink or brown suffusion of the lower surfaces makes *Teracolus* very hard to see among the pinks and browns of dry grass, when the wings are closed.

“ Aug. 9, 1917 Itigi.

‘ I’ve got the cameelious hump to-night, so please be patient and bear with me! The deadly monotony of this place palls: I have only about 100 patients in hospital now, and very few come to out-patients, so that, after my round before breakfast and about 2 hours more after it, there is no other medical work until the evening round—except some days when I get some men to vaccinate, and then I do them at the rate of 150 per hour, so they don’t last long! Very different from the rather too strenuous times of a few months ago when, except for very hurried breakfast and lunch-tea, I was rushed from 7 a.m. to 7 or later p.m.! If only this were Kakindu, and I could feel I was doing good insect work! Now in the very dry time there is even less in the way of Lepidoptera than ever—a few Pierines and occasionally a Lycaenid or Skipper—so that one hardly feels it is worth going out. However, I *do* go out in the afternoons (or else I would fall asleep!), and to-day and yesterday got three specimens of a nice Lycaenid [*Rapala caerulea*, H. H. Druce, ♂], on a flowering shrub, which was new to me and cheered me up!

“ About a fortnight ago I had a very welcome change, as I was sent away to a place called Lulanguru, about 17 miles W. of Tabora, where one got back to the country of granite kopjes and away from this infernal flat uninteresting bush. There I found one or two species new to me—some fine purple-tipped Pierines [*Teracolus regina*, Trim., ♂ ♀; also *T. ducissa*, Dogn., ♂ ♀], a Satyrine [*Henotesia simonsi*, Butl.], a beautiful Lycaenid [probably the ♂ *Deudorix dino-hares*, H. Gr.-Sm., see p. cxxxii], and, best of all, though not new, I got four more *Crenidomimas*, which I haven’t seen at Itigi. So far as I could see they were the same as the ones I sent you before. They came from the same kind of country, and were also model-less! [see p. cxiii]. It was also rather nice to get away from the eternal (and infernal!) noisy railway engines of this place. There is always one blowing off or making a nuisance of itself in some way! Fancy being

worried with the noise of engines in the heart of Africa!
Well, well.

“ Well, that’s enough. I feel better now, thank you !

“ Aug. 21, 1917. Itigi.

“ Very little to do nowadays here. I think there is every likelihood of this depot being closed, in which case I should be moved somewhere else. I hope it will be somewhere as far away and as different as possible from this dull, flat, dried-up bush country as possible. I am *very* bored with it.

“ Aug. 22, 1917. Itigi.

“ I keep collecting *P. simana* on account of its being so rare in collections : you may be able to use them for exchange. I should like some to go to the B.M. Also I keep on collecting other, commoner, Pierines (except the ones I know to be universal), as they are now in the dry phase. There is one very fine large *Belenois* [*B. gidica*, Godt.] of which I only know the dry form with underside well suffused with grey and brown scales. [The wet form was taken at Itigi on Mar. 21, and 2 intermediates on Aug. 25.] It is more agile and difficult to catch than any Pierine I know, which is saying a good deal ! I first saw it at St. Michael’s in September of last year, and have never seen it since (*i. e.* never during the *wet* season) until I got a fine pair *in cop.* on Aug. 18th, and since then have seen several others. I wonder if it only appears in dry weather ?

“ On June 27 three of a handsome Lycaenid new to me [*Stugeta bowkeri*, Trim., or very near this species], and on June 28 and again on 29 a very lovely orange-pink *Acræa* also new to me [*A. acrita acrita*, Hew., with reduced black at the apex of fore-wing].

“ On July 5 a very dead-leaf tailed brown Nymphaline new to me. It flitted from bush to bush, taking especial care to settle on or near clusters of wrinkled dead leaves. [A ♀ of *Charaxes neanthes*, Hew., 1854, the dry-season form of *zoolina*, Westw., 1850. This form was also taken at Lulanguru on July 24, Nov. 4 and 13, one of the specimens being noted as “scarce.” The wet form *zoolina* was cap-

tured at mud, 4 examples on Jan. 7, near Ndala ($32^{\circ} 45' E.$, $2^{\circ} 15' S.$), and 1 on Jan. 18 between Ndala and Igalula ($33^{\circ} 15' E.$, $4^{\circ} 50' S.$). The Pierine-like appearance of the upper surface pattern of the wet form is specially noted by Capt. Carpenter.]

“ On *Aug. 8* another Lycaenid [*Rapala caerulea*, H. H. Druce, ♂] new to me, with a patch of purple suffusion in middle of blue. Several more since then.

“ I found, dead, one evening, a lovely little Rodent which I can't place in my memory. I think it must have been a Dormouse. Its head was rather rounded: it had mole-grey fur, paler beneath, but its tail was plumose like a little squirrel—grey, tipped with white. It was about the size of our Dormouse.” Dr. Oldfield Thomas, F.R.S., writes that the Rodent “ would appear to be an African Dormouse—(*Graphiurus*—of which many species are found all over the continent.”

“ *Sept. 3, 1917. Itigi.*

“ It's as dry as a bone everywhere, and except Pierines there are no insects about. I have been *much* interested to meet a dry season. I should not have believed there could be such a difference so near the equator. It's every bit as marked, regarding insect life, as our English summer and winter.

“ *Sept. 18, 1917. Itigi.*

“ Well, I'm still awaiting news about my leave being granted. I am very much afraid that as the end seems to be very near now, I may get caught in the process of clearing up, which will be a lengthy business! I should think in the end it will prove to be quicker to safari back from Tabora to Muanza and go across the lake to Entebbe, rather than to go down to Dar es Salaam, where one might have to wait long for a boat to Mombasa!

“ *Oct. 6, 1917. Itigi.*

“ Insect life is still very scarce. We are nearing the end of the drought, and I am watching with interest the sprouting of bushes, etc., though we haven't had a *drop* of rain to

stimulate them. As regards *Acraea caldarena* f. *neluska*. Oberth., you will, I hope, by this time have received a box that contained some more of it and other butterflies. [This refers to a rare form of *caldarena*, Hew., used in taste experiments with monkeys at Ndala in Jan. 1917. Unfortunately it did not appear in the later collections, but an *Acraea* taken at St. Michael's, Aug. 21, 1916, may be proved by structural investigation to belong to this form.]

"I've been trying to catch some Hymenoptera (as there's nothing else) for the Bureau, on Acacia flowers, and got to-day for you a beautiful Hymenopteroid fly [a species of the Syrphid genus *Ceria* (*Cerioides*) very near to *gambiana*, Saund.]—brown and yellow with petiolated abdomen, and wings longitudinally folded as in *Diptera* which I have never seen before. But the posterior half was folded upwards, so as to lie *on top* of the darkened anterior half; the narrow strips thus produced were held as a wasp holds them, so the resemblance to a wasp of the type of *Belonogaster* was much accentuated. [See also Dr. G. A. K. Marshall in Trans. Ent. Soc., 1902, p. 534, and pl. xxiii, figs. 40, 41; also Dr. G. B. Longstaff in "Butterfly-hunting in Many Lands," pp. 392, 393, pl. iv, figs. 1-10.] I also got there 3 lovely *A. zetes acara*, typically *Eastern*: the E. form is even lovelier than the island forms, and these were very fresh. [In the first half of Oct. at Itigi 12 *acara* and 6 *astrigera* were taken.]

"Oct. 21, 1917. *Lulanguru* (3766 ft.), on
Central Railway, 17 m. W. of Tabora.

"Since I last wrote I have been moved to a place where I really can be of use and am not wasted as I was at Itigi. My present camp, named *Lulanguru*, is where I was for a brief period at the end of July and beginning of August, viz. 17 miles west of Tabora. It is a flat, deciduous bush country with granite kopjes. I told you something about the place before: since my last visit the new green growth has begun to come in readiness for the rains, and it is very pretty and springlike. I *was* glad to leave Itigi, where I was not at all justifying my existence and doing nothing to help on the war, and I got *very* tired of the place and of the

noise of the railway and engines. My job here is to look after a very large number of Congolese porters—15,000—who will be sent through in batches. As they all come from Sleeping Sickness country, and are going to a 'Fly' country (the rivers of G.E.A.), it is important that all cases of Trypanosomiasis should be kept back. So I have to examine each man to exclude S.S., and then vaccinate, etc. I am quite glad to have a job of work again, and particularly to feel that I am again in touch with 'my friend the enemy,' S.S. I hope at less busy times that I shall be able to send you some more butterflies from here, especially *Crenidomimas*, as before. So there's no chance of leave yet, but I don't mind now that I have got a useful job to do.

" Nov. 2, 1917. Lulanguru.

" I'm very happy here now that I've got, at last, a job of work to do again. Since the middle of October, when I got here, three batches of Congolese of about 450 each have arrived, and I have examined all of them and rejected some for apparent early Sleeping Sickness. It's very interesting seeing natives of such different type from what I have seen hitherto—they are many of them very very small: these, of course, are from the forests. It is said that altogether 15,000 are coming through here, but though that sounds a large number it's only enough to make good the wastage of *all* porters for *one month!* I have about 60 in hospital; every batch that arrives leaves me with cases of Pneumonia and Amoebic Dysentery, but thank goodness they seem free of Cerebrospinal Meningitis, which has been a great scourge in some parts.

" Our local war is so far away (some hundreds of miles! I am 17 miles W. of Tabora) that we only know what the weekly official wire tells us, but the one we got this morning announced such a haul of prisoners and killed that one's hopes rise again that after all it *may* be finished this year. If they can't get it done before the rains begin in January they will have to wait until June at the earliest before they can begin again!"

Speaking of Itigi: " Fortunately I found some thorn

Acacias in flower, and bottled lots of minute Hymenoptera for the Bureau. Many are very curious-looking Chalcids, and one a veritable giant about *an inch* long: I had never met with one more than half that size before. I wonder if it will turn out new. [Dr. Marshall has not been able to determine the insect, but thinks that it is a *Larradomorpha*, of which Capt. Carpenter had previously sent another fine species.]

"Here at Lulanguru I bag great numbers of things at light. Has this curious fact ever been recorded, that on different nights different species predominate? About a week ago one kind of Melolonthid, later another, last night a third, with two small Chrysomelids, and to-night, as I write, numbers of small actively flying *Carabidae* of several species, none of which have come on any previous night. I suppose the explanation is that large numbers of one species come out at approximately the same time from the pupa.

"Nov. 14, 1917. *Lulanguru.*

"The Itigi butterflies are mostly a long series of pairs of *Pierines in cop.*: — *P. simana*, *Belenois*, and *Teracolus*, a propos of what I wrote before (Proc. Ent. Soc., 1917, p. lii) that Darwin had said *Pierine* ♀♀ carry ♂♂. In all these cases ♂ carried ♀, save in one *P. simana*, which was probably a mistaken observation. The only other things of interest from Itigi were a number of very fine *Eastern zetes*, and sundry minute Hymenoptera and beetles for the Bureau.

"*Charaxes* abound on the kopje and some look interesting.

"Hot and exhausting weather.

"Nov. 27, 1917. *Lulanguru.*"

Extracts from this and other letters on *Pseudacraea poggei*, Dew., and its form *carpenteri* are published in Proc. Ent. Soc., 1918, pp. v–viii.

Writing of *Charaxes*: "I fancy I can spot mimics in *one* case at least. This kopje here is the best locality I have struck for them, except perhaps Kakindu, but then that was a large forest, whereas this kopje top is only a few hundred yards square.

" Pretty busy in *mornings* now: we have about 2000 in camp, and they arrived infected with measles, mumps and chicken-pox. I feel as if I was in charge of a boys' school! But I can collect most afternoons. We are having heavy rains now— heavier than I remember at this time last year.

" Nov. 30, 1917. *Lulanguru.*

" The only larva of *P. simana* escaped when it was too late to get more, as I was expecting to be moved! A pity!

" I am continuing to get *Crenidomimas* here, and have now got 4 or 5 more specimens, all, so far as I can see, the same as before. I haven't seen a single model! I don't know why the model *shouldn't* be here. [Capt. Carpenter, who is always interested in the success of a mimetic likeness, will be delighted to know that only four days before he wrote this letter, he caught the model *Crenis pechueli*, Dew., and labelled it as the mimic; also that he labelled two unusually bright and fresh *Crenidomimas* taken in Port. E. Africa (p. cxxiii) as "*Crenis*."] *P. leonidas*, F. (blue S. form), *swarms!* By the way, yesterday I saw a magnificent *Ps. boisduvali trimenii*, Butl., typically Eastern, high overhead and so out of reach that all I could do was to break my neck goggling up at it!! So that makes the third species of *Pseudacraea* here. *Poggei* continues to be caught! also *Charaxes!*

" Dec. 7, 1917. *Lulanguru.*

" I have got some Nymphalines here *in cop.*, in all of which the ♀ carries ♂—a *Precis* [*actia*, Dist., dry f.], *H. daedalus*, F. (twice), and *Ps. poggei*, Dew. It seems to me that *in Pierinae* the ♂ carries ♀ and *in Nymphalinae* the reverse. In a single pair of *Lycænidæ* (*Tarucus telicanus*, Lang)—the only one I have noted—the ♀ carried the ♂."

Between Dec. 19 and Jan. 2 Captain Carpenter captured 4 more pairs of *telicanus*, and in all but one, with the smallest female (carried by the male) the male was being carried by the female, and the same was true of a single pair of *Ariocerses amanga*, Westw. (Dec. 31), and of *Alaena interposita*, Butl. (Jan. 1), as also of the Satyrine *Yphthima asterope*, Klug (Dec. 11), and the Acraeina *A. encedon*, L., type form (Dec. 12). As this paper is being prepared for

the press the following note has arrived, written May 5, 1918, at Isipingo, on the coast near Durban, where Capt. Carpenter is spending his leave: "A propos of pairs *in cop.* I saw on the 2nd something of considerable interest. A fine pair of *P. dardanus*, Brown, flew by *in cop.*, alighted close by, flew off again, alighted and flew off once more, so that there was no possible doubt whatever that the ♀ *cenea*, Stoll, was supporting the ♂, which remained passive with wings closed. Of course I had no net, and so could not secure the specimens; but I think the observation of value as it is so difficult to make out which sex carries which in *Papilioninae*, and one doesn't often see *Papilios in cop.*"

[The specimens from Isipingo (1918) have now arrived and include the following pairs of *Pierinae*, in all of which the male carried the female: *Eronia cleodara*, Hübn., May 13; *Teracolus omphale*, Godt., May 11; *Belenois gidica*, Godt., May 23; also a pair from Saranda, 7 m. N. of Kilimatindi, ex-G.E.A., Feb. 5; *B. severina*, Cr., May 13 and June 6. In addition to the Pierines the Nymphaline *Byblia goetzius*, Herbst., May 13, the male carrying female. From Ankwabe, Port. E. Africa, 40° E., 13° S. (1918), the following very interesting Acraeinae pairs: 3 *A. caddarena*, Hew., the larger female carrying the smaller male, Aug. 1, the larger male carrying the smaller female, July 29 and 31; 2 *A. natalica*, Boisd., female carrying male in both, female distinctly larger in one pair, Aug. 29, a little smaller in the other, July 31. Also the Pierine *Terias brigitta*, Cr. (dry-season form), smaller male carrying larger female, July 4, and similarly in a wet-season pair from 34° 55' E., 4° 40' S., ex-G.E.A., Feb. 12. From Monapo, Port. E. Africa, 30 m. due W. of the coast opposite Mozambique Islands (1918): *Acraea oncaca*, Hopff., the male carrying the distinctly smaller female, Sept. 15; *Neptis agatha*, Cr., the female carrying the much smaller male, Sept. 11.]

[These results may be compared with those recorded by the Rev. George Wheeler in "The Entomologist's Record" for 1918, p. 152. In the single pair of *Dryas paphia* observed by Mr. Wheeler the male was carrying the female; but Mr. H. Donisthorpe ("Record," 1918, p. 171), Mr. Colthrup

(*ibid.* 1917, p. 246) and Mr. Wheeler himself (*ibid.* 1917, p. 166) have found both male and female taking the active part. Mr. Hamm also saw, near Winchester (July 1896), a male paired with the *calesina* female, and the latter, which could not be mistaken, supported the former. More evidence is required for all groups except the *Pierinae*. For these Dr. Dixey's conclusion on p. clii, will meet with general acceptance. In this group, indeed, the males appear to take the active part even when smaller than the females.]

Returning to the letter of Dec. 7: "We have just heard unofficially that von Lettow, the enemy commander, with what forces are left him, has got across the Rovuma R. into Portuguese East Africa. I'm not sure that it's good news, although it now means that the country is free of Germans, all the other bands having been accounted for. But the affair won't be over till the gallant von Lettow is also accounted for. He certainly is to be admired for his spirit.

"Dec. 9.—Sunday. Thundering and raining now and very cool!"

The following account of Lulanguru, written for the Entomological Society, was sent with the above letter of Dec. 7:

"This camp, 17 miles west of Tabora, is on the Central Railway and also on the main road from Dar es Salaam to Ujiji, along which countless slaves must have gone down to the coast in old days, and up which Stanley may have come to Ujiji. It lies in country which I am told by a Rhodesian is much like parts of N. Rhodesia. It is flat, 1148 metres above the sea, with scattered irregular low hills and kopjes of granite. The bush is of the open kind with small, not thorny, deciduous trees, now in full spring leaf, and the grass is sprouting again, so that everywhere it is delightfully green. We had about a week of quite heavy rain a little while ago.

"My collecting ground here is on a kopje immediately behind the camp, which seems to concentrate insects from the surrounding flat country: at any rate, until I started collecting on its summit I never found anything worth much.

"I will first go through the successive groups of butterflies and then give a few notes on other Orders.

“*Papilioninae*.—I very soon found there was a handsome species [*P. anthens nyassae*, Butl.] here, new to me, reminding me of *poliaces*, Cr., but appearing paler, and with longer tails. Curiously enough I do not find its tails nearly so brittle as in *poliaces*, of which it is hardly possible to take a perfect specimen out of the net.

“I suspect this species to be a Southern form, as I have never seen it before: it is a beautiful, Oriental-looking thing.

“*P. leonidas*, F., is very common. It is of a blue form, and thus new to me, as I have hitherto only met the greenish form of Uganda. It has favourite spots over which it will soar backwards and forwards [see S. A. Neave in P.Z.S., 1910, p. 68], and if one is caught, another will almost at once haunt the same spot. I have not seen its model here.”

Capt. Carpenter's specimens entirely confirm his statement, being distinctly bluer than those from further north. I remember that this point was raised inferentially in a letter written to me from Katanga or North-East Rhodesia by Mr. S. A. Neave. In it he maintained that *leonidas* was a mimic of an *Amauris* of the type of *hyalites dannfelti*, Auriv., rather than of *Tiramala petiverana*, Dbl. and Hew. He referred in his letter to the apparent blueness of the former in the wild state as being very different from its black-and-white appearance in the cabinet. In his paper published later in the Proc. Zool. Soc., 1910, p. 8, Mr. Neave says that the transparent spots of the model's fore-wing, “due perhaps to their more or less green background in nature, look pale green on the wing.” But in writing to me I distinctly remember how he emphasised the blueness.

Mr. Neave kindly wrote on March 29, 1918: “Yes, I recollect that examples of *P. leonidas* from Uganda were greener than those from North-Eastern Rhodesia and Katanga. I have no definite recollection about this species in German territory. I was there such a comparatively short time that I may not have taken it at all. I think I originally wrote you *re* the apparent blue or green colour of the white patches of *Amauris* from Katanga, as this was the first locality in which I had seen examples of the *Amauris* of this group in

life. The apparent colour varies from blue to green with the background."

Mr. Neave wrote again a few days later: "I have had a look at the B.M. series, and it seems probable that examples from the drier parts of Africa are mainly of the blue type as compared with the greener ones from more humid localities. I am not sure that the point is of great importance, though the apparent colour in the *Amauris* models varies with background, being greener in shade and amongst vegetation and bluer in bright sunshine; they would therefore appear more often of the latter colour in drier and more open situations, in which, however, they are comparatively rare."

Capt. Carpenter continues: "*Papilio (Cosmodesmns) pylades angolanus*, Goeze, abounds: it is a curious-looking thing on the wing, and sometimes as it dashes past has rather a Pierine appearance. *P. demodocus*, Esp., is common. I have seen a ♂ *P. dardanus*, Brown; somehow it looked slightly different from the forms I knew on the islands in L. Victoria, and I am wondering whether it also is from the south [probably the Eastern form with a much heavier submarginal black band to hind-wing]. It will be interesting if I can get a female, for since I came here in October I have not seen a single species of its models, and I have collected almost every day. Presumably *cenea* [probably *hippocoon*, F.] would be the commonest form. These five are the only Papilionines I have met as yet.

"*Pierinae*.—I know so little of the names of these that I cannot say much about them. *Beleuois* and *Catopsilia* (the thing like a Brimstone) are not very common—I haven't seen either *Eronia leda*, Boisd., or *cleodora*, Hübn., here. A *Terias* of a form strange to me [*T. regularis*, Butl.; see pp. cl, cli] is plentiful, and a few fine large *Teracobus* [*T. casta*, Gerst.] not uncommon, but the feature of the Pierine fauna is a magnificent large, fragile, pure white species with steely purple tips to fore-wing [*Teracobus regina*, Trim.]. It is of extremely powerful flight and is very shy, and therefore almost impossible to catch except when lulled by clouds or in the evening.

"Of *Nymphalidae* there are some good species. It is a

marvellous thing that since I came here I haven't seen a single Danaine of any kind whatever! [A ♀ *D. chrysippus*, L., of the type form was taken a little later, on Dec. 31.]

“*Acræinae*.—These have not proved to be plentiful: there are one or two species that I never met until I had come a good way south of the lake, and imagine they must be South African forms. *A. zetes*, L., occurs in its typical Eastern form [*acara*, Hew.] with yellow suffusion and very little black. [The Lulanguru species was not *acara*, but *anemosa* (11) with a single *astrigera*.] It is thus more lovely than the forms I met on the islands. I find it *extremely* shy and difficult to approach—far more so than such an aposematic and tough insect need be! I am quite sure that the Eastern forms I have met are far more difficult to catch than the island specimens were. *A. encedon*, L., occurs—rather washy and uncertain in colour. It annoys me because I have never found its larvae, and yet one sees it in all kinds of country, so it must feed on some universally distributed food-plant. [The larvae feed on the water-plant *Commelina*, “Sudd.” The Lulanguru collection contains—taken between Nov. 22 and Dec. 24—2 ♂♂ and a ♂ and ♀ *in cop.* of the type form, and 6 ♂♂ of the form *daira*, Godm. and Salv. Thus the *daira* form was not nearly so predominant as in Capt. Lamborn's collection made further east and north; Trans. Ent. Soc., 1917, pp. 327, 328.]

“*Nymphalinae*.—*Charaxes* abound on the kopje and several forms are new to me. It is a wonderfully exciting spectacle for an entomologist when these magnificent creatures chase each other in the bright sun through the trees with their new greenery. I saw one day a never-to-be-forgotten sight—two species whose names I know not chasing each other, both in perfect condition, one with the basal half of its wings sky blue, the rest black [the ♂ *bohemanni*, Feld.], the other with a broad border of rich terra-cotta to its velvety black wings [the ♂ *azota*, Hew.]. I put down rotten bananas as bait (remembering Swynnerton's tip) and have taken about a dozen different forms, though how many *species* I know not. The above-mentioned blue one, in ♀, has a very conspicuous white bar on the underside of the f.-w., which I am certain

acts as an aposeme when it is feeding [a note to this effect accompanies a ♀ *bohemanni* of Dec. 1]. It is resembled by a much smaller species [the *manica*,* Trim., ♀ of *ethcoles*, Cr.]. A specimen of the commonest small species [*guderiana*, Dew.] was once caught by a large Asilid fly, just as it was fluttering round the bait: this speaks well for the power of the Asilid. I am sending prey and captor."

Alcimus alamans, Walk., ♀ with the ♂ of *Char. guderiana*, Dew., Nov. 12, 1917. The Asilid bears the note "probably caught as it was fluttering round bait or on it, but I did not actually see it in act." Capt. Carpenter also sent a male of the same predaceous fly together with the ♂ of *Char. achæmenes*, Feld., captured by it Dec. 13, 1917. Both butterflies are included in the table on p. cxxi.

Capt. Carpenter not only recognised the mimetic resemblance of the *manica* ♀ to the ♀ *bohemanni*—the note "?mimic" appears on 4 examples of the former and "?model" on an example of the latter taken with one of them on Nov. 20—but he also noted the resemblance of the females of *achæmenes* and *guderiana* to both sexes of *saturnus*, Butl. Examples of each female and a male of *saturnus*, taken Nov. 17, bear the note "?mimetic relation: same spot and time." These and other records of the three species on the top of the kopje at Lulanguru afford valuable independent testimony to the validity of Dr. Marshall's suggestion (*ibid.*, p. 505). These captures at Lulanguru in one limited area, of mimetic *Charaxes* and their models among the larger species of the same group, are recorded in the tabular statement on p. cxxi. I have included the ♀ *azota* as a probable mimic of both sexes of *varanes volcgses*, R. & J.

It is probable from Capt. Carpenter's experience that the *manica* ♀ of *ethcoles* occurs where *bohemanni* is abundant and its female—more conspicuous than the male—commonly seen. Where this large species is scarcer the ♂ probably becomes a more advantageous model than the more rarely seen ♀, and *manica* is replaced by the *phaeus*, Hew., ♀ of the same species.† To test this conclusion we need from

* See footnote on p. lxxx.

† This paragraph requires revision in the light of Mr. Dollman's recently published evidence. See footnote on p. lxxx.

other localities where *bohemanni* is a model such facts as are now recorded for Lulanguru, or such as Mr. S. A. Neave, the Rev. K. St. Aubyn Rogers, Mr. C. F. M. Swynnerton and Major C. A. Wiggins have made available for other forms of the ♀ *etheocles* and their models. The *phaeus* f. is recorded from Tabora, near Lulanguru (Rothschild and Jordan, Nov. Zool., vii, 1900, p. 488), and Mr. St. Aubyn Rogers took it at Mamboya (Proc. Ent. Soc., 1918, p. lx), while Capt. Carpenter captured an example on June 11, 1916, far to the N.W. in the Ruanda Country, near Kigala. The locality is described as open country in 30° 45' E., 2° 10' S. The suggestion that the specimen is a mimetic ♀ of *etheocles*, new to the captor, was written on the "paper." Capt. Carpenter was not sufficiently long in the locality to be able to determine the existence or relative numbers of *bohemanni*. Further north in the strip of tropical forest near Kakindu (Proc. Ent. Soc., 1916, p. cx) he took two examples of the beautiful new ♀ form of *etheocles* described on p. lxxxii; also, in the same forest, its model, the ♂ of a larger *Charaxes*, viz. *etesipe*, Godt. At this point it is of interest to record his capture on June 28, 1916, in 31° 15' E., 2° 40' S., of a ♂ *Ch. hansali baringana*, Rothsch., thus greatly extending the known range of this rather rare form, described from Lake Baringo, B.E.A., and taken by the Rev. K. St. Aubyn Rogers in the Hills of Taita W.N.W. of Mombasa.

"*Crenidomimas* is not uncommon on the kopje, and now that I have learnt its habits I have got a number, which you will find interesting. It has a very skimming flight, which is much like that of *H. daedalus*. The latter, of course, keeps very near the ground, while *Crenidomimas* prefers to fly 10 feet or more high, but it does not make long flights, and returns over and over again to its favourite perch on the extreme tip of a spray 6-12 feet above ground, so that it can usually be caught. It often settles head downwards, on tree-trunks, but is very very wary and extremely difficult to catch in such a position."

It is likely that the butterflies seen on the tree-trunks were *Crenis* and not *Crenidomimas*. Mr. S. A. Neave, with a very extensive experience (Proc. Zool. Soc., 1910, pp. 32,

MODELS AND MIMICS AMONG THE CHARAXES ON THE KOPJE AT LULANGURU.

DATES IN 1917.	Bohemanni, Feld.		Etheocles, Cr.		Saturnus, Butl.	Achaemenes, Feld.		Guderiana, Dew.		Varanes volo- geses, R. & J.	Azota, Hew.	
	Males.	Females, MODEL A.	Females: <i>manica</i> f. mimics of A.	Males.	♂ and ♀ alike, MODEL B.	Females: mimics of B.	Males.	Females: mimics of B.	Males.	♂ and ♀ alike, Probable MODEL C.	Females: prob- able mimics of C.	Males.
Oct. 23 .	1											
Nov. 4 .	1											
" 6 .		1			1 ♂							1
" 7 .								2				
" 8 .								2				
" 9 .								1				
" 11 .	3							1	2			
" 12 .	1	1	1	2	1 ♂ 1 ♀		2	5	6			3
" 13 .						1		1	3	3 ♂ 1 ♀		
" 15 .	2	1				1	1	2				
" 17 .		1			1 ♂	2		1				1
" 18 .			3	1	1 ♀							
" 19 .				1	1 ♂	1		1	1	1 ♂	2	
" 20 .	2	2	1	3			2			2 ♂	2	2
" 21 .					1 ♀							
" 23 .												1
" 24 .	1								1		1	
" 26 .			1									
" 27 .					1 ♂							
" 28 .	1											
" 29 .												1
Dec. 1 .											1	
" 1 .	2	1						3	1			
" 5 .		2			1 ♂			1			1	2
" 13 .							1					
" 17 .	1	2			1 ♂							
" 24 .								1				
" 25 .							1					
TOTALS .	15	11	6	7	10	5	7	21	14	7	7	11

33, 38), writes: "I cannot recall ever having seen *Crenidomimas* settle on a tree-trunk, though the blue species of *Crenis*, of course, do so often—generally rather high up. Most of my examples of *Crenidomimas* that I caught *settled* were on damp sand. As Carpenter says, they may often be seen on the tips of boughs." [The suggestion contained in this paragraph has now been submitted to Capt. Carpenter, who has replied that the first *Crenidomimas* taken by him (at Namirembe Bay, July 27, 1916) was certainly settled, head downwards, on a tree-trunk, and that at Lulanguru these butterflies were captured at the flowers of a Papilionaceous tree as well as on branches and tree-trunks.]

The Lulanguru collection contains 17 *concordia*—1 ♂ and 3 ♀♀ taken July 26–27. 12 ♂♂ and 1 ♀ between Nov. 19 and Dec. 17. Six of the specimens are injured, probably in most cases at least by enemies. It has already been stated (p. cxiii) that a single example of the model *Crenis pechueli* was taken on Nov. 26. A ♀ *concordia* was captured on the following day, a ♂ on Nov. 28, and another on Nov. 29. The occurrence of *Crenis pechueli* at Lulanguru extends its range considerably to the N. and E., the localities given by Aurivillius in Seitz being Congo [probably only the S.E. of the State], Angola, Ovamboland, and Upper Zambesi.

Mr. Neave writes: "*C. concordia* is a more widely spread insect, both in *time* and *space*, than the blue *Crenis*. The latter are not only decidedly local, but are only on the wing for a relatively short time. On the other hand, when they do occur they are much more numerous than I have ever seen *C. concordia*. I know of many places in Nyasaland where the latter is not uncommon but where the *Crenis* are absent. On the other hand, Carpenter can hardly be sure that the *Crenis* are not present in his locality until he has spent a whole cycle of the seasons there."

In addition to the *concordia* from Lulanguru, Capt. Carpenter took a ♂ on July 27, 1916, at Namirembe Bay at the S.W. corner of the Victoria Nyanza, and a ♂ and ♀ Aug. 8–14, 1916, at about 32° 20' E., 3° 20' S. The two latter resemble the Lulanguru series, but the first and most northern differs in exhibiting an orange-ochreous wedge in area 6 of the fore-

wing upperside—a feature which appears in a few of Mr. Neave's captures from much further south. This marking, which is probably ancestral, deserves special study in long series from as many localities as possible. No models were taken with these three examples. The hind-wings of the Namirembe ♂ are symmetrically shorn, probably by a bird. [Since the above was written a ♀ *concordia* taken on July 31, 1918, in a dry stream bed at Ankwabe, Port. E. Africa (40° E., 13° S., about 1000 ft.), has been received (labelled "Crenid") from Capt. Carpenter. The specimen, which is beautifully fresh, exhibits an unusual development of yellow over the basal half of the upper surface of both wings, especially marked in areas 7 and 8 of the hind—a result which may be related to the outlying locality on the E. fringe of the range. Still later another fresh ♀, also labelled "Crenis," has been received from Monapo, Port. E. Africa, 30 m. W. of the coast opposite Mozambique Islands (Sept. 13, 1918). The basal areas are only slightly yellowish.]

Concerning these 3 *C. concordia* 1916 spoken of in the 1st paragraph Capt. Carpenter wrote on May 20, 1917, from Itigi: "I had rather suspected that the *Crenidomimas* was a mimic. I seemed to remember a picture of it in Eltringham's book ['African Mimetic Butterflies,' pl. vi, fig. 15]. I only caught three or four, I think, and it was excessively wary and not at all abundant. I did not ever see a model, but as the country was in the dry period it doesn't do to conclude that the model is not there. It was in very open country, sometimes thorn bush, which is extremely bad for butterflies generally. Didn't I get some *Crenis* in the Kakindu forest? But probably not the species which the *Crenidomimas* mimics." [None of the blue species are in the Kakindu collection.]

Capt. Carpenter's account of the Lulanguru *Nymphalinae* continues:

"The cream of the Nymphaline population at Lulanguru is provided by my pet genus *Pseudacraea*. [The notes on *Ps. poggei*, Dew., and the new form *carpenteri* are published in Proc. Ent. Soc., 1918, pp. v-xxii.]

"To take the least interesting species first. *Lucretia* [*expansa*,

Butl.] is quite common. I fancy it is not quite of the same form as the one I am used to on the islands [*lucretia lucretia*, Cr.].

“*Ps. boisduvali trimenii*, Butl.—I have to-day caught my first specimen of this splendid Eastern form. It is certainly much more like its model *zetes acara* [*anemosa* in the Lulanguru collection, see p. cxviii] (also of Eastern form here) than the specimens I caught on the islands. Perhaps the yellow suffusion in each case helps. [The ochreous subapical patch on the fore-wing is well developed in this ♂ example of the Eastern *trimenii*.] This specimen was flying high, and floating about in an exasperating way until it at last came within reach of a vigorous swoop. Seeing that both *trimenii* and *poggei* exist here I shall keep a sharp look-out for *imitator*! It would be splendid to get that too.

“The only other Nymphaline I have to mention from here is a *Precis* of a form new to me which I think may be a dry-season form [either *archesia*, Cr., or *antilope*, Feisth.] of one that I have hitherto only met ‘wet,’ but it is difficult to carry the differences in one’s head without having specimens for comparison. There was an interesting form [*P. antilope*, Feisth., wet form *simia*, Wallgr.] which I first met with last January: it continued abundant all through the rains, after which it vanished, and has not yet put in an appearance again: * it interested me chiefly because its underside *very closely* resembled that of the wet or *natalensis*, Staud., form of *P. octavia*, Cr., though the upperside was very distinct.”

Capt. Carpenter’s collection made during his journey with the Belgian Northern Forces and his sojourn at various camps contains a most interesting series of 5 species of *Precis* in which the seasonal differences are marked, and in all except *artaria* Hew., extraordinary. As so little is known of the butterfly fauna of the area he traversed I have thought it desirable to add on pp. cxxviii–cxxxii a tabular statement of these five

* “Since I wrote the above this *Precis* has appeared, simultaneously with the wet form of *octavia*, Cr.: the coincidence is very striking.” [Note added to duplicate copy of the account of Lulanguru, posted Dec. 24, 1917. It will be seen in the tabular statement that the wet form of *octavia* first appeared on Dec. 15, of *antilope* on Dec. 17.]

species as they were taken in the year and a half from June 6, 1916, up to Jan. 2, 1918. It is unnecessary to say anything of the geographical forms of the species, which are of the races characteristic of the S. and E. of Africa, except the two following.

Precis archesia, Cr. —The wet forms (*pelasgis*, Godt.) are on the whole intermediate between the most extreme wet forms from further south in which the dark ground-colour of the under surface is continuous and unmarked, and those from the tropical north in which it is freely sprinkled with grey scales (Trans. Ent. Soc., 1908, p. 546). Capt. Carpenter's examples exhibit a variable amount of grey sprinkling, especially over the basal area of both wings. The outer red transverse streak in the F.W. cell is distinctly represented in grey on the under surface of nearly all the specimens, and is usually accompanied by a much slighter indication of the shorter basal red streak. Forms of *pelasgis* like these are common both to the N., where they are accompanied by "drier" patterns, and to the S., where they are accompanied by "wetter," all being modifications of *pelasgis* with the characteristic "wet" outline of the wings.

The dry or *archesia* forms, as represented in Capt. Carpenter's collection, are remarkable in that they are never of the full dry phase. The 10 examples taken June 13-20, 1916, as well as the 2 of July 26, 1917, are all nearer to *staudingeri*, Auriv., than to any other form. The upper surface is of the full dry phase, the under falling short in the nearly uniformly coloured basal and, usually darker, distal areas, diversified only by a wash of grey especially marked in the distal area, and more strongly developed in the individuals with a fuscous ground-colour, less in those that are brown. Thus the appearance is very different from that of the intensely variegated, highly procryptic, variable patterns which are the commonest forms of the dry phase in S. Rhodesia and Natal: see Trans. Ent. Soc., 1902, pl. xiii, fig. 6. as compared with fig. 7, which, although exceptional in Natal, where it was captured, fairly represents the 12 forms of *staudingeri* taken by Capt. Carpenter. The basal area of a single individual (June 15, 1916) bears indistinct reddish marks

approaching those of the examples taken Nov. 11–27, 1917. These 9 worn specimens are nearest to *semitypica*, Auriv., and one of Nov. 11 may actually belong to this form. The others differ in opposite directions on the two surfaces, the upper being wetter in the absence or very faint development of the blue transverse streaks in the F.W. cell, the lower, of a uniform dark brown in both areas, drier in the traces of variegation caused by obscure reddish streaks in the basal area, which in the F.W. follow the upper surface pattern; these streaks are only present on the H.W. of some of the individuals, and here there is no correspondence with the upper surface pattern. In one example of Nov. 11 the reddish markings are accompanied by black streaks. It is unfortunate that all these interesting forms are in such bad condition.

Although, as Aurivillius states, both *staudingeri* and still more *semitypica* are transitional in pattern towards the wet phase, they are both very far on the dry side of intermediate, the form of the wings—a difference far more important than colour or pattern—remaining as in the full dry phase.

A single example of *limnoria*, Klug, wet f. *taveta*, Rog., from Itigi, Oct. 12, is omitted from the table. Aurivillius keeps *limnoria* as a distinct species, but transitional forms occur between it and *archesia* f. *pelasgis*, and the Rev. K. St. Aubyn Rogers, who has taken *limnoria* in ex-German East Africa and is familiar with it in B.E.A., believes that the two are conspecific. Further breeding experiments and structural investigations are greatly needed, as also with *pelasgis* in relation to *coelestina*, Dew. There is in the Hope Department a series of specimens, collected at the N.E. corner of the Victoria Nyanza by Major C. A. Wiggins, which includes both wet and dry forms of *coelestina* and also butterflies with the upper surface pattern of *pelasgis*, or its var. *chapunga*, Hew., combined with an under surface apparently transitional towards the wet forms of *coelestina*. Omitting the consideration of *limnoria*, by far the commonest and in most localities the only form of *archesia* in British East Africa and Uganda is the wet-phase *pelasgis*, a little short of the full wet form from South Africa. See Nov. Zool., xi, 1904, pp. 348, 349,

where Mr. Neave records 42 *pelasgis* from N.E. corner of Victoria Nyanza, Entebbe and Toro: also Trans. Ent. Soc., 1908, p. 546. Examples bred by the Rev. K. St. Aubyn Rogers at Weithaga, B.E.A., were only slightly less "wet" than the parent (*ibid.*, pp. 545, 546).

Precis artaxia, Hew.—The few examples of this species afford an interesting contrast with *archesia*; for although both appeared as wet and dry forms in the areas traversed by Capt. Carpenter, *archesia* is represented by *wet* forms in the tropical belt to the north, whereas all the specimens of *artaxia* collected by Major Wiggins in the above-mentioned locality were small *dry* forms, of which 42 are recorded by Mr. Neave from Ugaia on the N.E. shore of Victoria Nyanza (*ibid.*, pp. 348, 349). Dr. Marshall and the late Capt. F. C. Selous also observed the predominance of the dry form in certain parts of S.E. Rhodesia and Portuguese E. Africa, and it is probably adaptively connected with forested areas (Trans. Ent. Soc., 1902, pp. 423, 439-41). Although the number of specimens is so small, both *nachtigalli*, Dew., and the more extreme wet form *nobilitata*, Thur., were taken by Capt. Carpenter.

It is of interest to compare the remaining species of *Precis* in the following table with Mr. Neave's records from the equatorial north (l.c.). Capt. Carpenter's *actia*, Dist., exhibits both dry forms, *actia*, and wet, *furcata*, Rothsch. and Jord., while the 10 northern records are all of *furcata*. Mr. Neave's figures for *octavia*, Cr., also represented by dry and wet forms in the following table, are unfortunately erroneous, probably because the author had suddenly to leave England before the proofs of his paper were corrected. Specimens recorded as the dry form, *sesamus*, Trim., were examined and found to be the wet form *natalensis*, Staud., by Miss Britten, who has made a careful study of *octavia* in the Hope Department. Furthermore, the large numbers of *octavia*, *actia*, and *archesia* sent to me in more recent years from the neighbourhood of Entebbe by Major Wiggins are all wet forms. Only in the Toro Forest on the W. shore of the lake, near the old Anglo-German boundary, do the dry forms of *octavia* begin to appear, and this locality, although so near to Entebbe, has

a very different climate with a regular wet and dry season, as Miss Britten ascertained from the meteorological records, and as Mr. Neave observed on the spot. Although *oetaria* appears to be always wet in equatorial Uganda and perhaps in the extreme W. of B.E.A., this is by no means true of B.E.A. as a whole, for many records testify to the existence of dry forms (Trans. Ent. Soc., 1902, p. 417; 1908, pp. 542-44).

Precis antilope did not appear in the collection studied by Mr. Neave, but both dry and wet forms occur in equatorial B.E.A. (St. Aubyn Rogers, Trans. Ent. Soc., 1908, pp. 544-45).

Looking at the above tables it is seen that *Precis oetaria* and *P. actia* follow the dry and wet seasons with precision except for the presence of 2 wet forms of *oetaria* in the first dry period, and these, being worn, had probably lived for a considerable time. The record of *artaxia* is very similar. *P. antilope*, on the other hand, shows a strong tendency to anticipate the seasons, both wet and dry, as is seen in the group of wet forms taken Jan. 8-Mar. 21, 1917, and the dry between Apr. 1 and July 25 of the same year, the latter being mixed with wet forms towards the end of the wet season. *P. archesia* follows the seasons except for a single early wet form on Nov. 19, 1917.

"*Satyrinae*.—There is a species here on the kopje and elsewhere that is new to me—a pretty fawn-coloured large species [*Henotesia simonsi*, Butl.]. There are others (*Ypthima*, etc.) here which are probably different from those I have sent before.

"*Lycaenidae*.—There are very few on the kopje, but when here for a week in August I got a fine species new to me, which you have received previously to this letter—one of those with the spots on the underside split. The male is of a coppery brown colour [*Deudorix dinochares*, H. Gr.-Sm.]. However, there are, I think, two other species here new to me which I send now. One of them has a very boldly marked underside [*Spiudasis homeyeri*, Dew.]: it has its tails abstracted by some enemy. The other is one of those rich copper-coloured forms with red brown underside and very short twisted tails. [Both *Axiocerses harpax*, F., and *amanga*,

Westw., were taken: a ♂ *harpar* bears the note "Oct. 26, 1917. Settled on me to drink sweat." I have not seen any of those lovely light blue species with long milky white tails: I think they require forest and not open bush."

Probably the most interesting Lycaenid from Lulanguru is *Alaena interposita*, Butl., of which a long series of both sexes was sent. It is certainly the species described and figured as *A. hauttecoouri* by Oberthür in "Etudes," 12, p. 7, pl. 3, figs. 7 and 9 (1888). The figures are, as usual in this great work, admirable, and the examples described were from Tabora, only 17 miles from Lulanguru. It is unfortunate that Butler's *interposita*, described in 1883 from a single nearly female-coloured male from Victoria Nyanza, should take precedence over Oberthür's name accompanying the description and figures of the typical form. Arrivillius in "Rhop. Ethiop.," p. 255, is mistaken in sinking Butler's *Alaena aurantiaca*—a very different species—to the male of *hauttecoouri*.

Two of Captain Carpenter's examples of the yellow male bear interesting notes: "Oct. 24, 1917. Aeraeine mimic. When unalarmed flight looks like small *Acraca*." "Oct. 27. On stony kopje where long dry grass. Flight slow and fluttering like Aeraeine on wing. One specimen was bottled as it sat on grass stem!!"

I take the present opportunity to correct the unfortunate slip by which *Telipna reticulata* is quoted in place of *Alaena reticulata*, in Proc. Ent. Soc., 1916, p. cxxv, l. 4, and in the footnote. Furthermore, comparison with the ♂ type of *A. reticulata* in the British Museum proves that Capt. Carpenter's specimen does not belong to this but to a species at present undetermined.

"*Hesperidae*.—Are fairly abundant. One (? *Sarangesa*) is new to me. Of dark mottled grey, it rests on the bare granite rock, flat, with wings outspread like a Geometrid, and is as equally procryptic as the moths on bark. I have sent one or two specimens."

An example of *Sarangesa motozioides*, Holl., Nov. 7, 1917, bears a note similar to the above. Four examples of *Eagriss jamesoni*, E. M. Sh., of July 26-27, 2 of Aug. 1, and 1 of

Nov. 5 are the yellowish dry-season forms; while 2 of Nov. 5-9, and 3 of Dec. 26-31 are the black-and-white wet form. Of these latter a pair taken *in cop.* on Dec. 26 were resting with expanded wings on the under side of a large leaf.

Among the moths collected at Lulanguru was a most interesting series of individuals hitherto regarded as belonging to four different species of the Pterothysanid genus *Hibrides*. The occurrence of all together in the same locality, and almost certainly on the same small kopje top, strongly confirms the conclusion at which Sir George Hampson has arrived, that all are forms of a single species. Of the 11 moths—all taken Dec. 1-31, 1917—3 are white males (*norax*, Druce); 3 are white but strongly veined males (*renosa*, Kirb.); 3 are Acraeoid females (*crawshayi*, Butl.); 1 is the form with orange-ochreous hind-wings like *crawshayi* but fuscous fore-wings with a white subapical bar (*ansorgei*, Kirb.). On this Capt. Carpenter had noted "On wing incipient *Aletis* or *chrysippus* mimic." The eleventh specimen is an interesting variety of *ansorgei* with a rich orange-ochreous subapical fore-wing bar.

"After butterflies come moths, and that brings me to the subject of *insects which come to light*. Moths are almost the only things that *don't* come here—I have never seen so many insects at light. The most curious feature is the predominance of different families—or even species—on different nights. Sometimes the table is covered with wood-borers of numerous forms; on other nights quite small *Carabidae*; then large and annoying *Melolonthidae* predominate; on another night *Elateridae*, sometimes large, sometimes small; then small *Melolonthidae* or *Copridae*, *Mantidae*, *Blattidae*, *Myrmecoleonidae*, a few *Diptera*, *Hemiptera*, *Longicornia*, *Weevils*, water beetles of different groups, *Gerris*. Quite large and very odoriferous *Carabidae*, *Cicindelidae*, and even a beautiful Dragonfly and large Cicadas have all come. Perhaps on one night several species of an insect will come which is never seen again. Indeed Crustacea, Myriapoda, and Arachnida are almost the only Arthropods that have not been attracted! Consequently I have made a large collection for the Brit. Mus., and send you duplicates whenever possible. I have

not yet been able to ascertain exactly what constitutes a 'good dudu night,' but it must be calm and warm, and I think unsettled: a clear starlight night is not so good. How interesting it would be to make huge collections every night and correlate the different groups with minutely recorded meteorological data!

"Now a few other observations from my journal.

"*Attractiveness of exudate from trees.*—On Nov. 11 and a few days before and after I noticed a minute moist patch about a centimetre square on the bark of a tree which was very attractive to Hymenoptera and *Charaxes*. I caught three specimens of brilliant green *Ampulicinae* of at least two species, in succession, and *Pompilidae* also frequented it. It was presumably caused by a fungus disease. Another day a very sickly-looking stem of a sapling about 3 feet high was so attractive to *Charaxes* that half a dozen specimens of different species visited it at once, and probed it eagerly with the proboscis. After a day or two it proved less attractive, but some fine *Cetoniidae* came to it: when gum began to exude it was no longer attractive.

"*Mutilloid Spider.*—I sent you a year ago from Ndala a Mutilloid spider [see p. xcvi], and now send a second specimen like the first, with red thorax and black abdomen with four large white spots. As in the first instance, it momentarily deceived me as it ran along in a very Mutilloid manner. But when alarmed it scurried away in a typically spider fashion.

"*Ammophila lugubris*, Gerst.—I sent you some notes on a very unskilful or inexperienced specimen of this Fossor from Ndala, about a year ago [Proc. Ent. Soc., 1917, pp. xlii–xliv, where the specimen is referred to *beninensis*, Pal. de Beauv.]. A species which seems the same is common here now. On Nov. 26, on the kopje, as I strolled along, watching for butterflies, I saw on a low shrub at my feet one of these *Ammophila* behaving in a very curious manner. It was straddling a small stem and every now and then excitedly grasping it in its mandibles, as if it were a caterpillar. The reason for this was soon seen, for after a few minutes she flew to the ground at my feet and picked up her larva, which

she had dropped as I approached. This little point (grasping the stem) is most illuminating, as showing how the several acts are but links in a mechanical chain : the operations had arrived at a point when the impulse to *grasp something* in the mandibles was overwhelming. Having picked up her larva she carried it belly upwards, holding it at about the 4th or 5th segment, so that its anal extremity projected upwards in the air behind her, and walked with it for about 20 yards, keeping a wonderfully straight course among stones and tufts of grass. She then turned at a right angle and went on for another 10 yards, and then quite suddenly, as if certain of her whereabouts, put down the larva on a small clear space and began to take away the minute pebbles in her mandibles. I could see no difference from the surrounding soil, but the burrow was there right enough, for she very soon disclosed its mouth by removing a clod of earth, and went down, came up again, went down backwards, seizing the larva (a smooth Noctuid) by one extremity (probably anterior, but I forgot to take especial note), dragged it in : then after a short pause for oviposition came out again and started filling up the hole in the usual way, when I bottled her for identification. If she is the same species as the Ndala one she affords the greatest possible contrast in skilful working. [Mr. Rowland E. Turner has carefully compared the two specimens and finds that they are the same species, which he thinks should be placed under *lugubris*, Gerst., until the relation between this and *beninensis*, Pal. de Beauv., is satisfactorily cleared up.]

“ On the evening of Dec. 5th I saw in a shed another specimen of apparently the same species, which I failed to secure. She brought her larva (rather a smaller Noctuid larva than those above recorded) into the hut and started opening up her concealed burrow. Having disclosed it she took out one or two small clods of earth and went down, and reappeared with a Noctuid larva (of the same size as the one she had just brought), which was rather unusually wriggly at its hinder end. She brought out a little more earth from the burrow, and then turned to this latter larva and apparently decided it was too lively, for she proceeded

to massage it systematically with her mandibles from end to end, passing from tail to head. Twice she left off for a moment to push her face along the dusty ground, as if to clean her mandibles from something that soiled them, although she certainly had not broken the skin of the larva. I have never seen a *Fecssor* do this before. Eventually she put the larva down with its head at the margin of the burrow, went down backwards, seized the larva by the neck and dragged it down, came out, went down and came up again with a little more earth, did this twice again, and then dragged down the larva which I had seen her bring in. My attempt to bottle her failed. I had no net with me, and as I was due at the hospital for the evening round I couldn't wait for her return. But I'm sure she was of the same species as the last. It's interesting that she was using two medium-sized larvae instead of one larger specimen.

“*Courtship of Diptera.*—The courtship of *Asilidae* which I have witnessed several times is an interesting performance. The species referred to was almost certainly a *Promachus*. The ♀ sits as usual on a prominent bare twig, and the ♂ hovers in the air like a Syrphid, a few inches away on her right or left front and a little above. His energies are apparently directed to pleasing the lady by his hum: the pitch gradually rises, and as it does so he no longer remains stationary but oscillates slightly up and down, and then, just as the situation gets very exciting, the ♀ suddenly dashes away and the ♂ after her. Sometimes she settles again and the whole process is repeated, but I have never seen the actual union. One very often sees pairs united end to end: at other times the ♂ is on the back of the ♀, who often has her proboscis embedded in some prey [see *Trans. Ent. Soc.*, 1906, pp. 366–68], but whether the latter position is previous or subsequent to the former I do not know.

“In another group of flies, *Bombyliidae*, the ♂ also endeavours to please by his hum: in this case I have caught a specimen for identification [a ♀ *Eroprosopa cluta*, Lw.]. On Nov. 29th I first saw this. It is a species which keeps close to the ground, on which it often settles. On this occasion I saw one, presumably the ♀, sitting on the ground

while the other slowly circled round her, slightly above, making a most peculiar hum in which there was something of the rattling noise made by the large 'clockwork' *Pompilidae*, but can be best described as like the noise of an aeroplane heard fairly high up. Here again the ♀ darted off just as things got exciting. I saw another couple on a subsequent day, and was very anxious to net the hummer to prove it was a ♂, but I couldn't get it apart from the other. I noticed on the second occasion that the sitting specimen vibrated its wings slightly also.

"*Chlamys marshalli*, Jac. (*Chlamydinae*, allied to the *Cryptocephalinae*).—On Dec. 3rd I got a most curious beetle which I am sure is specially procryptic. It is a small, square, solid little insect with no limbs or antennae visible, and no constrictions visible between head and thorax or thorax and abdomen. It is of a greenish brown colour with rough integument. It was sitting on a vertical stem, closely apposed to it, and when I saw it I thought, 'Why does that caterpillar excrement remain on a vertical stem?' For that is precisely its appearance. It was not till I examined it very closely in my hand that I realised it was a beetle, and had it been resting on a horizontal leaf I should certainly have looked for a large caterpillar! I hope you will find it in the box and identify it.

"One more observation—quite a small one, but rather a curiosity. I was at a flowering shrub visited by many Hymenoptera, among them one of the large 'clockwork' black *Pompilidae*. It flew high over my head, but as it went about was closely followed by some half-dozen smaller black Hymenoptera, that might have been *Scoliidae*, just as small birds mob a big one. I can give no explanation, and am much puzzled by it.

"Jan. 1, 1918. Lulanguru.

"With reference to this box, No. 5 [containing Lulanguru captures of Dec., 1917], there are in it some nice, small Braconoid and Lycoid Longicorns, the former of which have absolutely deluded me in the field! I watched one quite a long time flying among some twigs and said to myself, 'Ah!

you are the Braconid which the last Braconid which deceived me, mimicked !' and, lo and behold, it was again the Longicorn in my net !"

Capt. Carpenter's collection, especially from Lulanguru, contains many interesting additions to the great Lycoid combination described and figured by Dr. Marshall from Salisbury, Mashonaland (*ibid.*, pp. 515-18, pl. xviii, figs. 1-52). The abundance of the central models at Itigi was well shown by the capture of 272 *Lycidae* belonging to 9 species, on a single plant on Mar. 23, 1917 (Proc. Ent. Soc., 1917, pp. lvii-lix). These 9 species only contained 2—*Lycus ampliatus*, F., and *rostratus*, L., and these in relatively small numbers of the species figured by Dr. Marshall. The mimetic species, of which a list is printed below, are all different from Dr. Marshall's except *Amphidesmus analis*, and the 3 species of *Dirphya* (*Nitocris*); and upon the mimetic relationship of these last Capt. Carpenter sheds new light. The locality is Lulanguru and the year 1917, unless otherwise stated.

DIPTERA (*Tachinidae*).—*Paraclara magnifica*, Bezzi., Dec. 25. "Mimetic of Lycoid Fossor." Also taken in the Ruanda Country, 30° 35' E., 2° 10' S., on June 8, 1916, when a similar note on the resemblance was recorded.

LEPIDOPTERA (*Tineidae*).—*Oedematopoda princeps*, Z. (allied to *Hyponomeuta*), Dec. 17 and 19. "Lycoid at rest" noted on both specimens.

HEMIPTERA (*Capsidae*).—*Lycidocoris mimeticus*, Reuter and Poppius, Nov. 21 and 26. "Beautifully Lycoid on wing" and "Very Lycoid at rest" are the respective notes.

HYMENOPTERA (*Larridae*).—*Notogonia bembesiana*, Bisch., Jan. 14, 1917, Ndala. "Lycoid Fossor." Mr. R. E. Turner informs me that this species bears a close resemblance to a much commoner and more widely ranging Fossor, *Liris haemorrhoidalis*, F.

HYMENOPTERA (*Tenthredinidae*).—*Hylotoma (Arge) annulipes*, Klug, Nov. 21 and Dec. 4. "Lycoid at rest" on both.

The Hymenoptera Parasitica are considered later, as Capt. Carpenter shows that they play the part of models as well as Lycoid mimics.

COLEOPTERA (*Cetoniidae*).—*Glycyphana (Gametis) balteata*,

de G., Dec. 3. "Lycoid." This mimetic resemblance and the association with *Lycidae* in life was noted by Dr. Longstaff and Dr. Dixey ("Butterfly-hunting," pp. 237, 238, 241).

COLEOPTERA (*Telephoridae*).—*Ichthyurus* sp., Dec. 6 and 13. No note is added to this species, but I think there is no doubt that the pattern is Lycoid, although the colouring of the anterior parts is rather too bright and yellow for a perfect resemblance. It is possible that the insect is Braconoid on the wing.

COLEOPTERA (Longicornia. *Cerambycidae*).—*Amphidesmus analis*, Oliv., Dec. 23. "Sitting on grass-blade very Lycoid." Included in Dr. Marshall's list and shown in his pl. xviii, fig. 25.

COLEOPTERA (Longicornia. *Cerambycidae*).—*Apiogaster* or genus near it, not in the British Museum Collection, Dec. 24. "Beautifully Lycoid at rest," in spite of the fact that the head and thorax are entirely black as well as the apices of the elytra.

COLEOPTERA (Longicornia. *Lamiidae*, *Phytaccinae*).—*Mystrocnemis bicolor*, Auriv., Dec. 24. "Very Lycoid." In this beetle, as in *Glycyphana balteata*, the Lycid pattern is reversed, being black anteriorly and orange-ochreous posteriorly. Capt. Carpenter's note that both these beetles are Lycoid confirms Dr. Longstaff's conclusion that this reversal probably does not detract from any benefit that the Cetoniid may derive from the likeness (*ibid.*, p. 238).

Capt. Carpenter brings evidence that the remaining Longicorns (all *Lamiidae*, *Phytaccinae*) of this combination are Braconoid when flying although Lycoid at rest. Of the models for the two larger species *Dirphya* (*Nitocris*) *nigricornis*, Oliv., and *similis*, Gahan, only *Pseudobracon servillei*, Brullé, Dec. 5,—a Braconid in spite of its name—appears in the Lulanguru collection. It bears the note that the large *Dirphyas* in the same box "look much like this on the wing." The pattern of this model is that of *Phaneromeris* sp. figured by Dr. Marshall on his pl. xviii, figs. 44, 45, while the two Lulanguru mimics enclosed with it are represented in figs. 29 and 30. A ♂ specimen of *D. nigricornis*, Dec. 14, 1916. Ndala, bears the note "Most extraordinarily like Braconid

on the wing," while another ♂ of Nov. 29, 1917, and a ♂ *D. similis* of Dec. 23 bear no special note, but are the specimens referred to in the label of the *Pseudobracon*.

A smaller *Dirphya* (*Nitocris*), of still greater interest, was also included as a Lycoid by Dr. Marshall, and represented as *Nitocris* sp. in his fig. 28. It appears to be still undescribed, although specimens from Damaraland, Nyasaland, and Umtali exist in the British Museum. A ♂ of Dec. 17 bears the note "Caught on wing as a Braconid," and a ♀ of Dec. 24, with "Completely deceived me. Caught as a Braconid on wing," is probably the specimen referred to in Capt. Carpenter's letter of Jan. 1, 1918 (p. cxxxviii). The former specimen set with expanded wings shows that the distal black and basal pale orange-ochreous area of the elytra are continued on to the functional wings, which therefore bear a pattern. This is very rare in beetles, and Dr. Gahan and Dr. Marshall are as sure as it is possible to be without making a special study of the point that all the African *Lycidae* of this combination have uniform, dark lower wings. The appearance is clearly mimetic of *Braconidae* during flight, and affords the strongest confirmation of Capt. Carpenter's conclusions, with which Dr. Marshall tells me that he entirely agrees.

Since the above paragraph was written a specimen of each of the larger *Dirphyas*, *nigricornis* and *similis*, has been set with expanded wings, showing that in these too the elytral pattern is continued on to the functional wings. Furthermore, there were marked differences between the concealed patterns of the two specimens which may be characteristic of the species.

The most perfect models for the small *Dirphya* are doubtless Bracons with patterns like those shown on figs. 44-46 of Dr. Marshall's pl. xviii, and especially the two smaller forms represented in figs. 47 and 48. None of these were sent by Capt. Carpenter—although, as already mentioned, the *Pseudobracon* possesses a similar pattern—but he included a Braconid of the genus *Glyptomorpha*, Dec. 31, with a pattern like that of the Braconid and Ichneumonid represented by Dr. Marshall in figs. 59-61; also another smaller Braconid of the genus *Merivotus*, Dec. 17, with a less emphasised form of the same

pattern. These would doubtless serve as models when on the wing, but there can be no doubt that smaller species with the pattern of the *Glyptomorpha* exist in the locality where the *Dirphyas* were taken. Dr. Marshall shows in fig. 62 a Reduviid bug with the most wonderful mimetic likeness, at rest as well as in flight to the *Parasitica* of figs. 59-61.

From these last species of *Dirphya*, Lycoid at rest, Braconid in flight, we pass to two species of the allied Lamiid genus *Oberea*, of which the first is doubtfully Lycoid, the second certainly not, being Braconoid at rest as well as in flight. Two males of the first, *O. sp.*, probably *ventralis*, Gahan, taken Nov. 22 and Dec. 26, both bear notes recording that they were "caught on the wing as Braconids"; a third male of Jan. 1, 1918, was "very Braconoid on wing." The pattern is very similar to that of the *Dirphyas* save that the anterior orange-ochreous is so much reduced that any direct mimetic likeness to the *Lycidae* is doubtful, although a place on the outskirts of this dominant combination is probably advantageous. In the second species *Oberea sp.* very near *scutellaris*, Gerst., ♂, the pattern is similar but the anterior colouring red instead of orange-ochreous, bringing about a close resemblance, especially on the wing but also at rest, to the black and red *Braconidae*. The beetle was "taken for Braconid on wing," the model, a species of *Iphiaulax* near *coccineus*, Brullé, being sent with it, both captured Apr. 15, at Itigi. Three species of *Braconidae* with this pattern, including *coccineus*, together with the mimetic *Oberea scutellaris*, Gerst., and Reduviid bug *Callilestes bicolor*, Dist., are described and shown by Dr. Marshall on p. 533 and in his pl. xviii, figs. 53-58.

The resemblance of Bornean Longicornia to *Braconidae* is dealt with in detail by the late Mr. R. Shelford, who gave a list of 12 species of *Phytaccinae*, including 9 *Obereas*, that are mimetic in this way (Proc. Zool. Soc., 1902, pp. 238-40).

The next letter, written in January from Dar es Salaam, gave an account of a visit to Lake Tanganyika after Capt. Carpenter had been relieved from his post at Lulanguru:—

"Here I am at last in Dar es Salaam, with, so far as I

can see, no prospect of getting home until months after all activities have come to an end. It's not in any way an attractive place, and every one dislikes it. I am in charge of the West African section of the huge carrier hospital here, and shall apparently remain so. I *may* get some local leave, but no home leave is being given. I arrived here on Jan. 15th after a most enjoyable week visiting Tanganyika, and think the Entomological Society might like to hear something of the lake, so I write this account.

“ Having been relieved of my last job I obtained unofficial leave to be absent for a week, and left Lulanguru at 7 p.m. on Jan. 3rd in a very comfortable, first-class coach, and at daybreak found the train just beginning the descent to Tanganyika, among hills well wooded and interesting, because all the vegetation seemed different from that at Lulanguru and also from that around L. Victoria. I noticed Bamboos and what I took to be giant Lobelias, though of a species different from the one I had met at Kigezi. I saw, before it was really light, some huge dark animal moving away from the railway, which I took to be a Rhino.—the first I have seen. Incidentally also it was the only Mammal I saw on the journey to Kigoma and back from there the whole way to Dar es Salaam, although one *night* was spent in travelling—rather a remarkable difference from the teeming herds of game to be seen from the Uganda Railway. Well, as we got nearer I saw the lake in front of and below us, very black and stormy-looking, with the mountains of the other side clearly visible; on our right, to the north, a rugged range of bare rocky mountains was flooded with golden light from the rising sun, and the whole effect was rather magnificent.

“ We reached Kigoma, which lies at the head of a well-sheltered bay, at 7.30 a.m. on the 4th. Though prettily situated it is not itself a pretty place. The northern coast is formed by low hills covered with green bush, affording a pleasing contrast with red soil and blue water. Most of Kigoma lies on the south side, so that there are no trees or bushes worth mentioning. There are only three large buildings, one a hotel and two Government blocks. At the south

side of the bay is a headland of a formation quite different from the north, consisting of small rounded boulders and large pebbles embedded in a loose matrix.

“ Shortly after arrival I wandered along the shore and found numbers of the fresh-water jellyfish cast up on the sand, in diameter about equal to a florin or half-crown, and so absolutely colourless that I never succeeded in finding one *in* the water. I also found numbers—but all water-worn—of one species of the molluscs peculiar to Tanganyika, a large conical species some three inches in height, and a single specimen of a tuberculated shell like the marine *Nassa*. There were also single valves of Lamellibranchs with marine appearance.

“ In the afternoon I was taken in the local car to Ujiji, which lies 7 miles south of Kigoma, the country in between all cultivated. I was much disappointed in Ujiji: as it is an old Arab settlement I had expected to find it picturesque, but it merely consists of great numbers of square mud houses, dirtily whitewashed, with thatched roofs, swarming with children. The famous meeting-place of Stanley and Livingstone in 1871 is marked by a block of concrete under an old, decrepit mango tree, formerly, at the time of meeting, on the shore. Owing to the shrinking of the lake, like the other African lakes, this point is now some 200 yards distant from the present actual shore, and I should think some 20 feet above it. Hence between 1871 and 1917 the lake has fallen 20 feet. When one realises that 6000 feet have been sounded without touching bottom (authority, Commander Thornley, R.N., in charge of our boats on the lake), one wonders what is happening that such a prodigious volume of water should fall in level at the rate of about 5 inches a year!

“ On the morning of Jan. 5th I wandered along the shore of the bay looking for objects of interest, and got a fine *Cicindelid* [*C. regalis*, Dej., also *C. intermedia*, Klug] new to me. I may say here that almost all the beetles [including the Coprid *Onitis uncinatus*, Klug, ♂] and Hemiptera I saw were strange to me, also some moths, but the only butterflies seen were familiar. I obtained a few specimens from both

sides of the lake which may be of interest to the Entomological Society. On this morning I saw and obtained a fine Pompilid [*Psammochares irper*, Gerst.] quite new to me, apparently specialised for digging in very loose sand such as *Bembex* also loves, for, like *Bembex*, it had the fore-limbs set closely with large bristles much more abundantly than those of other Pompilids which dig in hard soil. It is obvious that a brush-like leg is much more suitable when the sand is soft and loose. This species, which I send you, is grey and black, with wings approaching the Lycid coloration. I first saw it running quickly about, obviously searching for something, and soon it came to a spot where it scratched away a little loose sand and laid bare a spider, paralysed, and apparently *hidden away* until the wasp had found a suitable spot in which to bury it (this is a trait I have not met before among Fossors). The wasp then took it up and ran backwards with it for a good many yards, only occasionally turning round to negotiate a difficulty, until she came to the spot where the burrow had been previously dug: for she put the spider down, took away a lump of sand, and laid bare a very shallow hole into which she put the spider, without going down herself, and quickly covered it up with loose sand.

“ On the evening of the fifth I embarked on a small tug, which had done 12 years’ service on the Congo, and was bound for Albertville, the port which the Belgians have made on the west side of the lake, where the Lukuga river, one of the main sources of the Congo, takes origin. Since the war began the Belgians have made this port and run a railway to it, so that now one can cross Africa from Dar es Salaam to the mouth of the Congo by rail and steamer alternately. This Albertville is a new place: the former Albertville (now known by its native name of Toa) lies some 20 miles northwards. After a night of oily calm I awoke just before dawn to find that we were passing the most prominent point of the western coast (which lies S.S.W. from Kigoma), steaming between the mainland and a few small islands very close to the shore, rocky, and densely covered with bush, reminding me very much of islands of the type of *Ngamba* in L. Victoria.

The mainland has ranges of hills rising one behind another to a height of about 3000 feet, for the most part well wooded, but sometimes bare. Toa was soon passed—a few houses prettily situated on a low hill with its base lapped by the lake. Between this hill (which not long ago must have been an island) and the mountains is a stretch of flat sand overgrown with bushes: part is still under water, and forms a lake or lagoon which was used by Belgian hydroplanes in July, 1916, as a base from which they bombed the Germans out of Kigoma with great success. As we drew near the source of the Lukuga the coast became flatter, and there were long sandbanks. The river arises at such an angle with the lake that its source is almost invisible: it at once breaks back at a right angle and flows south for a bit before winding about in a westerly direction around the ends of the ranges of hills. It has no falls or cascades, but runs swiftly, being about as broad as the lower river at Oxford. The banks are well marked, and not concealed by beds of papyrus. I walked a mile or two along it, and was interested to see a train leave Albertville for the interior. I also collected a few insects, which I send you. [Among these were *Sphex* (*Parasphex*) *albisectus*, Lep.; *Bembex forcipata*, Handl.; *Chromatophania fenestrata*, Villen.; several specimens of *Pachytoma gigantea*, Illig.; and *Cicindela intermedia*, as on the E. of the lake.]

“ We reached Albertville at about 9, and one’s first impression was, ‘ Why, this is Tropical Africa.’ It looked like the old pictures and engravings one knows so well—and quite quite different from the infernally dull bush country which seems to compose most of late German East Africa, and also different from, and more ‘ tropical ’ than, the Uganda shore of L. Victoria—partly, I think, because of the little steep tree-clad hills, and sudden deep little valleys with ferns at the bottom; and more palm trees than one is accustomed to see. We put off again at 11 and went back to Toa to pick up the P.M.O. It was a most lovely blue evening, full of colour, though no more so than Victoria Nyanza. I noted near the coast that the water in places was quite green, in streaks, like the patches of colour one sees in the Red Sea, except that the

latter are red—both presumably due to Algae. We came back to Albertville for the night, and slept on board, and I had a delicious bathe next morning.

“ On Jan. 7th we sailed along the coast southwards for 6 hours and returned to Albertville just after dark. As we got more southward the mountains became higher, though still forested, and their irregularity was interesting and beautiful. Opposite us on the east coast, forming the most marked prominence thereof, was a very fine rugged group of mountains, named Kongue, rising to 5000 feet, which through glasses appeared to descend sheer into the lake, and one could see deep ravines and marks of waterfalls. I wished we had been sailing along that side. At the end of our 6 hours’ run I got an hour ashore and secured a couple of Coprids, both new to me, under cow droppings on the sand [*Liatongus planatus*, Cast., ♀, at Cape Tembwe; *Sisypthus crispatus*, Gory, ♂, at Tembwe Bay]. We had a very pretty pink sunset, and just after dark were met by a sudden thunderstorm which nearly sank the boat we had been towing, but it was secured alongside when the storm came on. It was quite a savage little storm and very noisy, and I was much interested, knowing so well the storms on Victoria!

“ Next day we returned to Toa, and sailed at 4 p.m. on our way back to Kigoma. For 4 hours we plugged against a heavy head wind and sea and got a good tossing—many on board (including a *real* sailor, superintendent of the lake ships) being sea-sick, but I much enjoyed the experience. These storms on Tanganyika are much feared by the native canoeemen, who never go far from land, but their dug-outs are very poor sea boats compared to the fine built canoes on L. Victoria.

“ Now a few words about the differences between Victoria Nyanza and Tanganyika. Except for the fact that both contain fresh-water they are as different as they well could be. But even in the water there is a difference, because of the green areas of Tanganyika due to some Alga. The coast-line is very different—Victoria, comparatively ‘tame-looking’ with low, *flat-topped* hills, or marshes of papyrus—Tanganyika with high steep mountains, and no marshes, and very very

little papyrus, altogether wilder-looking. Victoria is shallow: I do not think its maximum depth reaches 600 feet, whereas Tanganyika has been sounded to 6000 feet without touching bottom. In shape, of course, they are very different, and herein probably lies the reason of the difference in depth. Tanganyika fills up part of a great rift, whereas Victoria is merely a huge rain-puddle. The well-known fauna of Tanganyika is, of course, very different. I secured shells like *Nassa*, *Trochus*, *Littorina*, but some of the most peculiar species have to be dredged for. Such fish as I saw being sold were totally different from the ones I know in Victoria. Curiously enough, during all the time I was on Tanganyika I saw and heard no signs of the great fish eagle (I believe its name is *Haliaeetus vociferans*) which is so conspicuous on Victoria, though I am told it exists on the lake. The flora seemed very different—very few of the common bushes on Victoria were noted on Tanganyika; and I saw many trees, shrubs, and flowers new to me. I wished I had had time to collect insects on the forested hills of the western shore. Some day I hope to return home by that route. From L. Tanganyika to Boma, the ocean port at the mouth of the Congo, I believe takes 20 days or so.”

Among the specimens captured at Kigoma on Jan. 9 were a Fossor of the genus *Trypoxylon* near *confrater*, Kohl. and the following Coleoptera—*Oxythyrea vitticollis*, Boh., *Laccolptera turrigera*, Boh., *Aspidomorpha parummaculata*, Boh., and *Mesoplatys ochroptera*, Stål.

“ Mar. 1, 1918.

“ I wrote to you last from Dar es Salaam that I was just off on a tour up-country again to tackle an outbreak of plague in a district named Singidda, N. of the railway and S.W. of Arusha. I have just returned to the headquarters of the Political Officer at the conclusion of the tour. Curiously enough, I never saw a case. The epidemic appears to have begun in mid-January, and there must have been about 100 deaths, but the people left the infected houses and bolted into the bush, so that the outbreak was more or less stayed (though I have heard of three more deaths in the district since I left it). I investigated about 112 deaths, of which

83 had definite symptoms of plague, others doubtfully plague, some probably anthrax. I have given about 750 inoculations, but could only do 'contacts,' since the population is very large and the vaccine very limited.

"It's a most glorious country—the tail end of the Great Rift Valley, with very little bush—nearly all a huge expanse of undulating grass-land with a little bush in the hollows, an escarpment each side (the valley being about 20 miles in breadth) of about 300 feet, I suppose, with clumps of granite rock cropping out along the top and here and there in the valley. To the N.E. could always be seen a fine conical peak rising, I suppose, about 3000 feet above the surrounding country, called Amang (? why?) by the Germans, Nguruwe by the natives of this part (Wanyaturu). It looks like a volcano, and is marked on the map as being clothed with primitive forest (ah-h-h!!!). But no chance of collecting there! This is a *very* disappointing country for butterflies—very few in species and individuals, but *Synchlœ* is of interest, as I haven't seen it since I caught it in the bottom of the *other* rift (Kigezi!). But the paucity of butterflies is more than compensated for by thousands of water and wading birds congregated on shallow lakes which dry up in the dry season. Alas! I know so little about waders, but spotted Avocets and Flamingoes! I watched one of the latter feeding—he put his head under water in the well-known inverted position, and then proceeded to circle round his own head, which he kept under water until he had made two revolutions, then put it down again in the same spot and circled round it twice more, stepping sideways with trampling movements of his feet. I suppose this trampling squeezed out of the mud minute organisms which he strains out of the water like a whale. I could spend hours with glasses (and oh, for a cinema camera!). The birds are so tame you can sit down and watch them within 20 yards! Flocks of *Coots*, so that the water is black with them—which rather surprises me.

"I expect to return to Dar es Salaam shortly, and then get a month's local leave, and then have asked—mainly for Lepidopterous purposes!—to be sent to Portuguese East Africa!"

CAPTAIN G. D. H. CARPENTER'S PIERINES FROM LULANGURU AND ST. MICHAEL'S MISSION.—Dr. F. A. DIXEY exhibited Capt. Carpenter's Pierines and made the following observations :—

The Pierines collected by Capt. G. D. H. Carpenter at Lulanguru, seventeen miles W. of Tabora in East Africa, are in several respects of great interest. The most noteworthy captures are as follows :—

(1) A series of *Teracolus ducissa*, Dognin, consisting of five males and seven females, including one pair taken *in cop.* This pair settles the question of the male of *T. ducissa*, which has been erroneously stated to be like the female. In reality it bears considerable resemblance to the male of *T. subfasciatus*, Swains., from which it is chiefly distinguishable by the fact of the dark subapical bar of the fore-wing being continuous into the hind margin, and the included apical ground-colour being of a deeper orange. Aurivillius in Seitz. "Macrolepidoptera of the Ethiopian Region," p. 61, describes the male of *T. ducissa* as differing only from the female by its yellow ground-colour. His figures of the sexes (*ibid.*, pl. 20, f, g) really represent two females; but the same plate contains a figure of "*subfasciatus* ♀," which may very well have been drawn from the male of *T. ducissa*. My attention was called to this by Prof. Poulton.

(2) A long series of *Teracolus casta*, Gerst., comprising twelve males and seventeen females; twelve of the total number were taken paired. The males are mostly of the large dark-bordered form called *sipylus* by Swinhoe. The females show a remarkable range of variation.

The captures range in date from July 25, 1917, to Jan. 2, 1918. Capt. Carpenter notes that the wet season began from the end of November. In most of the species there is a well-marked correspondence with the change in meteorological conditions. This is evident in the case of the three species of *Terias*, *T. brigitta*, Cram., *regularis*, Butl., and *senegalensis*, Boisds., though not without some exceptions. The specimens of the first-named species were caught July 25–Aug. 1, and are all of the dry-season form, the males being somewhat transitional, and the females, as is usual, having the dry-season character more strongly

developed. The *T. regularis* caught in July are "dry," though not markedly so; those captured from Nov. 23 to Dec. 10 show a gradually increasing wet-season coloration. July examples of *T. hecale* are "dry"; a December male is transitional, but a female captured on Dec. 31 is conspicuously "dry." On the other hand, a pair taken on Jan. 1 is "wet" in both sexes. In *Teracolus regina*, Trim., the dry-season character is maintained in July. In December and January it is replaced by the wet. Not much seasonal difference is observable in *Catopsilia florella*, or in *Teracolus ducissa*; in *T. casta*, however, the change is marked. The dry-season character prevails throughout July; in October it begins to yield; from November to the following January the wet-season coloration is fully established. The specimens of *T. achine* were taken in December; they are all of the full wet-season phase. The same applies to the single example of *Teracolus annae*, Wallg. (caught in November). Two July specimens of *T. eris*, Klug, are "dry," the remainder (November and December) are "wet." *Belenois sererina* (July) is "dry." Other forms of *Belenois* I reserve for treatment on a future occasion.

Another consignment of Pierines from Capt. Carpenter comes from St. Michael's Mission, in Lat. 32° 45' E., Long. 3° 45' S. The earliest date for these specimens is Aug. 21, the latest is Oct. 12. Capt. Carpenter notes, "Dry season till light rains in early October."

The *Teracolus callidia*, *T. incretus*, *T. eragone* and *T. achine* were all taken in August, and in all the dry-season character is well marked; as it is also in *T. evarne* and *T. annae* (October), *Terias brigitta* (Aug. and Sept.) and *Belenois gidica* (Sept. and Oct.). The August and September *Teracolus rogersi* are "dry," the October specimen is "wet." All the *T. casta* except one ♀ were captured in August. The latter (Oct. 8) shows an approach to the wet-season phase; the remainder are all "dry." It will be seen that in this series of Pierines the correspondence of seasonal phases with Capt. Carpenter's note of seasonal conditions is remarkably close, so far as the material goes. The "light rains" that began in early October are immediately accompanied by a slight but

distinct change in *Teracolus rogersi* and *T. casta*; in other cases they have not, up to October 8, produced any perceptible effect.

Nuptial Flight of Pierines.—It may be remembered that in Proc. Ent. Soc. Lond., 1917, pp. liii, liv, a number of cases were recorded in which paired specimens were taken by Capt. Carpenter, the male in every instance but one supporting the female. Since then many more pairs have been sent home by Capt. Carpenter from the same locality (Itigi) as before; and in addition to these, further examples from Lulanguru. The following is a list of all the Pierines actually captured in the paired condition by Capt. Carpenter, including those mentioned in the communication above referred to. It will be understood that in every case the paired specimens themselves have been sent home by Capt. Carpenter, and may be seen in the Hope Department.

<i>Teracolus casta</i> , Gerst.	17 pairs
<i>T. eragore</i> , Klug	1 pair
<i>T. ducissa</i> , Dogn.	1 pair
<i>T. achine</i> , Cram.	3 pairs
<i>Herpaenia eriphia</i> , Godt.	1 pair
<i>Pinacopteryx simana</i> , Hopff.	35 pairs
<i>Belenois gidica</i> , Godt.	1 pair
<i>B. mesentina</i> , Cram.	10 pairs
<i>B. severina</i> , Cram.	8 pairs
<i>Terias regularis</i> , Butl.	1 pair
<i>T. senegalensis</i> , Boisd.	1 pair
<i>Catopsilia florella</i> , Fabr.	2 pairs

Eighty-one pairs in all.

Inasmuch as (except in one pair of *P. simana*) the female was invariably supported by the male, it may, I think, be concluded that this is the general rule in the subfamily *Pierinae*.

SPECIES OF *HELICONIUS* FROM FRENCH GUIANA. Mr. W. J. KAYE, on behalf of Mr. J. J. JOICEY, exhibited a very fine series of named forms of *Heliconius melpomene* and its companion species *Heliconius erato* from French Guiana. One or two remarkable new forms of the former and a number of

the form *tellus* of the latter were not present in a former large collection from the same locality two years ago.

MONSTROSITY IN *LEPTOTHORAX ACERVORUM*, F.—Mr. DONISTHORPE exhibited a very remarkable monstrosity of an ant, which had been sent to him by Mr. R. Butterfield of Keighley, who had taken it on April 26, 1918, in a mixed nest of *Myrmica ruginodis*, Nyl. and *Leptothorax acervorum*, F., at Mauley Bog, who suggested it might be a parasite. Mr. Donisthorpe pointed out that it was a monstrosity of the *Leptothorax*, being a small dealated ♀, but unlike all the Myrmicine ants, it only possessed one very small joint joining the epinotum to the gaster, instead of a pedicel of two joints, the petiole and post-petiole.

He also exhibited a specimen of *Elatér sanguinolentus*, Schr., taken on Wimbledon Common, May 28, 1918. He said that when hunting for bees, etc., for Mr. Morice, he noticed this beetle in some numbers, and as far as he was aware it had not been taken on Wimbledon Common for twenty-five years.

ABERRATIONS OF BRITISH RHOPALOCERA.—The Rev. G. WHEELER exhibited a specimen of *Pararge megera*, L., ab. ♀ *mediolugens*, Fuchs, taken at Guildford on May 31st, and observed that it was the first time he had met with this form either in England or abroad. All the specimens of this species met with on this day were unusually dark. He also showed a fine specimen of the brassy aberration *intermedia*, Tutt, of *Rumicia phlaeas*, L., taken at the same time and place.

METHOD OF FORMATION OF "CUCKOO-SPIT," BY *PHILAENUS SPUMARIUS*.—The PRESIDENT said that, as the nymph of *Philaenus spumarius*—the common "cuckoo-spit" insect—was now very abundant, and specimens for observation were easily obtainable, he wished to call attention to a remarkable peculiarity in its abdominal structure, which he had noticed when examining the insect a few days ago, and to which he could find no reference in any of the text-books or other works he had had time to consult. The peculiarity consisted in the fact that the tergites and pleurites of the abdomen from the 3rd to the 9th, instead of ending as usual at the sides to form lateral edges, are curved round and continued under-

neath the abdomen as membranous extensions, which meet in a suture along the middle line, or sometimes even overlap one another. Between them and the true ventral surface of the abdomen a cavity is formed which is filled with air; and it is into this air-chamber that the spiracles open. A median triangular lobe arising from the sternite of the 2nd segment fits in between the lobes of the 3rd segment, and together with a ridge extending from it on each side, closes up the air-chamber in front. Air can be admitted to, or expelled from, the chamber by means of a Y-shaped slit or valve, formed where the lobes of the 9th segment and the anal lobe come together. Fabre in his account of the froth insect ("Souvenirs," 7th Ser. 1900) had noticed this Y-shaped slit at the end of the abdomen, and correctly observed that it was by means of this valve that it blows its bubbles: but this was about the only accurate observation in his account, which for the rest must be treated as mainly conjectural or imaginary. Kershaw, in a paper in "Psyche" for 1914, had described the structure of the abdomen in the case of another species of Cercopidae, but whether for the first time or not, he was at present unable to say. Kershaw, however, maintained that the air which fills the bubbles was expelled along with the liquid from the alimentary canal, thus upholding the view which has been generally accepted since the time of De Geer; and he believed that the chief function of the air-chamber was to keep the spiracles from being clogged by the froth which surrounds the insect. The President said he was convinced from his own observations, confirmed by those made by Mr. F. Muir at his invitation, that there was no air mixed with the liquid as it issued from the anus; that the air with which the bubbles of froth were blown was forced out from the air-chamber beneath the abdomen through the Y-shaped slit at its end. Glands at the sides of the 7th and 8th abdominal segments from which tufts of white filaments extend had been variously interpreted, Berlese considering them to be the source of the liquid secretion, and Prof. Porta as a combination of wax-glands and tracheal gills; but as he found that the white tufts were completely dissolved in ether, he believed the glands were simply wax-

glands, though possibly they might secrete something of a mucilaginous nature that gives coherence to the froth. He hoped some of the Fellows present would take the opportunity to make observations on the insect with a view to confirming or disproving the account he had just given.

[Since the date of this meeting, I have found that a full account, agreeing in all essential respects with my own observations, was given by Dr. Karel Šule in *Zeit. für Wissen. Zool.* Bd. 99, pp. 147 *et seq.* (Nov. 1911).—C. J. G.]

BOTH SPECIES OF *HEMARIS* FROM THE NEW FOREST.—Mr. HAMILTON DRUCE exhibited about 30 specimens of *Hemaris tityus (bombylififormis)* and *H. fuciformis*, which he had taken near Brockenhurst on May 18th, 19th, 20th, and remarked that the extensive wood cutting in the Forest had not depleted their numbers.

Papers.

The following Papers were read:—

“Studies in Rhyneophora, iv; a preliminary note on the Male Genitalia,” by DAVID SHARP, M.A., M.B., F.R.S., etc.

“Notes on the Ontogeny and Morphology of the Male Genital Tube in Coleoptera,” by FREDERICK MUIR, F.E.S.

“Notes on various Species of the American Genus *Astylus*, Cast. (Coleoptera), with Descriptions of their Sexual Characters,” by G. C. CHAMPION, A.L.S., F.Z.S.

“New Staphylinidae from Singapore, pt. ii,” by MALCOLM CAMERON, M.B., R.N.

Wednesday, October 2nd, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President. in the Chair.

Alteration of Bye-law.

The proposed alteration in Bye-law viii was read for the second time.

Exhibitions.

LIFE-HISTORY OF *LYCAENA* ALCON.—Dr. CHAPMAN exhibited a bred specimen of *Lycaena alcon*, probably the first specimen

that has been bred, certainly the first from larvae taken in the autumn, and made the following observations :—

The life-history is interesting as parallel to, but differing from, that of *Lycaena arion*. The young larva feeds in the autumn in the flowers and other portions of *Gentiana pneumonanthe*, and probably of other Gentians. So far it is exactly parallel in growth to other Blues, such as many of our Plebeïids that pass the winter in the third instar; when it reaches the third instar it leaves the plant, wanders off, and, hitherto, efforts to carry it further have failed. At this point it agrees with *L. arion* in habits, but it is not like *L. arion*, which is in a remarkably modified and concentrated (as regards skin armature) fourth instar, but is in quite an ordinary third instar. In its plant life it has differed also in that several, often five or six, larvae live amicably in one flower, whereas *L. arion* is solitary, and if by any accident two larvae meet, as by a second egg having been laid on the same flower-head, or especially when incautiously associated in captivity, they are inveterate cannibals.

The remaining history is that both *arion* and *alcon* live in the nests of ants—I kept both species in those of *Myrmica scabrinodis*—and pupate in the nest (re *L. arion*, teste Capt. E. B. Purefoy). The differences are that *L. arion* eats the ant brood, whereas *L. alcon* certainly sucks their juices without eating them, and I could not prove that it ever actually ate them, though I thought it did so when past the winter, when its food would more often be ant pupae.

L. arion is in its fourth instar, and provided with a skin armature not unsuitable to it when full grown. *L. alcon* has only a third-instar armature, and when full grown might almost be described as without one, for, like *L. arion*, it does not moult after entering the ants' nest, but attains its full growth still in the third instar. The skin is then so attenuated that the fat-masses are very obvious, and its general aspect is like that of an internal feeder rather than that of a butterfly. It is to be noted as exceedingly remarkable that a butterfly larva should attain its full growth after only two moults.

Monsieur Oberthür, who is familiar with localities where *L. alcon* is common, and considered it highly probable that it

had a history similar to that of *L. arion*, and who with the assistance of Mr. H. Powell found that ants would carry off the larva of *L. alcon*, and that it would lap up the juices of wounded ant larvae, provided me with the young larvae for observation, in both 1916 and 1917, and my success in rearing the insect is entirely due to his initiative.

My detailed notes have been sent to him to appear in the "Etudes de Lépidoptérologie comparée."

Mr. Powell has seen the larva of *L. alcon* carried off by *Tetramorium caespitum* and by *Tapinoma erraticum*. Acting on this hint Mr. Donisthorpe provided himself with a nest of *Tetramorium*, and now has a larva of *L. alcon* thriving in it. I have larvae in nests of *Myrmica scabrinodis* and *M. laevinodis*.

AN OUTDOOR SPECIMEN OF THE COCKROACH.—Mr. DONISTHORPE exhibited a specimen of the common Cockroach (*Blatta orientalis*) taken under bark of oak in the New Forest, far away from any houses, July 29th, 1918. Dr. NEAVE and the PRESIDENT commented on this exhibit.

ERGATANDROMORPH OF MYRMICA SULCINODIS.—Mr. DONISTHORPE also exhibited a curious ergatandromorph of *M. sulcinodis* taken on Bloxworth Heath, from the collection of the late Rev. O. Pickard, Cambridge.

LARVAL SKINS OF DYTISCUS MARGINALIS.—Mr. HUGH MAIN exhibited the three larval skins of *Dytiscus marginalis*, prepared for demonstration purposes. Ova were deposited in captivity about the last week in May of this year. The larvae hatched on June 4 and 5. The first moult of one of the larvae took place on June 13, the second moult on June 28, and the pupa was disclosed on July 28. The other larvae passed through the same stages round about the same dates. The empty larval skins were floated out and spread on glass under water, and after drying were mounted up with a cover glass like a lantern slide, strips of cardboard being inserted to prevent pressure on the specimens.

EXPERIMENTS IN COLOUR-INHERITANCE IN PEDICULUS HUMANUS.—Mr. BACOT, in referring to some breeding experiments he had conducted respecting the inheritance of dark and light coloration in *Pediculus humanus*, explained that his results, which were of an indefinite character, were com-

pletely valueless owing to the discovery by Sikora that these insects reacted phototropically to the light or dark hue of their surroundings. It appeared that the factors necessary to the production of dark pigmentation were exposure in some earlier instar to light while in a dark environment. Individuals kept in complete darkness did not react. In his experiments a strain of lice which showed only pale greyish forms during the first three or four generations then commenced to produce dark (so-called melanic) individuals, presumably owing to the white sides and grey flannel in the box having been blackened with excrement by the insects during this period. With regard to the lengthy series of breeding experiments he had carried out the results curiously simulated some features of discontinuous variation, suggesting Mendelian inheritance in which the proportion of dark and light forms did not conform to theory. It appeared, in view of Sikora's discovery, that this was to be accounted for by the chance exposure to light of susceptible larvae or nymphs while amid dark surroundings during examination; the small glass-bottomed boxes in which the broods were reared being normally carried wrapped up in paper in a vest pocket, where little, if any, light could penetrate. The nature of the darkening was apparently twofold: (1) dependent upon the pigmentation of the chitinised plates, and (2) to the suffusion of the general skin surface. His own results suggested that, while the first character might be present without the second, the second was always accompanied by the first.

Paper.

The following paper was read, the author illustrating his subject with photographs shown in the epidiascope.

“Notes on Australian Sawflies, especially ‘Authors’ Types’ and the Specimens in the British Museum of Natural History and the Hope Collection in the Oxford University Museum, with Diagnostic Synopses of the Genera and Species,” by the Rev. F. D. MORICE, M.A., F.E.S.

Wednesday, October 16th, 1918.

Dr. S. A. NEAVE, M.A., D.Sc., F.Z.S., Vice-President, in the Chair.

Tea Fund.

The TREASURER having brought forward the question of subscriptions to the Tea Fund, a discussion took place during which the question was raised whether it would not be better for the Society to provide tea as one of its regular expenses; a charge for tea was also suggested. Eventually it was agreed *nem. con.*, on the motion of Mr. E. E. GREEN, seconded by Mr. H. ROWLAND-BROWN, that the question be referred back to the Council.

Alteration of Bye-law.

The proposed alteration in Bye-law viii was read for the third time, and it was announced that the Special Meeting would take place immediately before the Ordinary Meeting on Nov. 6th, at 8 p.m.

A RARE COCCID.—Mr. E. E. GREEN exhibited specimens of a rare Coccid (*Kermes quercus*) taken on the stem of a single oak, at Selby (Yorkshire). The species had been taken on two or three occasions only, apparently in the London district. The present examples were found to be associated with dense groups of adventitious buds on the stems of the tree, and were extraordinarily like the buds themselves.

EUPITHECIA HELVETICATA VAR. ARCEUTHATA AND A LIVING LARVA.—Mr. W. G. SHELDON exhibited specimens of *Eupithecia helvetica* var. *arceuthata*, Frey, and a living larva from Surrey, and made the following observations:—

E. helvetica, var. *arceuthata* has been known for many years to occur locally in the south of England. It was discovered so far back as 1862 by Harper Crewe, who in this and the following year seems to have secured a number of larvae. Specimens are said to have since been taken in Surrey, but the only definite record seems to be one by B. A. Bower in E.M.M., vol. x. (2nd series) p. 42, who records two examples beaten

from Juniper from the neighbourhood of Croydon; the other supposed specimens have turned out to be *E. satyrata* (see South "British Moths," vol. ii, p. 239).

It seems to be exceedingly scarce in collections, the only specimen purporting to be this form that I have seen is one which was in the collection of the late C. A. Briggs, and which I purchased at his sale; this is certainly not *E. var. arceuthata*.

In 1915 a friend informed me he had beaten two green *Eupithecia* larvae from Juniper in Surrey, and in the following year bred two undoubted examples of this variety therefrom. In 1916, my friend having kindly given me the locality, I obtained six larvae, from which I bred three examples. In 1917 thirteen larvae were obtained, from which, however, only three more imagines resulted; whilst this year I could only obtain four larvae.

It will thus be seen that *E. var. arceuthata* seems rare, at any rate in Surrey, and it is also exceedingly local, for all my larvae have been obtained from one small group of Junipers, although these shrubs are plentiful in the district.

Mr. KAYE and the Rev. F. D. MORICE commented on this exhibit.

NEW SUB-SPECIES OF *HELICONIUS ERATO*.—Mr. W. J. KAYE exhibited a remarkable new form of *Heliconius erato** for which he proposed the name *extrema*. It formed a connecting link between *H. erato chestertoni* and *H. erato colombina*. It was remarked that both of these two occurred usually without any but the most trivial variation. Both occurred in the Cauca Valley of Colombia, over a great area from north to south. In addition to the form *extrema* three others were shown, which formed a graduating series to *colombina*; one of these being very similar to *extrema*, but showing faintly an indication of a transverse yellow band beneath, as well as a very small indication of the fore-wing red band as found in

* *Heliconius erato extrema*, nov. s. sp.

Fore-wing dark bluish black with a steely gloss. Except for a small red dot on the costa above discocellulars without markings. Hind-wing like fore-wing unicolorous dark bluish black. No trace of yellow transverse band either above or below. 1 ♂.

Hab. COLOMBIA, Cauca (?).

colombina. These forms were purchased from a dealer with only the information "Colombia," but it is almost certain that they came from some part of the Cauca Valley. *H. erato molina* fitted well into the connecting series, and had still more red of the fore-wing band. It was recorded from Valdivia, and was probably only an occasional aberration, as it was only known from the type specimen.

LARVAL SKINS OF *DYTISCUS MARGINALIS* AND *HYDROPHILUS PICEUS*.—Mr. HUGH MAIN exhibited as transparencies in the epidiascope the larval skins of *Dytiscus marginalis*, which had been handed round at the meeting on Oct. 2. They appeared quite satisfactorily on the screen, showing the general characters and such details as the manner of dehiscence of the skins and the fringes of hairs on the various appendages, etc. It was pointed out that the tail appendages in the first larval skin were only fringed on the outer side, while in the succeeding skins they were fringed on both sides. The moulted skins of the larva of *Hydrophilus piceus* were also shown, and the spread-out empty skin of the pupa.

Such series illustrated very graphically the great increase in size of the larvae in the very limited time in which they passed through this stage of their life-history, viz. just under eight weeks from hatching of the egg to disclosure of the pupa, in the case of both insects.

Mr. E. A. BUTLER commented on this exhibit.

SPECIAL MEETING.

Wednesday, November 6th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

The Notice calling the Special Meeting was read by the SECRETARY, the object of the meeting being to make an alteration in Bye-law viii, the proposed change being supported by the TREASURER, the PRESIDENT, Comm. WALKER, Dr. CHAPMAN, the Rev. F. D. MORICE and Mr. JONES.

The TREASURER formally proposed to delete Clause 5 of Ch. viii, and to substitute :—

“The Council shall nominate a chartered or incorporated Accountant annually, who shall audit the Treasurer’s accounts. The Auditor shall be paid for his services a fee, the amount of which shall be agreed by the Council on behalf of the Society. The Treasurer shall furnish the Accountant with all the facilities he may require for auditing the accounts.”

The Treasurer having fully explained his reasons for proposing this alteration, it was seconded by Dr. Chapman and carried *nem. con.*

ORDINARY MEETING.

Wednesday, November 6th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Tea Arrangements.

The SECRETARY announced that the Tea question having come before both the Business Committee and the Council, the following recommendation had been agreed upon:—that the tea subscription list should be circulated at every meeting till the Annual Meeting inclusive, and that as soon as the finances permit the tea should be provided at the expense of the Society.

Election of Fellows.

The Rev. Fr. O’NEIL, S.J., Salisbury, Rhodesia; Messrs. ERNEST WILLIAM NIMMY, 210 Whippendell Road, Watford, Herts; R. STANWAY PARRIS, 6 High Street, Bishop’s Stortford; the Rev. ALFRED T. STIFF, Grantham, Victor Drive, Leigh-on-Sea; Capt. WILLIAM HENRY TAPP, F.R.A.S., F.R.G.S., and Mrs. ELEANOR EVA TAPP, of Loos, 88 Wickham Way, Beckenham, Kent; and the Rev. E. ADRIAN WOODRUFFE-PEACOCK, F.L.S., F.G.S., Cadney Vicarage, Brigg, Lincolnshire, were elected Fellows of the Society.

Exhibitions.

ORTHOPTERA FROM SALONICA.—Mr. W. J. LUCAS, exhibiting some Orthoptera from Salonica, made the following observations:—

From time to time Mr. P. J. Barranl, one of the Fellows of this Society, has sent me insects from Salonica belonging to the orders Orthoptera, Odonata, and Neuroptera. This evening I have brought up the Orthoptera, mainly for the sake of a very interesting form of the common earwig *Forficula auricularia*, Linn. They comprise:—

Labidura riparia, Pall.—One male from Salt Lake near Naresh, Salonica-Janes Road, Aug. 4, 1918. It is scarcely as large as some of our south-coast examples and much darker in colour, unless this is due to change in drying.

Forficula auricularia, Linn. var.—Six males and three females. There is a large whitish spot on the wing-tips (sometimes indicated in British specimens); the colour is dark; and all the males sent have "high" callipers, the greatest length in a straight line from base to tip being 9 mm. It was common, or fairly so, in May and June 1917 and 1918, at Saracli (1000 ft.) and Paprat (2200 ft.). It was also found (females apparently) in winter at Basanli, hibernating in a rotten cherry log.

Empusa fasciata, Brullé.—A male, taken June 4, 1917, at Saracli.

Gryllotalpa gryllotalpa, Linn. A female, from Kopriva, Struma Valley, Salonica. It was common at low elevations in April, May and June 1918.

MACEDONIAN ORTHOPTERA.—Captain BURR exhibited a series of Orthoptera from Macedonia, including *Saga natoliæ*, *S. vittata*, and *Saga* sp. n.; also a pair of *Dinarchus dasypus*, Illig., and a small series of *Glyphanus heldreichi*, Br., a wingless Oedipodid, which assimilates very closely to the ground, but on jumping turns a somersault which flashes its white ventral surface; the inner face of the posterior femora are bright blue and lemon yellow, and the neck membrane bright indigo, but none of these brilliant colours are exposed under ordinary circumstances. It has been suggested that

they may serve as signals between individuals, as the creature is apparently mute. Also a small *Caloptenus italicus*, L., ♂, together with a *Sphingonotus caeruleus*, L., ♀, which were taken *in copulâ*.

Mr. ROWLAND-BROWN inquired whether the Macedonian insects of other orders than Lepidoptera were predominantly Western. He had been struck by this characteristic of the butterflies sent to him from Salonica. Capt. BURR replied that this was so, and that the fauna of the northern Balkans was much richer than that of Macedonia, especially in the plains. He added that one rarely saw a bird either that one might not as well have met with in England.

CHALCID IN UNDIGESTED SEED.—The PRESIDENT exhibited a Chalcid, *Torymus elegans*, Borkh., sent to him by the Rev. E. A. Woodruffe-Peacock, which had emerged from a hawthorn seed which had passed through the alimentary canal of a blackbird, together with the seed from which it had emerged. He said that it had been parasitic on some insect, probably a Cecidomyid, which had been feeding in the seed.

Mr. GREEN asked whether there were not Chalcids that fed directly upon seeds, and the President replied that this was the case, but that this species was parasitic.

Dr. NEAVE remarked that there were Chalcids that fed within the stones of almonds and plums.

BUTTERFLIES OF THE GENUS *CASTNIA* AND A MIMETIC HESPERID.—Mr. L. B. PROUT, on behalf of Mr. J. J. JOICEY, exhibited the following species:—

Castnia erycina, Westw. (P.Z.S., 1881, p. 141, pl. xii. fig. 4), paratypes out of the Druce collection, together with an apparently very rare Erycinid butterfly (genus *Xenandria*?) erroneously described by Druce as "*Castnia pelopia* (E.M.M. xxvi, p. 69). Druce was evidently misled by the marvellous resemblance between these two, and did not examine the structure. A careful discussion of these forms by Houlbert (Oberth., "Ét. Lép." xv, pp. 654-8) is in part stultified by the fact that Westwood's figure is unrecognisable, showing a red band which is really wanting, in consequence of which he has thought to have discovered a new species *pelopioides*, which will really sink to *erycina*; in part also by Druce's

error above referred to. Although *erycina* is only definitely known from the Sarayaen district, while the only known examples of *pelopia* are from "interior of Colombia" and Chanchamayo (E. Peru), one cannot doubt that they will prove to occupy the same ground and to share in some mimetic association.

Also several new or doubtful forms of *Castnia*, not yet fully worked out.

FURTHER OBSERVATIONS ON THE "CUCKOO-SPIT" INSECT.—The PRESIDENT stated that since the meeting on June 5th, when he gave a short account of his observations on the "cuckoo-spit" insect, he found that an elaborate and very interesting paper on the same subject had been published by Dr. Karel Šulc in November 1911. It was some satisfaction to him to know that while his own main observations turned out not to be new, they were almost in complete accord with those of the Bohemian entomologist. There was one fact, however, frequently observed by himself which seemed to have escaped the observation of Dr. Šulc and other writers on the subject. According to them, the liquid excreted from the anus accumulates beneath the body of the insect; and into this liquid the tip of the abdomen is dipped, and then the bubbles of froth are blown. But when the insect has moved away into a new position, bubbles are generally produced before there is sufficient liquid under the insect in which to dip the end of its body. What he saw happen on such occasions was this: the insect at first stretches out its abdomen, directing it obliquely upwards, and the lips of the valve which admits air to the ventral air-chamber are at this time kept open; this condition lasts awhile, and then the liquid coming from the anus forms a film across the open valve, the abdomen is now dipped downwards and a little to one side, and at the same time the lips of the valve gradually close, and the bubble, which during the process has been forming, is set free; the tip of the abdomen is again raised, and then dipped down towards the other side. In this way the bubbles are formed and deposited alternately right and left of the insect, and gradually are pressed forwards along each side. He believed that it was the mere pressure exerted

by the bending down of the abdomen which forced the air from the air-chamber into each bubble. A consideration of the exact method by which the bubbles are formed was not without importance in relation to the question of what part, if any, the secretion of the wax-glands takes in giving to the liquid secretion from the anus its capacity for forming bubbles. Dr. Šule explains that the wax is acted upon by an enzyme in the alimentary secretion, and the acid thus produced forms, with the alkali present, a substance which gives to the liquid the properties of a soap-solution. Although he had himself at first suspected that the wax might in some way impart to the liquid its tendency to form lasting bubbles, he was on the whole inclined to doubt whether that did actually take place.

As further points of interest in connection with the frog-hoppers, he stated (1) that the median triangular lobe which in the nymph fits in between the lateral folds of the 3rd abdominal segment and helps to close up the air-chamber in front, persists in the imago of many of the species, where it is no longer functional, and takes the form of a median ridge continued behind into a short, pointed process; and (2) that when examining some nymphs alive under the microscope, he found pulsatile organs, of the kind described in *Nepidae* and some other water-bugs, present in the tibiae of all the legs, and the movement of the blood corpuscles in the legs very distinctly visible. Organs of the same kind had quite recently been discovered by Richardson in the Aphididae, and probably occurred generally in the Rhynchota and possibly also in other insects. He thought it might be of interest also to mention that the froth produced by the frog-hopper was in the days of Queen Elizabeth known as "Woodseare," and he would like to find out whether that name has survived anywhere in the British Islands up to the present time. Bacon, in referring to the froth, said of it: "The experience is that the froth which they call *Woodsare* (being like a kind of spittle is found but upon certain herbs, and those hot ones; as *lavender*, *sage*, *hyssope*, &c. Of the cause of this enquire further, for it seemeth to be a secret." In a work published in 1661 it is referred to thus: "That spumeous froth or dew

which here in the North we call Cuckoo-spittle and in the South, Woodsear." Possibly some persons might be influenced in their choice between these two names if they knew what the old English entomologist Moufet, who died in 1604, had to say on the subject: "Angli spumeam illam materiam *Wood-seare* vocant; quasi diceret, silvarum tabem: Germani cuculi salivam esse autumant." Moufet was familiar with the insect which comes from the "Cuckoo-spit," and said he had no hesitation in calling it a little grasshopper ("Locustella") rather than a Cicada, as Isidore, Bishop of Seville, had stated it to be. Isidore, however, was not far wrong; and John Ray came still nearer to the truth when he named it "Cicadula."

Death of a Fellow.

Prof. POULTON said he was sure the Society would regret to hear that Mr. C. W. FARQUHARSON, who had done so much valuable work in Africa, had been drowned in the sinking of the *Burutu* when on his way home on leave.

Paper.

The following paper was read:—

"Notes on a large Heliconine Collection made in French Guiana in 1917, compared with a similar Collection made in 1915," by J. J. JOICEY, F.E.S., and W. J. KAYE, F.E.S.

Wednesday, November 20th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Election of a Fellow.

Mr. JOSEPH HERROD-HEMPSALL, Orchard House, Stockingstone Road, Round Green, Luton, Beds., was elected a Fellow of the Society.

Nomination of Officers and Council.

The following list of Fellows nominated by the Council to hold office during the ensuing year was read:—

President, Comm. JAMES J. WALKER, M.A., R.N., F.L.S.
Treasurer, W. G. SHELDON. *Secretaries*, Rev. GEORGE
 WHEELER, M.A., F.Z.S.; Dr. S. A. NEAVE, M.A., D.Sc., F.Z.S.
Librarian, GEORGE CHARLES CHAMPION, F.Z.S., A.L.S. *Other*
Members of Council, E. C. BEDWELL; G. T. BETHUNE-BAKER,
 F.L.S., F.Z.S.; KENNETH G. BLAIR, B.Sc.; MALCOLM CAMERON,
 M.B., R.N.; W. C. CRAWLEY, B.A.; J. HARTLEY DURRANT;
 Dr. H. ELTRINGHAM, M.A., D.Sc., F.Z.S.; Dr. C. J. GAHAN,
 M.A., D.Sc.; Dr. A. D. IMMS, M.A., D.Sc., F.L.S.; Dr. G. A. K.
 MARSHALL, D.Sc., F.Z.S.; Rev. F. D. MORICE, M.A., F.Z.S.;
 HERBERT E. PAGE.

Exhibitions.

A NEW FORM OF MORPHO EUGENIA.—Mr. ARTHUR DICKSEE exhibited three specimens of a new race of *Morpho eugenia* from Colombia, from which it was hitherto unknown, together with two *Morpho eugenia* from French Guiana, and one *Morpho adonis* from French Guiana, and another from the Lower Amazons, for comparison.

He pointed out that the shape was half-way between the rounded form of *eugenia* and the pointed form of *adonis*, and that the colour approached more nearly to the colour of *adonis*, whereas the white costal markings approached more nearly to *M. eugenia*. He gave it the name of *Morpho eugenia*, form *damocles*. The locality is Villavicencio, Colombia, and the dates are May and June 1918.

Mr. W. J. KAYE commented on this exhibit.

BRED LYCAENA ARION.—Capt. PUREFOY exhibited a score of home-bred *L. arion*, together with their pupa cases.

He pointed out that the full-fed larva seldom, if ever, attempted to crawl far away from the ants in order to pupate. Larvae which he had kept both in the nests of *M. scabrinodis* and *M. laerinodis* generally fed in chambers deep down in the nest where the small ant larvae in their last instar were cared for by the workers. When the *arion* larva was full fed he generally remained where he was among the brood, slowly changing colour from a fine ochreous hue to a dead grey white. Six or seven days might elapse before the larval skin was cast. The ants were running over their guest all the time but never attacked him, even when the fresh pupa was

at its softest. The cremastral hooks would finally lose their hold of the silk pad and the pupa would lie at the bottom of the little earth chamber. When, after twenty-four days or so, the imago emerged, it had to find its way to the surface through the ant passages. This it never failed to do, and the freshly emerged butterfly would be found during the early morning drying its wings on the herbage growing on the nest.

Dr. CHAPMAN observed that when ants were placed in a new nest they refused to accept a larva of *L. alcon*, although they willingly accepted that of *L. arion*.

DARKENING OF HIND-WING IN *MECHANITIS POLYMNIA*.—Mr. W. J. KAYE exhibited six female *Mechanitis polymnia* from the Berbice River, caught at Friendship in July 1914 by Mr. H. C. Patoir, which all showed a very considerable darkening of the outer half of the hind-wing, one in particular having the whole outer half black. Two female *M. polymnia* were also shown from the Potaro River, in Central British Guiana, which were the blackest that had been taken, one of which was figured in the Trans. Ent. Soc., pl. xxiii, fig. 3, 1906. It certainly appeared as if towards Surinam the darkening in this species was more pronounced, and probably it would be found the same in the whole mimetic group of which *M. polymnia* was a member.

Paper.

The following paper was read :—

“The Hymenoptera of Fiji,” by ROWLAND E. TURNER, F.E.S.

Wednesday, December 4th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Nominations for Officers and Council.

No alternative names having been received, the list of the Council's nominees for office for the ensuing year was again read.

Election of Fellows.

Messrs. ANDERSON FERGUSON, 22 Polworth Gardens, Glasgow, W.; GEORGE GRACE, B.Sc., A.R.C.Sc., Inglenook, Utley, Keighley, Yorks. and P. V. ISAACS, B.A., Assistant Entomologist to the Madras Agricultural College and Research Institute, Coimbatore, India, were elected Fellows of the Society.

Exhibitions.

NEUROPTERA FROM SALONICA.—Mr. W. J. LUCAS exhibited the following *Neuroptera* from Salonica, sent to him by Mr. P. J. Barraud in 1916–1918, viz. :—

Nemoptera sinuata, Oliv., three; *Formicabo tetragrammicus*, Fabr., one; *Myrmecaelurus trigrammus*, Pall, one; *Palpares libelluloides*, Linn., two, a male and a female; *Osmylus chrysops*, Linn., two; *Ascalaphus macaronius*, Scop., var. *kolyraensis*, Laxm., one male.

THE MALES OF GLUTOPHRISSA EPAPHIA AND PHRISSURA SABINA DISTINGUISHED BY THEIR SCENT-SCALES.—Dr. F. A. DIXEY exhibited specimens of the males and females of *G. epaphia* and *P. sabina*, with outline drawings of their scent-scales. He said :—

Among the Pierines which may be comprehensively ranked under the genus *Appias*, as now in the British Museum, there are two African forms which appeared in that collection until lately as *Glutophrissa epaphia*, Cram., and *Phrissura sabina*, Feld. The females of both these forms do not resemble their respective males, and also differ widely from each other; but the males, though generally distinguishable without much difficulty, are sometimes so much alike as to render their determination by ordinary methods doubtful. Aurivillius in Seitz's "Macrolepidoptera, Ethiopian Region," Eng. ed., p. 38, says of *G. epaphia* : "The ♂ nearly approaches that of *sabina*, but is smaller and the black dot at the end of vein 1 on the fore-wing above is always wanting." These, however, are not invariable means of distinction, for some individuals of *epaphia* are larger than some of *sabina*, and the black dot at the end of vein 1 may be wanting in the latter, especially in the form inhabiting Madagascar. I think, however, that the

males can always be distinguished by the shape of their scent-scales; the females, as above noticed, present no difficulty.

The scent-scales show some individual differences, but the laminae of those of *G. epaphia* appear always to have parallel sides, with a somewhat squared base and a comparatively shallow apex. In *P. sabina* the sides may be parallel or may be curved towards each other like a pair of parenthesis-marks, but the base is always rounded and the apex comparatively sharp. When the sides are parallel, the lamina of *P. sabina* may be called U-shaped; when they are curved, the lamina tends to become cordate. In either case it differs from the almost rectangular proximal portion of the lamina in *G. epaphia*. This distinction holds good not only for the continental forms of the two species, but also for their respective forms found in Madagascar.

It may here be worth while to point out that a certain amount of confusion exists with regard to the Madagascar form of *P. sabina*. The female of this subspecies was originally described and figured by Boisduval as *Pieris phileris*, ♀ ("Faun. Lép. de Madag.," p. 17, pl. 2, fig. 5). It does not, however, belong to the male *Pieris (Belenois) phileris* with which Boisduval associated it: and this author's name for it will therefore not stand. In 1872 it was included by Mr. Butler in his list of species of the old genus *Pieris* as *Belenois confusa* sp. n. Butler afterwards described a similar female as *Belenois coniata* ♀ ("Cist. Entom.," 2, p. 391). Mabille ("Hist. Nat. de Madag., Lépid.," i. p. 263, pl. 34, figs. 5, 5A, 6, 6A) described and figured the form under Butler's name of *Pieris confusa*. His descriptions and figures of the "male" and female are, however, in every case those of the latter sex. These mistakes no doubt arose from the fact that in these two species, as in several other forms of the *Appias* group, the female as well as the male is furnished with a terminal tuft of hairs, quite distinct, though smaller than that of the males. This fact, together with the great diversity between the appearance of the sexes in *P. sabina* or *confusa*, and the ease with which the males of that species may be taken for those of *G. epaphia*, has led to the very natural

though erroneous conclusion that both sexes of *P. confusa* were represented in a series which consisted only of females. It seems probable that the male of *P. confusa* was really known to Mabille, but was not distinguished by him from the male of *G. epaphia*; for his figures of "*P. saba typica*, ♂," and "*P. saba* var. *epaphia*, ♂," might quite well be taken to represent males of *P. confusa* (*op. cit.*, pl. 36, figs. 3, 3A, 5, 5A).

THE RELATION OF THE ANAL TUFTS TO THE BRANDS OF THE HIND-WINGS OBSERVED AND THE SCENT PERCEIVED IN A MALE DANAINÉ BUTTERFLY BY W. A. LAMBORN.—Prof. POULTON gave an account of the following deeply interesting observations made at Tanga, late German East Africa, on Aug. 5, 1918, by Mr. W. A. Lamborn, in continuation of his S. Nigerian investigations, recorded in *Proc. Ent. Soc. Lond.*, 1911, xlvi; 1912, xxxiv; 1913, lxxxiii, and those of Capt. Carpenter, *ibid.*, 1914, cxi :

"Aug. 5, 1918.—To-day, a Bank Holiday, and kept as such even in Tanga, afforded me relief from the care of my usual 60 or 70 out-patients, and, the day being wet and dull at intervals, I was able to sit in my office, getting the hospital books in order, untroubled by any special hankering after the things of the bush. Then, after an early lunch, I sauntered out, at 1 p.m., to make further search for *Fleurya* or some plant near it; for all my recent rambles have been devoted to this object. At about two the sun suddenly came out brilliantly, arousing the insects; and the abundant *Amauris niavius dominicanus*, Trimen, in particular claimed my attention, for even now, as in Nigeria, I still often confuse, for the few vital seconds, till they get to a distance, or unless they settle, *Amauris* and *Euralia*. The majority of the *Amauris* came to rest after a short flight and sunned themselves, resting with wings approximated and then fully expanded, evidently enjoying the warmth. Suddenly my attention was attracted to a fine fresh male resting with expanded wings by the gleam in the sunshine of a white structure at the hinder end of its body. On near approach I discovered that this was due to the extrusion of the anal tufts, the gleam being due to the sunshine reflected off a

pencil of brownish white hairs resting on the inner side of the scent-patches. The outer black hairs were spread out fanwise, accurately covering the patch, the foremost hairs pointing towards the head of the insect, the middle hairs at right angles to the mid-line of the body, and the hindmost hairs pointing directly back. The abdomen of the insect at the junction of the 10th and 11th segments was strongly ante-flexed, the 9th and 10th segments being tumid, the 11th and 12th markedly constricted, an effect due, I thought, probably to the strong tonic action of a detrusor muscle concerned with the anal tufts. The butterfly remained motionless for some seconds in this attitude, and then regular but sudden movements of the wings took place, the fore-wings being approximated and then over-extended, the hind-wings following to about half-approximation and then also being over-extended. By this means a slight movement of the black hairs over the scent-patches only was effected. The operation took place 10 or 12 times in half as many seconds, and then, the tufts being withdrawn, the butterfly leisurely approximated its wings and flew away.

“ I found that almost as many males as I followed, old worn specimens as well as fresh ones, eventually settled and performed the same operation, which I studied in several more. One, an old damaged insect, which had settled on a leaf, extruded its right white tuft, but could not at first manage to get out the left. I could see peristaltic waves of contraction passing down the last three segments of its ante-flexed abdomen, for half a minute to no purpose. The violent expulsive efforts then resulted in the extrusion of the two tufts, but even then it was only able to spread the black hairs of the left tuft over the corresponding patch. The brownish white tuft did not appear. The subsequent movements were as in the first-mentioned butterfly. It flew away after a time and again endeavoured to exert the paler tuft, but unsuccessfully.

“ I then followed a second male and timed the operation by the second-hand of my watch. From the first extrusion of the tufts to their complete retraction lasted 1 minute, 40 seconds. These butterflies were so intent on their toilet

that I was able to approach my nose to within two or three inches of a third with tufts extruded. I experienced a sensation as if an aromatic snuff had impinged on the mucous membrane of my nostrils. Subsequently I seized by one wing a fourth butterfly with tufts extruded. They remained extruded in spite of its struggles, and on smelling them I experienced the same sensation."

The movements described in this valuable record strongly supported Dr. H. Eltringham's interpretation, in *Trans. Ent. Soc. Lond.*, 1913, p. 404, based on an examination of the structures in the laboratory:—

"We may suppose that the insect brushes out the secretion, the stiffer [darker] hairs probably assisting in lifting the covering scales. . . . It should be noted that these hairs are on the outer side of the brush, and would thus naturally come first into contact with the scent-patch."

Dr. Eltringham's researches showed that there was no special muscle directly concerned with the protrusion of the brushes. This was effected, as in many similarly eversible glandular and odoriferous structures, by the pressure of the fluids of the body. The constricted 11th and 12th segments and the peristaltic waves of contraction described by Mr. Lamborn were doubtless instrumental in producing this pressure.

A SUGGESTED INTERPRETATION OF THE SPECIAL ATTACKS MADE BY BLOOD-SUCKING DIPTERA ON NEW-COMERS INTO THE TROPICS AND OF THEIR GRADUAL DIMINUTION.—Prof. POULTON said that he had received the following suggestive notes from Mr. C. B. Williams, who had written from the Department of Agriculture, Trinidad, B.W.I., on Oct. 12, 1918:—

"I got last mail Parts II, III and IV of the *Trans. Ent. Soc.* for 1917 (somewhat delayed!), and was particularly interested in a discussion (pp. lxxvii *et seq.*) on the attraction of insects to salts, perspiration, urine, etc., because it largely fits in with some of my own ideas and observations on the subject. I have ventured a little further, and have developed a theory which appears to me to be sound. It is that relative resistance to mosquito bites is due to differences in the composition, and hence the scent, of the perspiration, and further

that after residing for some time in a hot climate the relative proportions of various waste products secreted internally and externally alter. The composition of the perspiration alters and the individual becomes less attractive to mosquitoes than when newly arrived. In spite of the fact that new-comers perspire more freely than natives, who take things more gently, I believe that mosquitoes are not attracted by such differences in *quantity* but in the *quality* of the secretion. I admit nine-tenths of this is conjecture, but it is the only working hypothesis that I can get that will explain the facts. I have tested it for two years now. There seems to be no doubt whatever that a new arrival to the tropics is more worried and more bitten by mosquitoes. It is not a matter of suffering more from the bites. I still swell and suffer from any bite, but there are places where I can now sit in comfort where I was continually bitten on my first arrival; and I find that new-comers still suffer when sitting alongside me at these same places, so that there has been no reduction in the number of mosquitoes.

“ Of course I know that the mosquito goes to get blood and not perspiration as in the case of the butterflies discussed in the P.E.S., but still it must be the scent of the perspiration that originally attracts them to their prey. Tabanids are blood-suckers, yet I have seen them attracted to a pair of socks just removed after a hot walk.

“ I wonder if some Bio-Chemist could be persuaded to take up the study of the composition of perspiration in relation to climate and mosquito attraction. It seems to me that it might lead to the discovery of some attractive baits for mosquitoes and possibly even for tsetse flies, to which the reasoning might also apply.

“ I was particularly pleased with the remark in the Proceedings about gout accounting for the non-attraction of butterflies to the perspiration of one individual. I believe gout is due to faulty kidney action, and this would of necessity have a direct effect on the composition of the perspiration.

“ I should be very glad if you would let me know what you think of this idea. Quite possibly it has been proposed before, but if so I have not heard of it. If you think it of

sufficient interest you might perhaps put it before the Entomological Society, to be pulled to pieces by more experienced hands."

Prof. Poulton said that the hypothesis was quite new to him, and that he thought it was important to put it on record as soon as possible, so that Entomologists generally might test it by past experience and future specially directed observation.

MR. BACOT said that experiments carried out in West Africa with *Stegomyia* supported Mr. Williams' theory; Mr. E. E. GREEN had found that during the whole of his residence in Ceylon he remained equally affected by the bites of mosquitoes, but that in England, though much attacked, he suffered no inconvenience from them. Mr. H. DOLLMAN and the Rev. G. WHEELER gave evidence from personal experience from residence in Central South Africa and Switzerland respectively, supporting the view that partial or even complete immunity was acquired after a time, and Mr. BACOT added evidence that this immunity lasts for many years. Dr. LONGSTAFF and Mr. BETHUNE-BAKER also adduced similar evidence with regard to the stings of bees and wasps. Mr. MALCOLM CAMERON pointed out that the personal element had also to be considered, insects attacking some people much more readily and persistently than others.

RHOPALOCERA FROM SOUTH CENTRAL AFRICA.—Mr. H. DOLLMAN exhibited two series of some thirty specimens each of bred *Charaxes*: they represented two distinct species of the "*etheocles*" group, the one having the ♀ form of *manica*, Trim. (resembling small ♀ *bohemanni*), the other having the ♀ form of *phaeus*, Hew. (resembling small ♂ *bohemanni*).

It was pointed out that there were constant and readily seen differentia in the respective males, and that in the great number of females bred the latter had never departed from the forms exhibited. The *phaeus* form having been bred in every month of the year, and the *manica* form, though not so extensively, but throughout several months (inclusive of the extreme wet and extreme dry periods), it may perhaps be concluded that there is no marked seasonal instability of either sex of the two species in this locality. The respective

larvae, drawings of which were shown, are quite distinct, both superficially and structurally. They feed on different leguminous trees—the *manica* form on an “acacia” called in Chikaonde “*musasi*,” the *phaeus* form on an “acacia” called “*kabulwebulwe*.”

The pupae also show distinctive characters; these are small but quite constant.

The experiments were conducted at Solwezi, Kasempa District, in South Central Africa, close to the Katanga boundary. The *phaeus* form had not been observed further south, but *manica* had been taken sparingly near to Broken Hill and Kashitu.

The exhibitor expressed the opinion that the two species were undoubtedly distinct.

He also exhibited a drawer of Nymphaline butterflies and details of their life-history. The first two species were *Hamanumida daedulus*, Fabr., and *Crenidomimas concordia*, Hopff., their pupae, and drawings of their larvae. The larva of *Crenidomimas*, previously unknown, was shown to be exceedingly similar to the well-known *Hamanumida*; their food-plants are different. *Diastogyna iris*, Auriv., was mentioned as having the same type of larva, of which, unfortunately, no drawing had been made. It feeds upon the big-leaved “*musuku*” tree. In the same exhibit was a bred series of *Pseudacraea poggei*, Dewitz, its pupae, and figures of the larva. Previously undescribed, the larva and pupa are of interest as showing such very close resemblance to the congeneric species. The larvae, though found in some numbers, are restricted to one kind of shrub—“*tandakatali*” (Chikaonde). The pupae are very freely parasitised by a small Tachinid fly. All the material of the second exhibit was from South Central Africa—either N.W. Rhodesia or the Katanga.

Prof. POULTON and Lord ROTHSCHILD commented on this exhibit.

A LOCAL RACE OF *PRECIS OCTAVIA*.—Lord ROTHSCHILD exhibited a series of a local race of *Precis octavia* from Tembora, Bahr-el-Gazal, and drew attention to the extraordinary number of intermediate specimens among the series of the dry-season form—14 out of 16. He also exhibited a series of wet- and

dry-season forms with intermediates of *Precis octavia octavia*, Cram., and *Precis octavia sesamus*, Trimen, from West and South Africa respectively, for comparison. He also remarked on a series from the Nuba Hills, Soudan, exhibited by Prof. Poulton, and pointed out that, contrary to the Tembora series, the dry-season forms were all pure dry-season, no intermediates being present. The wet-season form appears also to be paler.

Dr. G. A. K. MARSHALL said that he had bred many intermediates under abnormal conditions, and that any kind of shock seemed efficacious in bringing about this result.

LORD ROTHSCHILD said that in experiments on *Aglais urticae* he had found that it was only during a very short period just before hardening that the pupa was susceptible to surrounding influences.

Paper.

The following paper was read :—

“ Butterfly Vision,” by H. ELTRINGHAM, M.A., D.Sc., F.Z.S. The paper was illustrated by means of lantern slides showing the structure and optical action of the butterfly eye, and the author also described and illustrated a series of experiments designed to test the capacity of butterflies for perceiving colours. He had arrived at the conclusion that the optical image provided for the perception of the insect's brain was at least eight times more distinct than had been supposed under previous theories, and also that though the butterflies with which he had experimented were in some cases rather “ short ” at the red end of the spectrum, there was strong evidence that they could distinguish at least those colours with which they were associated in life.

Dr. LONGSTAFF warmly complimented the author on his paper and recalled one of his own observations in Jamaica where a yellow butterfly had selected and settled upon a yellow leaf lying on a wide area of uniform green. Dr. Eltringham had mentioned a very remarkable fact in connection with the actinic properties of the yellow flowers of the *Rudbeckia*, and he had himself observed the overwhelmingly brilliant effect of

this flower growing near Quebec against a dark background of leaves.

Mr. BACOT recalled the theory that the colours of flowers had been developed in response to the tastes of insects.

Dr. DIXEY, Mr. BETHUNE-BAKER and others also contributed to the discussion.

Dr. Eltringham in reply said that he had been able to give only an abstract of his paper, and that the points raised would be found more fully discussed in the complete publication.

THE ANNUAL MEETING.

The Annual Meeting took place on Wednesday, January 15th, 1919, Dr. C. J. GAHAN, M.A., D.Sc., President, being in the Chair.

The TREASURER, after explaining the position of affairs under the new bye-law governing the audit, read his Statement of Accounts, which was adopted on the motion of Mr. W. J. LUCAS, seconded by Mr. HUGH MAIN.

The Rev. G. WHEELER, one of the Secretaries, then read the following

Report of the Council.

Adverse circumstances notwithstanding, the condition of the Society may be described as distinctly flourishing, our numbers having again risen above 600. We have lost six Fellows by death and eight by resignation; none have been removed from the list. Twenty-one new Fellows have been elected to the Society, and M. PAUL MARCHAL was elected early in the year to succeed to the Honorary Fellowship rendered vacant by the death of Dr. EMIL FREY-GESSNER, of Geneva, at the end of 1917. The Society now consists of twelve Honorary Fellows, two Special Life Fellows, and five hundred and ninety-one ordinary Fellows, making a total of six hundred and five. Of those lost by death Capt. CHARLES EMMETT and Mr. C. JEMMETT gave their lives for their country, and Mr. C. O. FARQUHARSON, who was doing admirable entomological work in Africa, was drowned in the collision of the *Burutu*, when returning home on leave; the remaining three were Mr. E. A. AGAR of Dominica, the Rev. F. E. LOWE, and Col. J. G. PILCHER.

Owing to the great increase in the expense of printing, the volume of the Transactions for 1917 will of necessity be the smallest published for some years. It will consist of

327 pages, illustrated by thirteen half-tone plates, two line blocks and a sketch-map, and contain sixteen papers by the following authors :—Mr. MALCOLM CAMERON, M.B., R.N. (2); Dr. F. A. DIXEY, M.A., M.D., F.R.S. (2); Messrs. E. DUKINFIELD JONES; E. E. GREEN; the late ANTOINE GROUVELLE (communicated by Mr. HUGH SCOTT, M.A.); J. J. JOICEY and W. J. KAYE in conjunction; K. KUNHI KANNAN, M.A.; Rev. F. D. MORICE, M.A.; Mr. FREDERICK MUIR; LOYD ROTHSCHILD, F.R.S., F.L.S., F.Z.S.; Mr. DAVID SHARP, M.A., M.B., F.R.S.; Dr. A. JEFFERIES TURNER, M.D.; and Mr. ROWLAND E. TURNER, F.Z.S. (2). The cost of reproduction of Mr. DUKINFIELD JONES'S plates was partly borne by the Author, and Mr. J. J. JOICEY has given the whole expenses of the sketch-map; the cost of reproduction of all the other plates has been borne by the Society, but the originals have in all cases been presented by the authors. Five papers are concerned with the Coleoptera, five with the Lepidoptera, three with the Hymenoptera, two with the Hemiptera, and one is on Nomenclature. The Proceedings will consist of nearly 180 pages and one line-block plate.

At a special Meeting on November 6th an alteration was effected in the bye-laws with the view of appointing a professional Auditor.

The meetings have not been so fully attended as in late years, but the papers and exhibits have fully maintained their interest.

The Council has resolved to appoint a sub-committee to consider the question of better accommodation for the Society, and to approach the Government on the question, if thought advisable, but the actual nomination of the Fellows who shall serve upon this sub-committee has been left to the incoming Council.

As some confusion seems to have been caused by the apparent discrepancies between the two Lists of Fellows published annually, it may be well to explain that the List issued in Part V contains the names of all who have been Fellows during any part of the year to which the Part refers, and therefore includes the names of all those who have died, resigned, or been removed during the course of the year,

while the List published separately consists of the names of those only who are actually Fellows at the time of going to press. This latter List can only be issued, for technical reasons, after the publication of Part V of the previous year.

The TREASURER reports as follows :—

“ The Income for 1918 shows an increase on that of 1917 of £236 9s. 2*d.*, the details of which are as follows :—

	1917.		1918.		Comparison.	
	£	s. d.	£	s. d.	£	s. d.
Interest	37	2 11	55	10 1	+	18 7 2
Admission Fees	25	4 0	31	10 0	+	6 6 0
Annual Contributions—						
Current Year	390	12 0	476	14 0	+	86 2 0
Arrears	45	3 0	186	18 6	+	141 15 6
Sale of Publications	144	9 10	154	0 11	+	9 11 1
Donations—						
In Aid of Publications	11	8 8	5	13 7	—	5 15 1
„ „ Tea Fund	3	2 6	14	15 0	+	11 12 6
„ „ Library	31	10 0		<i>Nil.</i>	—	31 10 0
	£688	12 11	£926	3 1	+	£236 9 2

“ This increase in income consists very largely of increases in the Annual Contributions, for 1918, and for arrears. It must be remembered that the more favourable state of affairs in this respect arises in great part owing to the severe and prolonged illness of the late Treasurer, Mr. A. H. Jones.

“ The surest test of the Society’s financial condition, from an income point of view, is undoubtedly the number of subscribers who pay their contributions within the year in which they are due. In 1913, the year before the war, the number of Fellows who paid their subscription within the year was 467; in 1914—the high-water mark—472; in 1915, 452; in 1916, 414; in 1917, 372; and in 1918, 455. It has been very difficult during the past year to get into touch with many of the subscribers who reside in remote parts of the world. The restrictions of intercourse will now be removed, and I trust that at the end of this year I shall be able to record a result as favourable as that of 1915.

“ The reasons which have made it difficult to obtain subscriptions for the current year apply also to the arrears, the

total of which on January 1st, 1918, amounted to £291 8s. 5d., due from 151 contributors. This on the 31st of December last had been reduced to £147 10s. 11d., due from 69 contributors. I feel quite sure that this item will be very much less at the end of this year.

“ The expenditure has been largely influenced by the reduction in volume of the Publications. The net result of the increase in income, and reduction in expenditure, is, that the Society has a balance in hand, after allowing for the liabilities, of £298 15s. 5d., as against 17s. 10d. on January 1st, 1918.

“ It must, however, be borne in mind that the cost of certain items of expenditure, and especially publishing, have greatly increased during the past year. The cost of this item over pre-war rates is about double, and although this may, and I hope will, be modified when conditions become normal, there is unfortunately no doubt but that a large portion will be permanent.

“ The value of the Society's investments in consequence of the improved national situation has increased during the year by £68 5s. 11d. In the statement of assets and liabilities the value of the Library has not been taken into account. In the last statement it was estimated at £3,800; probably at the present time the value is considerably more than this; the Library is now insured for £4,375. The Stock of the Society's Publications is insured for £600.

“ W. G. SHELDON.

“ *Treasurer.*”

The following is the Report of the LIBRARIAN :—

“ Three hundred and thirty volumes have been issued from the Library for home reading. Twenty volumes and a large quantity of Separata have been presented to the Library. As was the case the previous year, very few foreign periodicals have come to hand. The Library has again been largely used for purposes of reference.”

The Report was adopted on the motion of Mr. E. E. GREEN, seconded by Mr. JANSON.

No alternative names having been received, the President declared the following Fellows, nominated by the Council,

to be appointed as Officers and Council for the ensuing year :—

President, Comm. JAMES J. WALKER, M.A., R.N., F.L.S. *Treasurer*, W. G. SHELDON. *Secretaries*, Rev. GEORGE WHEELER, M.A., F.Z.S.; Dr. S. A. NEAVE, M.A., D.Sc., F.Z.S. *Librarian*, GEORGE CHARLES CHAMPION, F.Z.S., A.L.S. *Other Members of Council*, E. C. BEDWELL; G. T. BETHUNE-BAKER, F.L.S., F.Z.S.; KENNETH G. BLAIR, B.Sc.; MALCOLM CAMERON, M.B., R.N.; W. C. CRAWLEY, B.A.; J. HARTLEY DURRANT; Dr. H. ELTRINGHAM, M.A., D.Sc., F.Z.S.; Dr. C. J. GAHAN, M.A., D.Sc.; Dr. A. D. IMMS, M.A., D.Sc., F.L.S.; Dr. G. A. K. MARSHALL, D.Sc., F.Z.S.; Rev. F. D. MORICE, M.A., F.Z.S.; HERBERT E. PAGE.

The PRESIDENT then delivered an Address, after which a Vote of Thanks to him was proposed by Dr. LONGSTAFF, and seconded by Mr. J. H. DURRANT, to which Dr. GAHAN made a reply.

Prof. POULTON then proposed a Vote of Thanks to the other Officers, remarking on the difficulties with which they had had to contend this year and on the flourishing condition of the Society notwithstanding. This was seconded by Mr. R. ADKIN. The TREASURER and both SECRETARIES said a few words in reply.

THE ENTOMOLOGICAL SOCIETY OF LONDON.

TREASURER'S ACCOUNTS for the Year ending December 31, 1918.

Presented at the Annual Meeting, January 15, 1919.

RECEIPTS AND PAYMENTS ACCOUNT.

RECEIPTS.		PAYMENTS.	
	£ s. d.		£ s. d.
To Balance as per last Account—		By Rent	70 7 6
General Account	£294 18 8	„ Salaries	50 0 0
Westwood Bequest Fund...	87 19 2	„ Library—	
	<u>382 17 10</u>	New Books ...	£4 12 2
„ Interest on Investments—		Binding Repairs and Insurance	18 18 5
Dividend on Consols ...	£33 17 0		<u>23 10 7</u>
Interest on Deposit ...	14 9 5	„ Cost of Publications—	
Interest on Birmingham 3% Stock...	7 3 8	Printing ...	£240 15 1
	<u>55 10 1</u>	Illustrations	50 14 3
„ Admission Fees ...	31 10 0	Distribution	20 9 1
„ Annual Contributions 1918	£476 14 0		<u>341 18 5</u>
Arrears ...	186 18 6	„ Sundry Printing and Stationery ...	23 6 6
In Advance ...	21 0 0	„ Postage ...	13 12 10
	<u>684 12 6</u>	„ Tea and Light Refreshments	13 19 0
„ Compositions ...	15 15 0	„ Miscellaneous Payments...	16 4 8
„ Sales of Publications ...	154 0 11	„ Balance at Bankers—	
„ Donations—		On General Account ...	£725 16 7
In aid of Publications ...	£5 13 7	On Tea Fund Account ...	11 0
In aid of Tea Fund ...	14 15 0		<u>£726 7 7</u>
	<u>20 8 7</u>	On Westwood Bequest Fund Account ...	95 2 10
	<u>£1,341 14 11</u>		<u>821 10 5</u>
		„ Cash in hand on Tea Fund Account ...	5 0
			<u>£1,341 14 11</u>

WESTWOOD BEQUEST FUND.

	£ s. d.		£ s. d.
To Balance at Bank, Jan. 1, 1918	87 19 2	By Expenditure on Illustrations	—
„ Interest on Birmingham Corporation 3% Stock	7 3 8	„ Balance at Bank, Dec. 31, 1918	95 2 10
	<u>£95 2 10</u>		<u>£95 2 10</u>

TEA FUND.

	£ s. d.		£ s. d.
To Donations	14 15 0	By Tea and Light Refreshments	13 19 0
	<u>£14 15 0</u>	„ Balance at Bank, Dec. 31, 1918	£ 11 0
		„ Cash in Treasurer's hands	5 0
			<u>16 0</u>
			<u>£14 15 0</u>

W. G. SHELDON, *Treasurer.*

We have examined the above Account of Receipts and Payments with the Books and Vouchers produced to us and certify it to be in accordance therewith.

The Bankers have certified the correctness of the Cash Balance, and that they hold the Securities for the Investments.

(Signed) W. B. KEEN & Co., *Chartered Accountants.*

23, Queen Victoria Street,
London, E.C. 4.
January 13, 1919.

MEMORANDUM
AS TO ASSETS AND LIABILITIES AT DECEMBER 31, 1918.

ASSETS.	£	s.	d.	LIABILITIES.	£	s.	d.
To Arrears of Annual Contributions... £147 10 11				By Cost of Printing Transactions Part V, 1917; Parts I—V, 1918: Cost of Plates and Sundry Unpaid Accounts; and Cost of Postage on Transactions due to Fellows residing abroad and at present undelivered ... 523 0 0			
Less Amount not considered good	63	10	11				
„ Present value of—			84 0 0				
£1,354 2s. 2d.							
Consols $2\frac{1}{2}$ %							
at 59 (cost							
£1,233 3s.) ... £798 17 2							
£239 12s. 4d.							
Birmingham Corporation							
3 % Stock at							
62 (cost £250)	148	16	0				
„ Balance at Bankers, Dec. 31, 1918—			947 13 2				
On Deposit Account £600 0 0							
On Current Account 221 10 5							
			821 10 5				

W. G. SIELDON, *Treasurer.*

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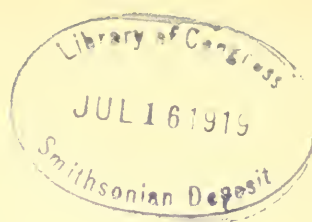
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ERRATA.

TRANSACTIONS.

Page 185, description of text figure 55, for *pinarius* read *pinarius*.
Page 228, line 2 from bottom, for *Dermestis* read *Dermestes*.

PROCEEDINGS.

Page lxxxvii, l. 7, for *johanna* read *johannae*.
Page cxiv, l. 15, for *cleodara* read *cleodora*.
Page cxxiii, l. 18, for only slightly yellowish read not quite so yellowish.
Page cxlii, line 8, for Braconid read Braconoid.
Page cli, line 13 from bottom, for *evagone* read *evagore*.
Page clxvii, l. 16, for C. W. Farquharson read C. O. Farquharson.

TRANSACTIONS.

Page 234, line 8 from bottom, for *flavogattatum*, n. sp., read *flavoguttatum*, n. sp.
Page 241, line 3 from bottom, for *Mimocyplus* read *Mimocyptus*.



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