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P R E F A C E.

OUR present volume fully maintains its character as a representative Zoological Journal, one in which contributions to all Orders are desiderated, while its pages are open to every subject which relates to animal life.

Among notes on Mammals, an excellent memoir on the Humpback Whale (*Megaptera böops*) has appeared. Aves is an ever present subject with 'THE ZOOLOGIST,' and has been so since its first number was issued. Among its many notes is one in the December issue constituting the second record of Baer's Pochard (*Nyroca baeri*) in this country. Mr. Selous continues his valuable papers on bird behaviour, and Prof. Patten describes his observations on avian migration during sojourns at Irish Lighthouses. Reptilia and Batrachia have provided notes and records, while Pisces have obtained the annual Norfolk report by Mr. Patterson; fish vendors in the East End of London have inspired an interesting record by Mr. Stubbs, and Col. Shepherd has continued his studies on the "Pharyngeal Teeth of Fishes." Crustacea have found several observers, and the Insecta have obtained more attention; a paper on a "Luminous South African Fulgorid Insect" by Mr. Bell-Marley having more than usual interest to entomologists. The Annelida have incited several memoirs by Mr. Hilderic Friend, which have largely increased our knowledge of the British Earthworms.

In taking a purview of the general zoological incidents of the year 1913, we have to deplore a heavy death-roll among our prominent men. Dr. A. R. Wallace and Lord Avebury have passed away, and their names constituted the last links with that eminent band of workers and scientists who lived in the latter half of the last century, men who not only discovered facts, but formed and enunciated conclusions which are still inseparable from present scientific thought, though of course modified or enlarged by modern progress. Both also found time to study social and economic questions. A great zoological teacher has departed in the person of Prof. Adam Sedgwick; while two very prominent ornithologists have left the ranks, we allude to Dr. P. L. Sclater and Mr. R. J. Ussher.

Among the principal publications of the year confined to British Zoology, we must remember the Scotts' 'British Parasitic Copepoda,' published by the Ray Society; the completion of Kirkman's 'British Bird Book'; the continuation of Barrett-Hamilton's 'History of British Mammals'; the 'Annual Report on the Immigration of Summer Residents in the Spring of 1912,' still ably edited by W. R. Ogilvie Grant; and an important book still awaiting notice in these pages, 'The Gannet,' by J. H. Gurney.

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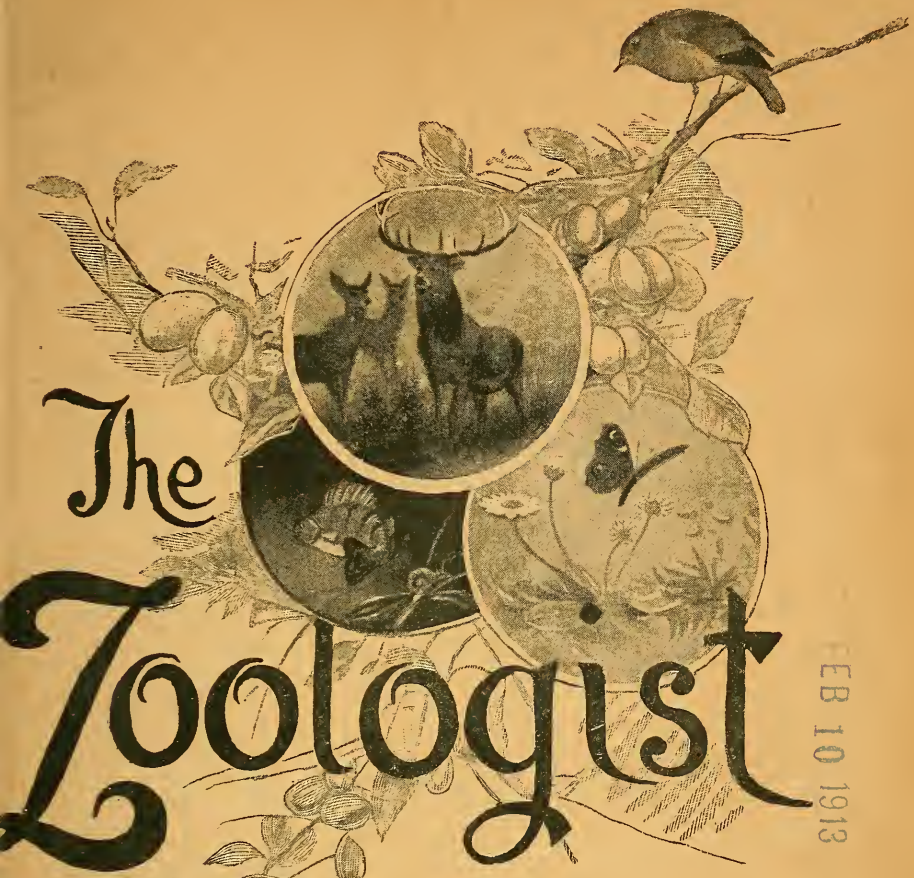
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ROBINS ON MIGRATION OBSERVED AT THE TUSKAR ROCK AND LIGHTHOUSE.

BY Professor C. J. PATTEN, M.D., M.A., Sc.D.

THE migratory movements of this very familiar and common bird, common in Ireland as well as in England, Scotland, and Wales, seem to be puzzling. Many Robins are said to change their quarters by making overland peregrinations within the confines of the British Isles, but the increase of birds in some districts cannot be explained on those grounds. Here in Sheffield, for instance, there is a marked increase of Robins in the autumn, and although this locality is many miles removed from the sea, there is no reason whatever for thinking that the increase in birds is simply an influx of birds, already resident, from the eastern seaboard of Great Britain—in other words, a westward overland movement comparable to what is said to take place between the mainland and adjacent islands on the western seaboard of Ireland when stress of weather and consequent scarcity of food compel the birds to resort to milder climates.* Stress of weather may compel Robins, and for that matter, many other species, to seek refuge along the more genial winter climes of the western fringe of Ireland, but this factor alone cannot account for the increase of Robins in winter at such localities. As evidence bearing on this point, I may say that when I was at Clare Island, Co. Mayo, in December, 1910, the weather

* On the contrary, the weather in the fall of the year in Sheffield and Yorkshire generally is more severe than it is on the east coast.

on the mainland and on the island was quite mild, yet Robins were much more numerous than they had been there in the spring and summer. When I lived in Dublin I always noted a decided increase of Robins in the autumn and winter, *i. e.* from October onward. It seems very likely, then, that a considerable number of Robins immigrate to Ireland as well as to Great Britain at the fall of the year. The puzzling feature is this: Why have I seen and collected so few birds during my one hundred and twenty-four days' residence at the Tuskar Light Station? In its bearing, in its movements, in its bold confiding nature, and in its plumage the Robin attracts notice. In fact, few birds ought to be less easily overlooked. And yet I observed only seven Robins altogether—six at the lantern and one on the rock, all of which I collected. Beyond one other bird observed on the rock by Mr. Granville, no other records were made of the presence of this species during my stay at the Tuskar Light-Station. I have not as yet had opportunities of learning something of the features of migration of this bird at other light-stations along the eastern seaboard of Ireland, where differences in the powers of illumination, in the speed of revolution of the rays in revolving lights, in the height of the lantern from the ground, may act as determining factors in a more or less degree in attracting this species to the lantern. Hence it is quite obvious that one cannot state with any degree of certainty that the cause of the Robin's absence from the lantern depends upon its peculiar powers of sight, so that it can withstand to a considerable extent the intense brilliancy of the rays without being dazzled, and thereby can largely avoid coming in contact with the lantern-glass. However, on the other hand, from a close study made repeatedly on many species, I can state with considerable confidence that, under the mesmeric enchantment of the luminous beams, different birds do behave very differently.

In the case of the Robin, I noticed that the six specimens which approached the light acted very similarly. They came up quietly, fluttered down the glass, and were easily picked off. While under the impression that I may have seen more Robins in the rays other than those collected, I cannot at the same time feel convinced in this matter, and my hypothesis is framed almost entirely on the fact that I saw birds about the same size

and plump build of the Robin on nights when this bird was captured, and that these birds behaved in a characteristic manner. Unlike many species which career wildly about in the rays before approaching the glass, each suspected Robin flew quietly and almost heavily towards the lantern. Unless it struck it seemed to fly back for a short distance, and then disappear by descending into the abyss of darkness. Moreover, each Robin seemed to make but one effort to reach the glass, failing which it went off with downward flight. So evident was this feature that I never had the opportunity of seeing one strike, as many birds do, in a wildly excited fashion, flutter half-way down, leave the lantern, and come back to repeat this performance, or to strike against the iron framework, the balcony railings, or other parts of the lighthouse, and thereby allow me to become familiar with the species, and soon to be able to identify it.

Not one of the six Robins was identified by me until they were brought to hand. The above considerations lead me to think that the Robin is one of those species which may not be so susceptible as some others to the dazzling influence of the luminous beams. In succeeding articles I hope to point out, in dealing with particular birds, that their behaviour at the lantern is highly characteristic. Here, however, I can only refer to two birds which, given the same meteorological conditions, behave very differently under the sway of the lantern's glare. The Starling becomes a perfect fool, and insists on flying with full—or at all events considerable—force against the glass. If it does not kill itself outright or render itself unconscious, it will, with loud clattering of feet and wings, come fluttering down the lantern. If captured and liberated, it usually comes back with great force, and, if not already incapacitated, will repeat this performance till it falls dead or exhausted on the balcony or rock. The Swallow, on the other hand, will fly for hours—even all night, and in thick, misty weather—round and round the lantern, and in and out and up and down the path of the rays, and yet avoid the glass in a most marvellous manner. To return to the aërial movements of the Robin in the vicinity of the lantern, I would say that its advent is mainly a sign of fatigue. I do not say for a moment that such is not the case in many other birds, but it appears

still more evident in the case of the Robin, whose quiet approach to the lantern in its endeavour to secure a resting place appears to be but once attempted. I surmise with a considerable amount of conviction that those birds which failed to reach the glass descended to the waters below, off which they never rose again. On no occasion have I noticed Robins augment in numbers as the night grew later.* This means they did not tarry at the lantern till their companions, coming in successive parties, reinforced their numbers. But in other species no feature in bird-migration is more characteristic. On a dark, calm, and misty night we may see only one or two Willow-Warblers or Wheatears for an hour, or perhaps two, flying out in the rays, while later on these are joined by others, so that by midnight there may be double or treble the numbers. When the meteorological conditions, being favourable, remained constant, I have often noticed a steady and regular increase of numbers up to a short time before dawn. Here it is evident that those birds which arrived round the lantern in the earlier part of the night, and still were able to career about till nearly dawn, must have been far from fatigued. At the same time the light seemed to possess a fascination for them, and compelled them to fly round and round the lantern with unceasing energy. In regard to the remarkable paucity of the occurrences of the Robin at the Tuskar lantern, it may be observed that while this species made its appearance on dark, calm nights and in company with other species, still it was conspicuous by its absence on many other nights when the meteorological conditions were much more conducive in attracting migrants, which, indeed, collected round the lantern in large numbers. On such nights Robins probably were also on the move, but avoided being lured to the beacon's blaze.

Coming now to my personal observations on this species made at the Tuskar Light-Station, it seems to me surprising that during a spell of thirty-two days' residence on the Rock, *viz.* from March 21st to April 22nd, I made no records of this bird's appearance during the vernal migration. In fact, I did not see

* In his 'Studies in Bird-Migration,' vol. i. p. 40, Mr. Eagle Clarke mentions that fifty or sixty Robins were noticed, on November 10th, flying round the lantern of the Kentish Knock Lightship from 2 a.m. till daylight. But whether a smaller number were noticed earlier in the night is not stated.

a single Robin during all that time I was on the Rock. And yet the period of the spring migration is apparently a lengthened one, extending from February to May, during which months many observations elsewhere have been made, and records attested by the capture of specimens (Barrington). The time when I was at the Tuskar Light-Station last spring should have represented the period of most active migration. Furthermore, in regard to the state of the weather, I may set forth that there were several splendid nights suitable for alluring migrants to the lantern, on which occasions great numbers of birds were collected. It is interesting to note, moreover, that in the lengthened period from 1881 to 1897, Mr. Barrington* only obtained four reported occurrences from the Tuskar in the spring—three in February and one in March. It is very significant that none of these occurrences are instances of birds seen at the lantern, but on the rock and in gloomy weather. The birds were not captured, and so these occurrences cannot carry the same weight that they would, had the specimens been secured and forwarded for corroboration. In fact, from what I have to say presently, we shall see what an important matter it is for an ornithologist to receive statements regarding the occurrence of this species (familiar and conspicuous though it may be as we see it in our lawns and gardens) with a considerable degree of caution. In short, then, neither Mr. Barrington nor I have *received* a specimen of the Robin in spring from the Tuskar Light-Station. Having thus no personal experience of the Robin's migration in spring at the Tuskar Light-Station, I feel I am not in a position to offer much comment in regard to its migration route, but probably large numbers adroitly avoid the lantern. Inasmuch, however, as it has been observed at several of the lightships adjacent to the Tuskar Rock, one cannot infer that the latter station is out of its migration route. From the Blackwater Bank Lightship its occurrence has been proved, for Mr. Barrington† tells us he received a specimen from that station on March 13th, 1896.

Now, if we include the east coast generally, the Robin is said to have struck the lanterns of five stations, while in the case of

* 'Migration of Birds,' "Analysis of Reports," 1881-1897, pp. 38-42.

† *Loc. cit.* p. 38.

the north coast it only struck two, the south coast two, and the west coast only one.* However, from what I have said in regard to its behaviour at the lantern, it is evident that we cannot conclude from these statistics alone that much greater numbers pass along the east coast than along the other coasts of Ireland. It is suggestive that the Robin, like the Wren, may fly relatively low, and so pass the Tuskar tower below the level of the lantern. This, however, would not account for the complete absence of the bird from the lantern in spring and its occurrence in autumn.

Passing on to the autumnal migration of the Robin, I am able to furnish seven personal records from the Tuskar Light-Station—six from the lantern and one from the rock. Five of these birds were obtained in September—two in September, 1911, and three in September, 1912. Taking the two seasons together, we find that the occurrence of the Robin in September covered only a period of six days, extending from Sept. 12th to 17th, the birds of 1912 appearing just a shade earlier than those of 1911. Hence it may be that this is a period marked by active migration, and that these birds represent stray specimens from many others which passed the lantern unobserved. But, assuming that the Robin avoids the lantern to a large extent, it is extremely hard to fix the period when migration is at its height. However, I was pleased to obtain evidence this autumn of the migration of this bird in August, in which month the other two specimens were collected. In 1911 I did not arrive on the Tuskar Rock until Sept. 11th, and hence cannot say whether the Robin occurred in August.

In regard to the specimens collected, it may be noted that the two earliest birds of the season were captured almost simultaneously, whilst the last two Robins of the season were obtained also on one night and in rapid succession. The first birds, according to season and not to year, were obtained on Aug. 15th, 1912. The night was calm, the sky dark and clouded over, and there was a light breeze coming from the west. Though I saw a few birds flitting about in the rays since 9 o'clock, nevertheless no bird came in contact with the glass before 10.40 p.m., when the Robin was captured. This bird flew in very

* Barrington, *loc. cit.*, p. 39.

quietly, and after a few flutters it managed to secure a footing on a window-sash above my head out of arm's reach. However, in the dazzle of the white beam as it swept across the bird, the latter came fluttering down in response to tappings made by Mr. Glanville on the pane of glass below. As the bird descended and came within reach it was easily picked off the lantern-window.

Half an hour passed before I saw another bird. Then at 11.10 o'clock a bird flew quietly in over my head until it came in contact with the glass, down the panes of which it started fluttering; however, being within arm's length, I easily secured it without a moment's delay. It proved to be a second Robin. Birds were scarce and species few this night, the only other species I identified being Wheatears and Spotted Flycatchers, examples of which flew against the glass, but were not collected.* At the time that the second Robin was collected the wind had veered to south-west, and the sky had cleared sufficiently to allow the stars to shine out, though not brilliantly. About midnight a few small birds, which may have been Robins, passed through the rays; odd birds of this kind appeared at intervals of about every twenty minutes till 2 a.m. From then until dawn I saw no more birds. On the whole this night was very dark and calm, and had there been more haze it would have been a typical night for bringing birds round the lantern.

An interval of twenty-eight days now took place before I saw another Robin. On Thursday night, Sept. 12th, 1912, at 10.10 o'clock, one came up slowly to the lantern just over my head, and as it fluttered down the glass I collected it. The night was calm, the sky dark and somewhat overcast, but it cleared at intervals so that the stars shone out brilliantly. Curiously enough, it was just in one of these starlit intervals that the Robin was collected. This was a night in which many kinds of birds were seen round the lantern. Wheatears, mainly belonging to the large race, appeared soon after darkness set in. They were followed by Willow-Warblers, Corn-Crakes, Golderests, Ring-Ouzels, Chiffchaffs, Sedge-Warblers and Common Terns. Specimens of all these were collected,

* *Vide* "Spotted Flycatchers on Migration observed at the Tuskar Rock and Lighthouse," 'Irish Naturalist,' October, 1912, p. 198.

Corn-Crakes excepted. None of the species appeared in large numbers.

Following the order of season, regardless of the particular year, I now record the observation made by Mr. Glanville (Principal Lightkeeper). On Sept. 12th, 1911 (the same day of the month that the last-mentioned Robin appeared in 1912), he saw a Robin on the Rock at 7.40 a.m., in company with a Wren, a Goldcrest, a Whinchat, some Wheatears, and Sedge-Warblers. It was the second day of my first visit to the Rock, and, being inexperienced, I thought it would be probably an easy matter to secure these specimens if I hunted them up later on. But I found out my mistake, for, on coming out two hours later when I had finished writing my journal notes, the Robin, the Wren, and the Goldcrest were nowhere to be seen. I have since learned that birds may in some instances alight on the Rock for a few minutes, and it is a good rule to go out and look for them the moment one hears of their presence. The Sedge-Warblers and Wheatears, however, remained on, and I collected specimens of each. Later in the day I saw a Pied Wagtail, and in the evening collected a specimen of the Blue-headed Wagtail* and of the Spotted Flycatcher. On this occasion the Robin was migrating in company with several species. All these birds no doubt tarried to seek shelter on the rock, for the morning set in very wet, and the wind, at first blowing a moderate breeze, rose later in the day to a fresh, and still later to a strong, breeze. The sky also remained very overcast and gloomy-looking, and rain fell all day long.

Two days later—here again according to season and not to year, *i. e.* on Sept. 14th, 1912—I observed a Robin on the Rock at 9.30 a.m. It was tame, rather fatigued, and easily collected. This morning Meadow-Pipits and Swallows flew past the Rock; several Pipits alighted, also two Grey Wagtails and a Pied Wagtail. In addition three other Grey Wagtails passed over the Rock. The morning was fine, bright, and fairly calm, the wind an hour before noon falling off to a flat calm. The prevalent wind during the day was west. On the night of the same date, at 8.2 o'clock, I saw a bird whose plump build and quiet flight, as it drew near the lantern, suggested to me that

* *Vide* "Birds new to Ireland," 'Irish Naturalist,' March, 1912, p. 49.

it was a Robin. It came up to the glass, but soon it departed to return no more. It may, however, have been a Stonechat, a bird with somewhat the same form and flight. I surmise this because I observed and collected a female Stonechat at 6.10 the next morning. Wheatears, Swallows, and Greater Whitethroats appeared this night, and I collected examples of the last-named species. The night was very calm, the sky dark and overcast, the wind west, but the atmosphere was so exceptionally clear that from the balcony we could see the flash of the Blackwater Bank Lightship's lantern—a rare sight.

Two nights later—*viz.* Sept. 16th, 1912, at 11.35 p.m.—I collected a Robin, which came in quietly and fluttered down the lantern. Just then Chiffchaffs appeared in considerable numbers, and I collected specimens of them immediately before and after I secured the Robin. The prevalent wind was north-west. The night was dark, the sky overcast, and the weather exceedingly calm. Many kinds of birds on the move came near the lantern, though several species escaped striking. Several aquatic birds came into the rays, *e. g.* Curlews, Redshanks, Turnstones, and Terns. All these I saw and could identify; I also heard several times the voice of the Snipe, though I failed to catch a glimpse of the bird itself. Many kinds of land-birds also appeared; with the exceptions of two Song-Thrushes and a Spotted Flycatcher, seen in the rays, specimens of all the other kinds seen were collected. In addition to the Robin and Chiffchaff already mentioned, these were: The Greater Whitethroat, Ring-Ouzel, Goldcrest, and Wren. I do not think that I saw any other Robins besides the one I collected.

The latest autumnal record of the occurrence of the Robin, when two appeared simultaneously at the Tuskar Light-Station, was made the next night, Sept. 17th, but in the previous year, namely, 1911. These were really the first two Robins which I collected, but seasonally they were the latest. Their aerial movements as they drew near the lantern were similar to what was seen in the case of the other Robins. But this was the only instance in which the two birds flew against the glass exactly at the same moment, the hour being 9 p.m. Besides Wheatears and Goldcrests, specimens of which I collected, no other birds appeared which I could name. A few, however, flew about in the

rays which may have been Robins. The numbers of birds round the lantern this night were not many, and their presence was of short duration. The first bird I saw was at 8 p.m., the last at 10.30 p.m. The weather was calm, the sky dark and overcast, but the atmosphere was clear, and a light breeze was blowing from the north-west.

The occurrences of the Robin, then, which took place during my residence on the Tuskar Light-Station may be summed up as follows:—

First visit, Sept. 11th to Oct. 7th, 1911.

Sept. 12th.—One Robin seen on the Rock, 7.40 a.m.

Sept. 17th.—Two Robins collected at the lantern at 9 p.m.

[A few others suspected to be Robins, seen in the rays.]

Total number of records: *three*.

Second visit, March 21st to April 22nd, 1912.

No occurrences recorded.

Third visit, July 29th to Sept. 30th, 1912.

Aug. 15th.—Two Robins collected at the lantern—the first at 10.40, the second at 11.10 p.m.

Sept. 12th.—One Robin collected at the lantern at 10.10 p.m.

Sept. 14th.—One Robin collected on the Rock at 9.30 a.m.

[Another, suspected to be a Robin, seen in the rays of the lantern at 8.2 p.m.]

Sept. 16th.—One Robin collected at the lantern at 11.35 p.m.

Total number of records: *five*.

Grand total made during one hundred and twenty-four days' residence at the Tuskar Light-Station: *eight*.

N.B.—Occurrences included in square brackets, whose identification is uncertain, are excluded from the numbers in this summarized list.

Before concluding this paper, I should like to refer to the extraordinarily small number of Robins which Mr. Barrington *actually received* during his negotiations with all the light-keepers round the Irish coast during the period of years extending from 1881 to 1897. Only two specimens were received—one in spring (killed striking the Blackwater-Bank Lightship lantern, Co. Wexford, March 13th, 1896), and one in autumn (killed striking the Rockabill Lighthouse lantern, Co.

Dublin, November 1st, 1891).* If, however, we give full credit to the statement in which it is said the bird struck on twenty other occasions,† the census of the occurrence, though still exceedingly small, affords us some testimony that the Robin is a genuine migratory bird. If we look at the reported occurrences which Mr. Barrington received, we find he gives, including spring and autumn migration, eighty during the months of regular migration, and of these forty-one are from the east coast, twenty from the west, eleven from the north, and eight from the south.‡ Crediting such as a fairly accurate return, there is, as Mr. Barrington says, "a sufficient concurrence of testimony from many stations to lead us to the conclusion that the Robin annually migrates in some numbers."§ However, without the evidence obtainable from a light station at all, the noticeable increase of Robins over a wide area of the British Isles in autumn and winter can only be satisfactorily accounted for by an influx of visitants from without the British Isles. Nor do the local overland movements, directed chiefly to the islands of the western seaboard of Ireland, necessarily supplant the more protracted pilgrimages taken by the immigrants arriving on any points of the Irish coast. But what interests me greatly in reading Mr. Barrington's article on the Robin in his 'Analysis of Reports, 1881-97,' is this: that evidently not one of the twenty Robins said to have struck have been forwarded.|| What became of them, and did the lightkeepers really secure them and identify them beyond doubt? Personally I have no reason to doubt that twice twenty Robins may have come to the lanterns, for even that number would be far smaller proportionately than what I have furnished of the birds I saw in a few months, and at only one lighthouse. One would like to know what is really meant by the term "*striking*," in the case of the above-mentioned twenty Robins, and were the birds killed, stunned, or even badly disabled, thereby attracting the lightkeepers to put them out of misery directly they were discovered? This point interests me to a great extent, because none of the birds which I collected "*struck*" in the strict sense of the term, but simply came in

* Barrington, *loc. cit.*, p. 38.

† *Loc. cit.*, p. 39.

‡ *Loc. cit.*, p. 42. § *Loc. cit.*, p. 39.

|| *Loc. cit.*, p. 39.

quietly to the lantern and then fluttered down the glass; and, had I not been on the spot to pick them off, the chances are more likely than not that they would have exhausted themselves and fallen over the balcony into the sea. If the birds, here recorded by Mr. Barrington as having "*struck*," behaved similarly, we then have an explanation offered as to why they were not forwarded; simply because they were probably never brought to hand. For, from what I can glean from lightkeepers, the common practice is not to go out on the balcony and try to capture a bird which is fluttering down the glass, unless it first shows some indication of having been disabled to a degree sufficient to ensure its capture.

The lightkeepers see so many common small birds fluttering on the glass that they grow as used to the sight as we do when we behold for a moment moths fluttering at a street-lamp, and then take no further notice of these insects. This—coupled with the fact that when migrants approach the glass it is frequently raining, or at all events the weather is generally damp and foggy and uninviting for the keepers to leave the shelter of the inside of the lantern—gives the key to why so many birds are let pass. If, on the other hand, we get a number of birds striking so hard that they are killed outright and fall dead on the balcony, then they would be secured next morning when the lightkeeper went out to inspect the lantern, its framework, and riggings. Moreover, the rap at the window made by birds striking hard would arrest attention, and induce the keeper on watch to go out on the balcony at once, and collect, at all events, some of the birds before he grew tired of this diversion. A case in point has recently come to hand, when, in the space of about two hours, about seventy Blackbirds struck so hard that they were discovered on the balcony dead. The greater number of these were packed and consigned to me by Mr. Power, Tuskar lightkeeper, to whom I am greatly indebted for the material for research purposes.

In regard to reported occurrences, it may be remembered that I have already referred to the fact that it is important for ornithologists to sift statements with a considerable degree of caution. Even the trained ornithologist may at times make mistakes in regard to the identification of the Robin as it moves hither and thither on a marine rock-island. This is due to the

fact that owing to the marked unevenness of the surface, with its innumerable crevices and projections, the bird is frequently not seen in its entirety. Hence it is that if one catches sight of a bird apparently about the same size as the Robin, and at the same time only its breast and head are visible, and if in the twinkle of an eye it disappears by dropping into a crevice, one must not conclude, because the bird displayed a reddish-coloured breast, that it was a Robin. In certain light, when a curious lurid glare seems to accentuate the colour of everything on the rock, I have more than once mistaken Wheatears, with particularly richly shaded chestnut breasts, for Robins; and the female Stonechat has been pointed out to me as a Robin. I can quite understand a lightkeeper mistaking a male Chaffinch in an exhausted condition for a Robin, especially in the spring, when the breast is very richly shaded. For much of the characteristic demeanour of the Chaffinch is masked, and instead of seeing a smart perky little finch hopping about in a dainty fashion, all the while uttering its familiar "spink" note, we see an apparently rotundly built bird, its feathers all puffed out, and at the same time we note that the white on the wing is occluded by the overlapping back-feathers. In such a condition this bird seldom utters a note, and if it were observed breast on, it might be taken for a Robin. In regard to mistaken identity, I was much interested to learn from Mr. Glanville that the Black Redstart* went by the name of the young Robin by some lightkeepers, a mistake which he frankly admitted he shared some years ago.

In regard to the migration route taken by the above birds recorded by me from the Tuskar Light-Station, I cannot, as already mentioned, offer much comment. One would naturally class them as taking one of three routes:—(a) As descending from more northerly latitudes east of the British Isles, and travelling in a south-westerly direction, reaching Ireland as autumn immigrants; however, on account of their plumage they do not appear to resemble the Continental form of Robin, and so I am not in favour of adopting the view that they took this route. (b) As cross-Channel emigrants from Scotland or England and

* Probably the adult female and immature of either sex of the Common Redstart were thought also to be young Robins.

immigrants to Ireland. In their plumage they resemble the British form of Robin, but inasmuch as the movement took place as early as mid-August and ceased in mid-September, and inasmuch as the east to west or north-east to south-west inter-British movement is usually regarded as being correlated with seeking a more genial climate in cold winter weather, I am not inclined to favour the view that this was the route taken either. (c) As *emigrants** from Ireland seeking more southerly quarters than the British Isles, and travelling in companionship with the south-bound emigrants which accompanied them to the lantern. It is most likely that this was the route they were taking, but how far they might have flown, had they escaped all vicissitudes *en route*, I am not prepared to say.

Post-mortem examination showed that they were all immature females; all in plump condition, with much fat under the skin; and all, save one, had not a vestige of food in the gizzard. The one whose gizzard contained sparse remains of marine crustaceans was the one collected on the rock at 9.30 a.m. on September 14th, 1912. This food, foreign to the Robin's taste when on land, was no doubt picked up on the rock on the same morning that the bird arrived.

* According to Saunders (Man. Brit. Birds, 2nd edit., 1899, p. 37) young Robins are, to some extent, driven away by their parents and forced to *emigrate*.

SOME FISH-NOTES FROM GREAT YARMOUTH AND NEIGHBOURHOOD FOR 1912.

BY ARTHUR H. PATTERSON.

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THE year 1912 has not provided me with any surprises in the shape of unrecorded species in my own neighbourhood, or exceptional captures, although a few erratic occurrences are worthy of note. Owing to the disagreeable weather characterizing what should have been the busiest period of the local shrimpers' season, I received very few "curios" from these inshore fisher-folk, who, on the whole, made fairly remunerative catches, the "Pink Shrimp" (*Æsop's Prawn*) having swarmed in the roadstead.

Since the publication of my "List of Suffolk Fishes" (*cf.* 'Zoologist,' 1909),* there has appeared a section on the "Fishes" in the 'Victorian History of Suffolk,' compiled by Mr. J. T. Cunningham, M.A. To the value of that section I would like to bear testimony. Entirely void of technicalities, it is most excellently arranged; and it is curious to note that, written contemporaneously with my own—I have not the slightest doubt that we wrote unknown to each other—the lists should so strikingly correspond. Since my own list was published, the Jago's Gold-sinny (*Ctenolabrus rupestris*) (1910), the Black Seabream (*Cantharus lineatus*), and the Hag-fish (*Myxine glutinosa*) have been recorded for the Suffolk seaboard; whilst Mr. Cunningham's records of the Solenette (*Solea lutea*), Cuckoo Wrasse (*Labrus mixtus*), and the Smooth-hound (*Mustelus vulgaris*) must be added to my own list. For some of the species placed in the Victorian list, to which the editor attaches a slight doubt, verification of their occurrence will be seen in my catalogue of 1909, *e.g.* the *Bubalis*, *Liparis*, Butterfish, Carps, &c.

My first fish of the year was a small Ballan Wrasse, which reached me from Lowestoft on January 5th.

On January 6th the 'Angler's News' recorded the capture of

* Pp. 361, 414 and 447.

a fine Bream (*Abramis brama*) near Norwich, that turned the scale at $7\frac{1}{2}$ lb., measuring 25 in. in length.

Whilst incapacitated by influenza on February 6th, news was brought me regarding an enormous Eel (*Anguilla vulgaris*) that had been brought into port, and purchased by Mr. Robert Beazor, fish merchant. This gentleman kindly obliged me by sending the great slimy brute to my house. I had no hesitation in deciding it to be an old, undoubtedly barren, female. It looked as unsavoury as a long-kept Wolf-fish, the skin being jelly-like to the touch, while the blue-filmed eyes were as large as sixpences and lack-lustreless as ground-glass. I guessed its length at 5 ft., and was informed its weight was 28 lb.

A very young $2\frac{1}{2}$ in. Black Sea-bream (*Cantharus lineatus*) was sent me by Mr. F. C. Cook on February 10th; it had been washed up on Lowestoft beach, and is new to the Suffolk list.

A "double" Flounder was captured at Breydon on February 18th. A somewhat remarkable number of Flounders, whose under sides are blotched with grey, amber, and brown, and amounting in some cases to an almost entire discoloration, are caught in the "drains" and "runs" and on the mud-flats. Dr. Günther refers to "the coloration of many marine fishes being dependent on the nature of their surroundings," and to the fact of these colours being produced in two ways, "either by an increase or decrease of the black, red, and yellow pigment cells or chromatophores, in the skin of the fish; or the rapid contraction or expansion of the chromatophores which happen to be developed." I take it that the strong chemical forces more abounding in sewer-polluted estuaries, like Breydon, intensify the tendency to discoloration by excessive irritation of the pigment cells. The Flounders taken on Breydon are always dull-coloured on the upper surface, corresponding greatly with the muddy bottom, whereas those netted outside the harbour are invariably of a bright sandy hue, and the under surface is not nearly so often found discoloured.

A $9\frac{1}{2}$ in. Lemon Sole (*Solea lascaris*) was sent me from Lowestoft early in April. The general tint was sandy or light drab, with a suggestion of black dots "peppered" over it, with a number of pearl white spots, an eighth of an inch in diameter, as if implanted by the end of a penholder.

On April 7th a local shrimper brought me a very beautiful specimen of the Gattorugine (*Blennius gattorugine*), which he had captured early that day in his net when shrimping near the St. Nicholas' lightship. It measured 5 in. in length, and was only the second I have known to be captured off the Norfolk coast, the first having been brought to me in May, 1899. The present example must have been very beautiful in appearance when freshly taken out of the water, as its colours when brought to me in the evening were still strikingly distinct, red predominating, the dark bars becoming more strongly defined as the other parts faded. The upper illustration in plate cxiii. in Couch's 'Fishes,' vol. ii., is a good one of this species.

An interesting Sole came to me from Lowestoft on May 3rd; its upper surface was milk-white, with the exception of a small shilling-sized spot of the normal colour over one eye, and surrounding it. Length 15 in.

The finding of several dead Mackerel last autumn upon the tide-mark (*cf.* 'Zoologist,' 1912, p. 32) of exceeding full rotundity as compared with others of lesser girth of the same length led me to examine others washed up this year. I see nothing sufficiently suggestive as to their being of different races, but rather an individual tendency to obesity. I measured an example on October 17th, 1912, at 15 in. in length with a girth of 8 in. I made the following measurements at various dates:—

Example	14 in. long,	$6\frac{1}{2}$ in. round.	May 31st.
„	14 „ „	$6\frac{1}{2}$ „ „	} June 1st.
„	$13\frac{1}{2}$ „ „	$6\frac{1}{4}$ „ „	
„	13 „ „	6 „ „	} June 12th.
„	13 „ „	6 „ „	
„	12 „ „	$5\frac{1}{2}$ „ „	} June 13th.
„	$13\frac{1}{2}$ „ „	6 „ „	
„	$13\frac{1}{2}$ „ „	$6\frac{1}{4}$ „ „	} June 17th.
„	$13\frac{1}{2}$ „ „	$6\frac{1}{2}$ „ „	
„	14 „ „	6 „ „	} Oct. 17th.
„	14 „ „	$6\frac{1}{2}$ „ „	
„	$13\frac{1}{2}$ „ „	7 „ „	
„	15 „ „	8 „ „	

I offered a somewhat tempting price to a number of fisher-folk for the first or every Mackerel they might bring me showing spots or rings upon the abdomen. There came to me in June

an example with faint spots and ocellations well down below the lateral line—two-thirds down the fish; but the under part was normal. Its excess of markings made it somewhat conspicuous. I had hoped, sooner or later, to meet with a Spanish Mackerel (*Scomber colias*). Another example, measuring 16 in., with a girth of 8 in., was brought to me on Nov. 9th with very similar markings—a sort of faint fretwork of jumbled ocellations, but the absence of a swim-bladder and every other characteristic of the type (*S. scomber*) made its identification satisfactory. It would be curious to add that this, like a number of other “curios,” as they term them, caused their possessors to reach me in a somewhat unintelligible and highly laudatory manner, having on their way exhibited them at every familiar public-house, a trick conducive to free drinks from an admiring or interested circle.

At the latter part of the Mackerel fishing there appeared to be a decided immigration of Dog-fishes; so numerous must they have been that great numbers of the Mackerel were taken out of the nets with their backs badly bitten; others had their bellies bitten through, their sexual organs (roes and milts) and entrails having been entirely drawn out. These “broken” fish, often fine ones, were sold to hawkers, who very readily disposed of them amongst the poor. The fisher-folk had a mild revenge in skinning the netted Dog-fishes, whose trimmed carcasses were sold from the same barrows on which were exposed their victims.

Early in June Herrings taken off the coast were in fine condition and noticeably fat, some were exceedingly large. I have note of an example measuring 15 in., with a girth of $7\frac{3}{4}$ in., weighing 14 oz. A full normal Herring measured on Nov. 8th $10\frac{1}{2}$ in. by $5\frac{1}{2}$ in.

It is very unusual to find a Dab (*Pleuronectes limanda*) discoloured on the under surface; I obtained one, however, in the third week in June, an 11 in. example, coloured on both sides, with the exception of the under “face” or reverse side of the head. Another came to hand, about the same size, with five red spots on each side of the upper surface near the margins of the dorsal and anal fins.

A Monk-fish (*Squatina vulgaris*), 13 in. in length, was captured in a shrimp-net on July 13th. Subsequently other and larger

examples came to port, probably from the neighbourhood of Cromer Knowle. On Aug. 14th I saw one on Mr. Beazor's fish-slab, weighing four stone.

At Aldeburgh two Bass scaling 13 lb., and a Grey Mullet of 6 lb., were taken, and recorded in the 'Angler's News' of July 20th.

In the following week's issue a very fine Sting Ray (*Raia pastinaca*) was chronicled; it had been taken in a trawl-net off the Sizewell Bank, near Southwold, on the 20th. The fish scaled 60 lb., and had a double barb to the tail. It had made itself extremely disagreeable to the Soles that had been unfortunate enough to be netted with it.

I commenced my August holidays by a foray among the local ditches in search of Sticklebacks, with a view to determining the several varieties I had hoped to find in the neighbourhood. My captures were mostly very small—half-grown fishes, an adult being very exceptional. It seemed to me just possible, seeing the enormous number one meets with in spring, that after the duties of procreation have ended, there must be some obscure forces at work to eliminate many of these elders. Do they die and become the food for the many carnivorous larvæ and crustaceans, &c., that frequent the same ditches? One seldom finds dead fish at or near the surface, although in July, 1909, I discovered dead Sticklebacks partly eaten by crustaceans. They were the variety known as *Gasterosteus trachurus* (the Rough-tailed). With the exception of Ten-spined Sticklebacks, on this occasion I only met with the Quarter Armed (*G. gymnurus*), both on the marshes north of Yarmouth and to the southward.

In the shallow and rather fetid ditches bordering on the River Bure I met with numerous half-grown Sticklebacks woe-fully smothered with black spots and blotches immediately under the skin. I take it to be the *Trichodina pediculus*, referred to by Dr. Day in his article on the *Gasterosteidæ* ('British Fishes,' vol. i. p. 243), an evidently parasitic Infusoria. I notice that the shallower and warmer—and consequently dirtier—the waters haunted by Sticklebacks, the more susceptible do they seem to attacks from parasitic visitors, and from tumours. In the same net in which I garnered the Sticklebacks I secured some peculiar

coral-like Polyzoa. Mr. H. E. Hurrell, a well-known student of pond-life, who was "fishing" with me at the time, identified the specimens as marine Polyzoa, *Membrianfora monostachys* (var. *forsana*). This was attached to the lower portion of a plant which grows rankly in the brackish ditches bordering on the River Bure and Breydon walls. "It is a beautiful species," Mr. Hurrell wrote me later, "and on account of the conditions under which they were growing formed their colonies in lines of two and three cells abreast. In some cases the polypidoms intertwined, and the animals when ascertained gave the appearance of a living *chevaux de frise*. This polyzoon is closely allied to the sea-mats, and is somewhat rare, but has been found intermittently in the vicinity of Great Yarmouth for the past forty years. It is no doubt a pretty constant species, but has lacked observers." From one of these ditches a few years since I obtained Sticklebacks infested with *Thersites gasterosteus*, a parasite which I believe to be by no means common in any other part of this country.

One of my most enjoyable excursions "happened" on Aug. 2nd, when, in company with two kindred souls, the marsh ditches lying over to the westward of the Waveney, beyond Burgh Castle, were "lamb-netted." A lamb-net is very like a quarter section of an orange, a flat base lying on the ditch bottom, the other part of the net being hooped at half a right angle. There is a sloping flange below, so that any eels that may be frightened in are prevented getting out again, as they never think to lift their heads, but viciously poke into the sloping wall of net, which is but a few inches deep. One holds the net firm by means of a long pole that is looped on to the "beam" below. The hardest work mostly fell to myself—that of "plouning" or beating the water by a quick and forceful plunge of the end on which a sphere of wood is fastened. Advancing and "plouning" sadly disturb the half-dormant Eels, and, fleeing before it, into the net they go. Whoever held the net could feel the contact, and would constantly shout, "Here's another!" "There's a big one in!" &c. We captured most of our Eels near the sluice-ends of the ditches which abutted on the river, the "sluice-gates" being opened as water needs to be let out, or when a drought obtains, to be let in, in order to refreshen the marshes. It is by

the sluices that Eels find their way in. Most of our Eels ran from a half-pound to a pound each, and they were of a ruddy or golden hue, owing no doubt to environmental causes. We obtained over a stone, but deemed it a poor half-day's work. Among the catches we discovered a Smelt, some very small Sticklebacks, and a number of Opossum Shrimps; also one Flounder and a Perch. The paucity of smaller creatures undoubtedly was due to the hungry Eels, whose patience must sorely have been tried in filling up their stomachs with such tiny prey. In the stomachs of what Eels I dissected I only found in each a spoonful of *Gammarus* (probably *G. daubeni*), an ally of the freshwater Shrimp. The Perch was about four ounces in weight, in splendid condition, and had the stripings curiously bifurcated.

I made very few excursions after that date, for the month provided but one long series of disagreeable weather characterized by almost incessant rains or winds. Only one day did I really enjoy a little sport on Breydon, when Jary, the bird-watcher (employed by the Breydon Protection Society), roused me up early in the morning, and got his smelt-boat ready for a "draw" or two. He rowed up one of the wide "drains," and, having been put ashore encased in heavy boots, I took the "lead" line, and slowly squelched through the soft ooze as he payed out the smelt-net, and rowed down-stream with it. At four convenient points we pulled in the semi-circling net, and in four hauls had three hundred and twenty Smelts in our box under the boat's thwarts. Our catch would have been much heavier had not tide and wind proved too strong for us to manipulate the net longer. Some extraordinary hauls have been made during the autumn, bad weather notwithstanding. The utter absence was noticed of Atherines (*Atherina presbyter*), locally known as "Smolts," a fish in no request locally, being thought dry and insipid. The smelters have a saying, "If you get a lot of Smolts, you get few Smelts," and there may be something in the idea that these strongly scented fishes drive other species out of their neighbourhood. On a visit to Lowestoft I was astonished to note their almost entire absence there, as in most seasons the scores of contented anglers of all ages, baiting with the tiniest morsels of Shrimp,

haul out considerable quantities of Atherines, as well as numerous young Herrings no larger than "whitebait." They, however, caught numbers of four-inch Bibs (*Gadus luscus*). Bibs of the same size were abundantly taken in the Yarmouth shrimp-nets all summer and autumn. There were unprecedented numbers of small Bass, locally known as "Sea Perch," taken on Breydon in August and September. In August they measured $4\frac{1}{2}$ in.; some taken in October I measured at $7\frac{1}{2}$ in., an evident quick growth of three inches in three months.

On Aug. 16th a photographic illustration of a Sunfish (*Orthogoriscus mola*), recently captured at East Runton, was published in the 'Eastern Daily Press.' It measured 20 in. from nose to tail, and 30 in. from tip of dorsal fin to tip of anal fin. From what I can gather, it was subsequently cut up for crab-bait.

On Sept. 1st, at the entrance of Wroxham Broad, some thirty miles up river, a Flounder was taken on a leger, the bait being a worm.

"Sept. 20th. The rivers during the past two or three days had been full of fresh brown water, pumped from the overflowed marshes; Bream and Roach taken in smelt-nets, and seen well towards the harbour-mouth" (excerpt from note-book).

So enormous was the downpour of back waters, after the cloud-burst, that for days, on the strong ebbs, the freshets pushed out of the harbour right away into the roadstead, going out at the Corton Gat (half-way to Lowestoft), being deflected when the returning flood-tide from the northward set in. For two or three days I suspected that no salt water came into the harbour from the sea, a fortunate circumstance for the marshmen.

Several Sea-Trout (*Salmo trutta*) were netted on Breydon during the autumn, and one was recorded in the 'Angler's News' of Sept. 21st as having been taken with gentles at Oulton Broad.

Sharks, little and big, of divers species, seem to have been very troublesome on the Herring-grounds all the way from Scotland downwards. Two nine-feet Porbeagles were brought into port in the middle of October, having been entangled in the Herring-nets.

The spring and early summer Mackerel fishery was pursued

by thirty boats, the season beginning on April 15th and ending on July 8th, securing catches of over two million and a quarter Mackerel.

During the third week in September an emphatically fine Silver Bream (*Abramis blicca*), weighing $2\frac{1}{2}$ lb.. was taken in the Waveney near Beccles. A fish of this species weighing a pound is esteemed a fairly good specimen.

October 6th. Among the refuse at the tide-line, and in company with many dead Herrings and Mackerel, I found a small Haddock, a rather rare visitor to the Yarmouth seaboard nowadays.

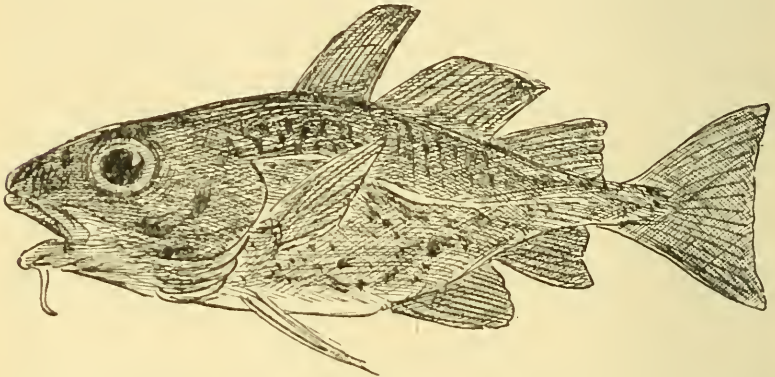
According to the 'East Anglian Daily Times' of Oct. 25th, there had been taken recently in a net, by Mr. George Smy, a Hag-fish, or Myxine (*Myxine glutinosa*), at Orford, on the Suffolk coast. It measured just over a foot in length. This is, I believe, new to the Suffolk coast, and hitherto has not yet been recorded for the Norfolk seaboard. It is given by Howse, in the 'Catalogue of the Fishes of Northumberland and Durham,' as "not uncommon," and he mentions its "extreme abundance on the east coast." He relates that one hundred and twenty-three specimens were taken out of one Codfish at Redcar in the winter of 1843. Messrs. Eagle Clarke & Roebuck ('Yorkshire Vertebrates') state it is "resident and abundant off the whole coast from Redcar to Flamborough." Dr. Day ('British Fishes') records it for Moray Firth, Weymouth, Swansea, &c. Dr. Laver ('Mammals, Reptiles, and Fishes of Essex') does not give it in his list.

November 8th. Mackerel are being taken in rather unusual numbers for this time of the year. I saw several examples to-day of a very large size. On the 9th I saw a number of Mackerel on the fish-wharf measuring 18 in.

On Nov. 12th I wrote to the 'Eastern Daily Press,' begging for an opportunity to see any so-called "slinky" (sickly) Codfish, caught by sea-anglers, now so numerously crowding every pier on the Norfolk and Suffolk coasts. I have heard of many of these wastrels being taken, but had not so far examined any, the "successful" angler almost in every case having thrown the "lice"-haunted creatures overboard again in disgust. My letter aroused considerable interest, and the first, taken on Britannia

Pier, on Nov. 15th, was sent me. It was a stunted fish, measuring 13 in. in length, with a girth of $9\frac{1}{2}$ in. Upon it I found small colonies of a fiddle-shaped crustaceous parasite, which I took to be a *Caligus*. I sent some to the British Museum, where the species was identified as *Caligus curtus*.

There were as many females on this fish as males; these were still alive on the following day. It would be interesting to come to some satisfactory conclusion as to whether the parasites preferably attach themselves to an already sickly fish, or whether the poor condition follows on their attachment. The fish examined had an excess of mucous juices upon its body, upon which its lodgers apparently subsisted; in such a case they might be more of



STUNTED CODFISH.

a boon than a nuisance. Beneden ('Animal Parasites and Messmates,' p. 72), with some assurance, concludes that "they live on the produce of cutaneous secretions, and if they improve, as do the ticks, the cleanliness of the host, they are not less useful in a hygienic point of view, for they prevent the accumulation of cutaneous productions." To my mind these "fish-lice" are far more pretty than their vulgar nickname. In the gills of this codling I found an obese *Lerneæ branchialis*, and in the stomach a number of thread-like worms. The latter, when dropped in a tube of formalin, formed themselves into a kind of ball, with many loose ends twirling and twisting in a curious manner. Altogether, I suspect this poor codling had had a shocking time!

A very large Flounder was taken about the same time, crowded with parasites, and was so thin that when held up to

the light it was semi-transparent. Unfortunately I did not see this fish.

Early in December my attention was called to a long, attenuated, sickly-looking Cod, which should have weighed, if in good condition, about 25 lb. Every fin, from the pectorals to the caudal fin, was worn or eaten away—in some to half the length of the fin-rays, in others a little less—whilst through the raw edge of the dorsals the fin-rays showed distinctly. The fish had the appearance of having had the fins rotting away.

Mr. E. Curtis, writing from Lowestoft on Nov. 13th, mentions the taking of great quantities of young Soles in July among the Shrimps, a mistake that does not occur off the Yarmouth sea-board. He notes the hanging of Monk-fish from the sterns of incoming trawlers by a piece of rope, as a sort of mascot. Large numbers of Five-bearded Rocklings (*Motella mustela*) were taken in the shrimp-nets in August. On October 4th he observed a Salmon-Trout of some 20 in. length on board a herring-drifter, and on the day following a fine Sea-Bream, 14 in. in length—a rather unusual East Coast capture at this time of the year.

The great East Coast Herring Fishery, of which Yarmouth is the great centre, opened early, and excellent catches marked the beginning of the season. Up to Oct. 24th scarcely a night's cessation through bad weather had been experienced. The official figures published weekly in the local papers were of great interest, although not brightened by much "incident." The following are examples of such reports:

Number of crans landed at the fish-wharf for week ending	Crans.
Saturday, Oct. 12th, 1912	103,809
Ditto, Gorleston	15,259
Ditto, other wharves	827
Combined total for week	119,895
Total landings for the corresponding week of last year ...	75,560
The progressive total landings for the season up to and including Saturday Oct. 12th, are as follows:—	
Fish-wharf	262,730
Gorleston	31,576
Other wharves	1,184
Combined total landings up to and including Saturday, Oct. 12th	295,490
An increase up to corresponding date of last year of 164,750 crans.	

The total of boats fishing out of Yarmouth port for 1912 was 915 as against 882 of the previous year. The following are a few interesting items connected with the fishing :—

On Sept. 24th the steam drifter 'Sunbeam' made a remarkable catch of 320,000 Herrings. The nets had been "struck" by a heavy shoal. In the early morning the crew were seen by those on other vessels to be hauling in an unusual number of fish, some of the lighter fished boats standing by with the hope of taking over such nets as could not be emptied on board the 'Sunbeam.' The skipper paid no heed to them, hoping that another vessel belonging to the same owner might come to his help, a desire that did not prove futile. A second boat came to help, and took aboard the remainder. The night's catch realized £520. The first boat brought in 230,000 Herrings, the other the remaining 90,000.

Up to Oct. 19th Yarmouth's catch was 295,490,000 Herrings, as against 164,750,000 last year. Lowestoft's catch was 150,992,000, as against 61,892,000 last year. By breakfast-time on one day that week a Lowestoft boat had cleared out her night's catch of 60,000 Herrings; she had cleaned up and got out again, and was back once more by tea-time with another great catch of 30,000 fish.

A feature of the fishing has been the freedom with which Herrings have been "struck" in the daytime.

It has been estimated by a local fish-merchant, fully competent to form an opinion, that the pilfering of Herrings by boys and even girls, mostly after school hours, had amounted in one busy week to the astonishing value of £100.

A great hue and cry has been raised against the use of the trawl for catching Herrings in the North Sea, and strong protests have been made by Scotch and English fish-merchants, who see in its continued operations disaster looming ahead. On Oct. 19th a huge protest meeting was held in Yarmouth Town Hall, when no fewer than nine Members of Parliament, twelve mayors and provosts of towns largely interested in the fishing industry were present. This meeting was promptly followed by a deputation, headed by Mr. Arthur Fell, member for the borough, which waited upon the President of the Board of Agriculture and Fisheries, and the Vice-President of the Irish Board of

Fisheries. Striking facts were presented to their notice. It was stated that £10,000,000 was invested in Herring fishing at Yarmouth and Lowestoft, and 25,000 fishermen were concerned, while apart from the allied trades 60,000 people were engaged in it. It was incontestably proved that trawled Herrings were far inferior in quality to those taken by drift-nets; they were scaleless and went black. Huge quantities of immature fish were destroyed, and the spawn undoubtedly suffered. A case was quoted where a skipper made a catch of 1200 boxes of Herrings, of which only 150 boxes were landed; at best the small fishes were only fit for manure. International action would have to be taken or ruin would follow.

Writing me on Nov. 4th, Mr. Ernest R. Cooper, of Southwold, remarks that "the Herrings are very southerly this year, and I understand the bulk of the fishing in October has been done abreast of this town; unfortunately the Scotch curers boycotted us this year, and we have had few boats in."

The record price of £4 2s. per cran was realized in Lowestoft early in December.

There was an early inshoring of very fine Sprats off Southwold, the first catches being made in October, "when," writes Mr. Ernest R. Cooper, "a school set in from the north and between 20th and 25th October, when 646 bushels were landed in the harbour. Unfortunately the weather broke then, blowing strongly from the south-west for several days, then from the north-west, and not a bushel has been caught since. [Dated Nov. 4th.] I trust, however, that another school will set in from the south as usual this month." Mr. Cooper gives the first arrivals in 1910 and 1911 on Nov. 2nd and Nov. 13th respectively. I saw no more on sale in Yarmouth until Nov. 11th, when a few turned up, on which date also broke upon us a gale from the westward, veering to the north, which put a stop at once to all sea-fishing operations, when the Scotch and English fishing luggers were packed in Yarmouth Harbour like matches in a box. Under date of Dec. 10th, Mr. Cooper writes that "the quantity of Sprats landed at Southwold Harbour in Nov. 1912 was 533 bushels against 64 bushels in Nov. 1911. More are landed on the beach; probably the harbour catch is about one-third the total landings at Southwold." To the middle of December good

quantities were still being sent to Yarmouth, the long-continued westerly and south-westerly winds being favourable to fishing. The Sprats that I have sampled have been this year of exquisite flavour, an opinion not shared by Mr. Robert Beazor (*vide* "Notes").

Mr. Robert Beazor, Senr., fish-merchant, as usual, sends me some interesting "Notes." He writes:—"On Jan. 1st (New Year's Day) a half-dozen fine Smelts, full of roe, were sent to the market with some flat fish captured in a draw-net [seine], and for several days following others were landed. It was earlier than I ever knew them to be taken. Plenty of Dutch Smelts were daily on the market, prices being exceptionally low—from 6d. to 9d. per score, in boxes of two score fishes. On the whole the Smelt season was a poor one; the thirty or forty boats engaged did not average more than four or five score fishes each per tide. The largest quantity I had in one day was about fifty score. The Trout season was practically a failure; the smelters proper took but very few. In May, on three or four days, a nice lot, however, came in from Winterton and other seaside villages adjoining. On June 19th I recorded the landing of a 12-lb. Salmon by one of the drifters that had gone out for Mackerel. It had fouled and rolled itself up in the net, and was captured eighteen miles east of Yarmouth. This has been an exceptional year for Mackerel, which were landed in large quantities. Early in June Horse-Mackerel [Scads] were taken in large quantities with the Mackerel, but there was no sale for this fish, not even with the barrow-hawkers, who find no difficulty in disposing of the less tempting Dogfish! I noticed several Scribbled Mackerel and one black-backed Mackerel during the season. In September a man brought to my office a fine specimen of the Anchovy that had been enmeshed with the Herrings some three miles east of Corton Light-vessel. It was as large as a middle-sized Herring. The great Herring fishery needs no comment from me, but I must remark on the miserably poor quality of the fish, accounting for so many merchants being without their customary quantity of 'Reds' ['high-dried'], of which there are even now but few to be obtained. The Sprat season has not, to my mind, been one of the best; the fish are very 'cliny,' and poor and mean, like the

Herrings. Among the few Herrings recently [December] landed large numbers of Pilchards—quite a third of the quantity, in fact—have been taken, which is quite an unusual occurrence.”

The sport of Sea Angling has become exceedingly popular in the neighbourhood of late years, anglers of both sexes becoming more numerous every year. Whittings come into the shallow waters in considerable numbers in October and November, whilst devotees of the rod, including even boys of tender years, that thronged the old jetty at Yarmouth, fished over each other's shoulders literally two and three deep at times. Mr. Harry Tunbridge, manager of the Britannia Pier, sends me the following statistics:—“The total number of Whiting taken from this pier in October was 23,206; in November, 8030. Total, 31,236.”

Mr. F. T. Fenton, manager of the Claremont Pier, Lowestoft, under date of Dec. 14th, writes:—“No record is kept of the numbers of fish landed, but this season has been the best for Whiting for many years past. I have known 130 to be caught in seven hours by one rod. In one week no fewer than 6000 were brought to basket. Codling up to 19½ lb. have been taken this year. Major Seymour made an interesting capture of a 2½ lb. Turbot at four o'clock one afternoon, and on the next day, at exactly the same time, he landed another of 2¾ lb. weight.”

The season for Codlings commenced in December, but so far poor catches have been made, a 21 lb. being the largest landed.

Amongst the few crustaceans which came to hand that attracted more than ordinary attention may be mentioned an aged Lobster (*Homarus vulgaris*), whose shell was covered with Barnacles, *Sabellæ*, and zoophytes. The edges of the outer covering, and more especially the claw-ends, were badly worn, like an old Gnu's horns in the “Zoo,” it being evident that exuviation had for some time past been a lost art.

Among the malformed pincer-claws of the Edible Crab, a speciality that has interested me for many years, may be mentioned:—

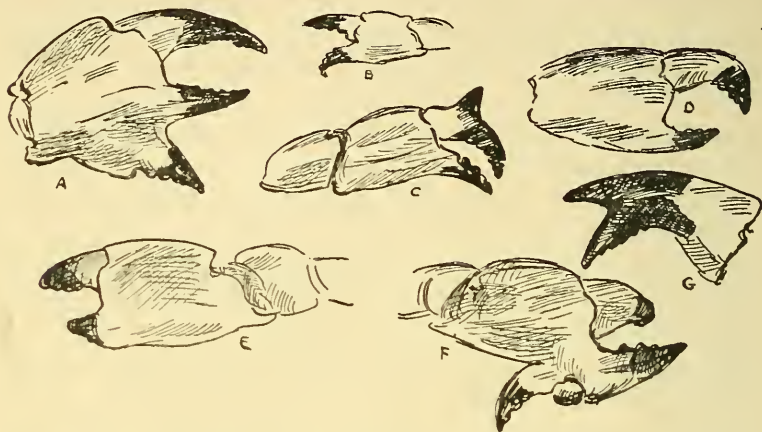
A.—A three-pointed pincer-claw that had a curious resemblance to a pickle-fork, or the fore-foot of a mole. May 6th.

B.—Small example with one chela curved outwardly.

C.—Movable chelæ with excrescence-like knob, suggesting the head of a guinea-fowl. March 23rd.

D. — When closed there was a macaw-like appearance. June 1st.

E, F.—Two pincer-claws from the same Crab: E very blunted at the points of the chelæ; F had an extra fixed chela with a



small knob that easily worked in the socket, and was a bad attempt at a movable chela. The upper free chela was stunted and knobby.

G.—A large movable chela with two points.

These various specimens have been forwarded to the Kelvin-grove Museum, Glasgow, where many former "finds" have been sent.

On May 31st a local fishmonger called my attention to some Lobsters that had arrived from Cromer. From out the joint behind the free chelæ a pipe-like "affair" protruded, and had sorely puzzled him as to what this might be. I immediately took hold of one and pulled it out, exhibiting to him the chelæ or claw that had been wrenched from a living Edible Crab and stuck in, not only in order to prevent the Lobster opening its pincers, but to save the trouble of tying the claws together. I had seen wooden pegs used for the purpose, and thought it extremely cruel to the unfortunate crustacean, and estimated the extra torture inflicted on the living Crab much more so, as the ligaments must necessarily have been drawn out with the "point." A crustacean casting a joint knows exactly where to do it, and suffers, I should say, little pain in the process; but

this involuntary amputation was unnatural. I forwarded diagrams and account to the Hon. Mrs. Stuart, who is greatly interested in humane movements, and she concurred in my opinion. It is rather curious that the use of a wooden peg engaged the attention of the Supreme Court of Pennsylvania (U.S.A.) some little time after, when a magistrate had seen fit to decide that a Lobster was not an animal, and that there was no law against cruelty to Lobsters. Whether the Court came to the conclusion that the creature was a vegetable or a mineral (seeing that its shelly covering is composed of chalk), I have not yet learnt.

An Octopus, the body of which equalled in size a lemon, was taken in a longshore-net a few hundred yards from the shore off Yarmouth on July 9th.

Since publishing in the 'Transactions of the Norfolk and Norwich Naturalists' Society' a paper on the Whales of Norfolk, I have received the following communication from Mr. Victor Ames, of Thornham, King's Lynn:—"I don't know if a note on 'a Whale' cast up on this coast 1487-88 is known to you. I mentioned it to the late Mr. T. Southwell, after he had read his *last* paper. He thought it very interesting; he had not known of it before. I give the title at the back of my letter: 'Original Letters' during the Reign of Henry VI. Edw. IV-V. Rich III. Hy VII . . . Sir John Fenn Kt. V. Vols. Murray, Albemarle Street 1823 pp. 349-351. 'At Thornham in the King's Stream a Whale 66 feet & more. 12 feet bigness & deepness.' Mr. Southwell thought 'the King's Stream' [*i. e.* the Wash] very curious. There are a great many gate-posts here on this property of the [jaw] bones of the Whale."

As this occurrence and record may be new to some, I have thought it worthy of publication here.

THE SEALS IN THE WASH. — In his interesting Half-yearly Report on the Eastern Sea Fisheries, ending September 30th, Inspector H. Donnison again referred to the Seals (*Phoca vitulina*) which have become so prominent a feature on the sands lying in the Wash between the Norfolk and Lincolnshire coasts. He stated that rewards of five shillings per "nose" had been paid for forty-one Seals, an amount reaching to £10 5s., which did not cover all the slain, several having been lost in the sea, whilst a few living ones had been captured and despatched to

various parts of the country. No continued or methodical means had been taken to abate the "nuisance," as it hardly paid for fisher-folk to neglect their various avocations of winking, musselling, cockling, shrimping, &c., to pursue them. A higher reward was suggested. He estimated that there are now about two thousand head of Seals, a considerable increase over last year's one thousand; and he concluded that unless strenuous efforts were made to reduce them, three thousand might be expected there next year. Complaints—fisher-folk are never really content—were rife as to the havoc made among the fishes of the Wash. The large middle sands between Lynn Deeps and Boston Deeps were favourite haunts; on the Dog's Head Sand three hundred Seals were met with at one time. The young were carefully screened and protected by their parents. In this group alone the juveniles were reckoned at quite a hundred. Some young ones were captured and kept for some time on board the Fisheries boat, 'Protector,' and, although still "suckers," they were soon capable of devouring daily a bucketful of fish, which was cut up small for them. They show a preference for small flat fish, but were keen enough to accept dogfish when other food was scarce. The Inspector anticipated that next year "sportsmen" would be attracted to the spot, an eventuality that could hardly be desirable when the instincts and tender mercies of the average "sportsman" are known to be not seldom cruel. A young Seal drifted down to Yarmouth beach on the tides in September, and was easily caught by a man, who afterwards disposed of it to a menagerie.

With regard to the infant Seals, Mr. Donnison, in his Report, states that twenty-five were brought on board alive, two-thirds of which still had the umbilical cord attached to them, a proof of their exceeding juvenility; these measured from $3\frac{1}{2}$ in. to 6 in. in length. The average length of these cubs was 2 ft. 6 in., and weights figured at from 24 lb. to 27 lb. A fisherman informed him that a large Seal he had taken weighed about 26 stones, and measured from tip to tip 6 ft. 6 in.; an unborn young one taken from it was 2 ft. 6 in. in length. The Inspector refers to the species generally as *Phoca vitulina*, but it would be extremely interesting if by careful examination the Grey Seal (*Halichærus gryphus*) or any other less common local species could be identified among them.

PREHISTORIC MAN IN SUSSEX.

THE following communication was read before the Geological Society of London on December 18th, 1912* :—“On the Discovery of a Palæolithic Human Skull and Mandible in a Flint-bearing Gravel overlying the Wealden (Hastings Beds) at Piltown, Fletching (Sussex).” By CHARLES DAWSON, F.S.A., F.G.S., and ARTHUR SMITH WOODWARD, LL.D., F.R.S., Sec.G.S. With an Appendix by Prof. G. ELLIOT SMITH, M.D., F.R.S.

The gravel in which the discovery was made occurs in a field near Piltown Common, in the parish of Fletching (Sussex), and is described by the first author. In the section exposed it is about 4 ft. thick. It consists, for the greater part, of waterworn fragments of Wealden ironstone and sandstone, with occasional pebbles of chert, probably from the Greensand, and a considerable proportion of chalk-flints, which are also waterworn, all deeply stained with oxide of iron, and most of them tabular in shape. The human skull was originally found by workmen, broken up by them, and most of the pieces thrown away on the spot. As many fragments as possible were recovered by the authors, and half of a human mandible was also obtained by the first author from a patch of undisturbed gravel close to the place where the skull occurred. Two broken pieces of the molar of a Pliocene type of Elephant and a much-rolled cusp of a molar of *Mastodon* were also found, besides teeth of *Hippopotamus Castor*, and *Equus*, and a fragment of an antler of *Cervus elaphus*. Like the human skull and mandible, all these fossils are well mineralized with oxide of iron. Many of the waterworn iron-stained flints closely resemble the “eoliths” from the North Downs, near Ightham. Mingled with them were found a few Palæolithic implements of the characteristic Chellean type. The gravel at Piltown rests upon a plateau 80 ft. above the River Ouse, and at a distance of less than a mile to the north of the existing stream. It appears to cover several acres, but at the same level on the opposite (south) side of the river it is represented only by scattered flints. Numerous iron-stained tabular flints, like those of the Piltown gravel, have been found in the basin of the Ouse between the chalk escarpment and Sheffield Park, and between this escarpment and Uckfield. As they are identical with the flints well known in the plateau deposits of the North and South Downs, it may be assumed that they have been derived from a plane formerly existing between those two points.

The human skull and mandible, and the associated fossils, are described by the second author. The skull (which unfortunately lacks the bones of the face) exhibits all the essential features of the genus *Homo*, with a brain capacity of not less than 1070 c.c., but possibly a little more. It measures about 190 mm. in length from

* ‘Abstracts of the Proceedings,’ No. 932.

the glabella to theinion, by 150 mm. in width at the widest part of the parietal region; and the bones are remarkably thick, the average thickness of the frontals and parietals being 10 mm., while an exceptional thickness of 12 mm. is reached at one corner. The forehead is steeper than that of the Neanderthal type, with only a feeble brow-ridge, and the conformation of the occipital bone shows that the tentorium over the cerebellum is on the level of the external occipital protuberance, as in modern man. Seen from behind the skull is remarkably low and broad, and the mastoid processes are relatively small. The right mandibular ramus is nearly complete to the middle of the symphysis, lacking only the articular condyle and the upper part of the bone in advance of the molars. The horizontal ramus is slender, and, so far as preserved, resembles in shape that of a young Chimpanzee (*Anthropopithecus niger*). The lower symphyseal border is not thickened and rounded, as in man, but produced into a thin inwardly curved flange, as in the apes. The ascending ramus is comparatively wide, with extensive insertions for the temporal and masseter muscles, and a very slight sigmoid notch above. Molars 1 and 2, which occur in their sockets, are typically human, though they are comparatively large and narrow, each bearing a fifth cusp. The socket of molar 3 indicates an equally large tooth, placed well within the ascending ramus of the jaw. The two molars have been worn perfectly flat by mastication, a circumstance suggesting that the canines resembled those of man in not projecting sensibly above the level of the other teeth. The weakness of the mandible, the slight prominence of the brow-ridges, the small backward extent of the origin of the temporal muscles, and the reduction of the mastoid processes suggest that the specimen belongs to a female individual, and it may be regarded as representing a hitherto unknown genus and species, for which a new name is proposed.

The authors conclude that the Piltown gravel-bed is of the same age as the contained Chellean implements, which are not so much waterworn as most of the associated flints. The rolled fragments of molars of the Pliocene Elephant and *Mastodon* are considered to have been derived with the flints from older gravels; while the other mammalian remains and the human skull and mandible, which cannot have been transported far by water, must be assigned to the period of the deposition of the gravel-bed itself. The remoteness of that period is indicated by the subsequent deepening of the valley of the Ouse to the amount of 80 ft.

In the Appendix, Prof. Elliot Smith remarks that, although the brain presents a remarkable general similarity to the well-known cranial casts of Palæolithic man, and especially to those of Gibraltar and La Quina, which are supposed to be feminine, the cast of the skull here described is smaller and more primitive in form than any of these. The most noteworthy feature is the pronounced Gorilla-like drooping of the temporal region, due to the extreme narrowing of its posterior part, which causes a deep excavation of its under surface. This feeble development of the part of the brain which recent research has shown to be intimately related to the power of

speech in modern man is very significant, especially when we notice that a marked boss (which, as Dr. Smith Woodward described, lends a curiously distinctive form to the brain-cast and skull when viewed from behind) is making its appearance in precisely the spot where in modern man is developed the mechanism that permits the spontaneous elaboration of speech and the ability to name objects.

The apparent paradox of the association of a simian jaw with a human brain is not surprising to one familiar with recent research upon the evolution of man. In the process of evolving the brain of man from the ape the superficial area of the cerebral cortex had to be tripled, and this expansion was not like the mere growth of a muscle with exercise, but the gradual building up of the most complex mechanism in existence. The growth of the brain preceded the refinement of the features and the somatic characters in general.

There are no grounds whatever for supposing that this simian jaw and human brain-cast did not belong to one and the same individual, who was probably a right-handed female.

In the discussion that ensued, Prof. Boyd Dawkins said that he agreed with the authors of the paper that the deposit containing the human remains belonged to the Pleistocene age, and that the Pliocene Mammalia in it—*Mastodon arvernensis* and the rest—had been derived from a Pliocene stratum formerly existing in that area. The latter were merely adventitious, and were no proof of the Pliocene age of the stratum. The Palæolithic implements were, in his belief, of the same age as the human bones. There was no connection between the faculty of speech and the capacity for making implements, as was urged by the last speaker. The evidence was clear that this discovery revealed a missing link between man and the higher apes, appearing at the stage of the evolution of the higher Mammalia in which it may be looked for—in the Pleistocene age. The modern type of man had no place in this age. He congratulated the Society on having had the clear and lucid statement of the authors supplemented by the valuable remarks of Prof. Elliot Smith, the highest authority on the human brain.

Mr. Clement Reid observed that no detailed "drift survey" had yet been made of this particular area, but perhaps the survey of the Sussex coastal plain might throw light on the age of the deposit at Piltown. In the coastal plain the Pleistocene deposits fall into three main groups. At the bottom is the erratic deposit of Selsey, probably contemporaneous with the chalky boulder clay. Above comes a series of interglacial deposits showing varying climates and varying amounts of submergence, the submergence culminating in the Goodwood raised beach, at 135 ft. above the sea, and passing away in the lesser submergence shown by the raised beach of Brighton. Above all these marine and fluviomarine deposits lies the great sheet of Coombe Rock, which shows a recurrence of Arctic conditions, perhaps dry cold. The uppermost Pleistocene deposit is probably of Mousterian date.

The speaker tried to trace these deposits of the coastal plain continuously through the valleys which breach the South Downs

into the Wealden area, but without much success. It seemed, however, that the low plateau of the Weald, on which the Piltdown deposit probably lies, must belong to a period later than that of maximum depression, for otherwise these lowlands of the Weald would be covered by marine deposits, as is the coastal plain. It was impossible to speak with confidence, but the whole of the evidence suggested that the Piltdown deposit and the plateau on which it rests belong to a base-level plain, which originated about the period of the Brighton raised beach. The deposits are not pre-Glacial or even early Pleistocene—they belong to an epoch long after the first cold period had passed away; but they occur at the very base of the great implement-bearing succession of Palæolithic deposits in the South-east of England.

THE PENNANT COLLECTION.

It is of interest, to zoologists especially, to know that the collections of Thomas Pennant, the author of the 'British Zoology' and other important works, have remained more or less undisturbed since the time of his death, which took place at Downing Hall, Holywell, Flintshire, on December 16th, 1798, or, at all events, although greatly disarranged, it is fortunate that they have not since been entirely dispersed. The Downing estate subsequently came into the possession of the Denbigh family, and is now to be disposed of. The present Earl of Denbigh, C.V.O., has had the whole of the Pennant collection sent to the Natural History Museum, and has very generously given permission for all specimens of interest to be retained for the National Collection.

The collection consists chiefly of stuffed birds, shells, fossils, and minerals; also a few mammals, fishes, and crustacea.

With the exception of the recent shells, the specimens have not as yet been closely investigated, so at present it is impossible to estimate their true value. Among the minerals are specimens sent to Pennant by Bishop Pontoppidan, William Borlase, and others, which may probably prove of interest.

With regard to the shells, British conchologists will be glad to know that fifteen types and sixty-one figured specimens described in the 'British Zoology' have been identified. Naturalists are much indebted to the Earl of Denbigh for this donation to the National Collection.

E. A. SMITH.

NOTES AND QUERIES.

A V E S.

Little Owl in North Devon.—A Little Owl (*Carine noctua*) has recently been captured at Snapper, just outside Barnstaple, in the North of Devon, and is now in the possession of Mr. Stowell, of Barnstaple. I am indebted to Mr. W. J. Harte, of the North Devon Athenæum, for informing me of this record, which is interesting because the specimen in all probability is the forerunner of an extension south-west of the species, which has recently been successfully re-introduced into this country in Hants, Yorkshire, Herts, and elsewhere. In Montagu's 'Ornithological Dictionary' (Supplement) I find, under the heading, "Little Owl":—"We are assured by Mr. Comyns that a neighbour shot at one of this species in the North of Devon in the autumn of 1808." Other specimens have been reported from Plymouth, Dawlish, Ashburton, Downes, and Pilsmore, the latter specimen being in the Torquay Museum. Another record—but still from South Devon—is given in 'British Birds' for May, 1912, p. 333.—BRUCE F. CUMMINGS (146, Holland Road, Kensington, W.).

Rough-legged Buzzard at Great Yarmouth.—On Oct. 16th, 1912, I was shown an example of a Rough-legged Buzzard (*Buteo lagopus*) which had been shot about a mile north of Yarmouth, on marshes lying between the River Bure and sandhills. The bird was feeding on the ground when first shot at, and it then rose to a considerable elevation, apparently going away. However, the gunner observed that it returned to the same spot, and by hiding himself secured the specimen. The bird appeared to be famished after crossing the North Sea, and when dissected its stomach was found to contain the remains of a frog. The bird was found to be 21 in. in measurement.—B. DYE (Row 60, Great Yarmouth).

Black-headed Gull in Full Breeding Plumage.—A Black-headed Gull, which was shot on Dec. 16th, 1912, has been brought to me, and perhaps the date may be worthy of note, as I have looked back a great many years in the volumes of 'The Zoologist' without finding an earlier date given. The bird in question is in particularly fine feather.—H. MARMADUKE LANGDALE (Compton House, Compton, Petersfield).

Occurrence of Sabine's Snipe and Great Northern Diver in Co. Cork.—About the middle of November a specimen of that dark variety of the Common Snipe was shot near Skibbereen by a Mr. Lewis. It was the darkest specimen I have ever seen, the under parts and under tail-coverts being sooty-black.

When in the shop of Mr. Rohu, bird-preserved and furrier, on Dec-13th, 1912, I was shown a specimen of the Great Northern Diver, exhibiting the perfect breeding plumage, which was shot the day before in Kinsale Harbour. It was one of the handsomest specimens I have ever seen; I think it a very unusual occurrence for a bird in that plumage appearing in the middle of December. In the course of many years I have shot specimens nearly every season, but except in May and June, before leaving for their northern haunts, have never met with them in the breeding plumage. Many years ago, at the end of May, when crossing Killala Bay to Killcummin Head, we met a flock of ten Great Northern Divers, of whom nine appeared to be in full breeding plumage. They had evidently collected in the Bay, preparing for their northern flight.—ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

CRUSTACEA.

***Dromia vulgaris* off the Essex Coast.**—It has not been my privilege to see any published lists of the Essex crustaceans, and my British authorities are somewhat antiquated. Consequently, when a few days ago a fine example of *Dromia vulgaris* was brought to me from Lowestoft by Mr. F. C. Cook from the vicinity of the 'Galloper' light-vessel, I was more than pleased to believe it a rare find, as Bell gives no records for the eastern coasts north of Whitstable Bay, on the Kentish seaboard, although recorded as more frequent in the south of England. In Skuse's 'Brit. Stalk-eyed Crustacea and Spiders' it is, however, given as found "sparingly on all our coasts, . . . plentiful in the Channel Islands," and that "the Sussex and Essex coasts are perhaps our best localities." The round, velvety ball of a carapace, with the densely hair-clad, clumsy legs drawn up under it, gives the animal a very rotund, lemon-shaped appearance. This example was taken late in December by the Lowestoft sailing-trawler, 'Giralda,' whose skipper and owner, Mr. J. Stead, much interested in curious finds, brought the Crab home, remarking on its rarity, as having for a considerable period fished in that neighbourhood, he had never met with it before.—ARTHUR H. PATTERSON (Ibis House, Yarmouth).

NOTICES OF NEW BOOKS.

The Theory of Evolution in the Light of Facts. By KARL FRANK, S.J. Translated from the German by C. T. DRUERY, F.L.S. Kegan Paul, Trench, Trübner & Co., Ltd.

THE interest and importance of this publication lie in the theological position of its author combined with the authoritative imprimatur of the great Order to which he belongs. For this book is no example of the "modernism" to which the door of the Roman Church is now "slammed, barred, and bolted," but is printed with the full licence of the still strongest and pre-eminently dialectical society of that great Communion.

The argument used is neither anti-scientific nor pro-Catholic. If we define the word "evolution" as a more or less ratiocinative process by which on scientific data we seek to unravel and understand the cosmic process, we shall not disagree with Father Frank fundamentally, though of course we cannot expect to be allowed to define a term which is used by him as the centre of his argument. His conclusions—and, we take it, also the decision of his Order—are given in the following paragraph:—
 "Theories of evolution will remain, since everything points to the fact that there was and is an evolution of the organic world. This evolution, however, does not express itself in quite impossible spontaneous 'leaps' from the inorganic to the organic, or from plants to animals, and also not in plan and objectless hither-and-thither variation, but in a constant maintenance of the harmony between construction and function and the external conditions of life, and in constant development of the bases, since 'bases'—and these, too, for one definite end—must exist, as the result is always in one definite direction—*viz.* the purposeful, the vitally capable." Of course, Father*Frank adds the postulate, that the evolutionary tendencies are creative and not accidental.

A chapter on Adaptive Phenomena in Symbiotics (Ant guests and Termite guests) is given by Father Wasmann, and no better

authority could be named, but this brings us to one of the very few clerical errors in the volume. On the title-page we read, "By P. E. Wasmann"; on the outside paper covering to the book we notice the more familiar name, "Erich Wasmann."

These pages are very useful to English students and readers by giving references to little consulted German writers on evolutionary subjects. The whole treatise by Father Frank proves—and that to the hilt—at least one fact: that an evolutionary conception, varying admittedly in direction and degree, now permeates all our logical conclusions.

A Reply to "Revised Darwinism, or Father Wasmann on Evolution, by the Rev. Simon FitzSimons." By the Rev. ERICH WASMANN, S.J. B. Herder. London: 68, Great Russell Street.

THE previous volume noticed above gave us some doubts as to its representing all branches of thought in the great Church to which the author belonged. The receipt of this polemic has satisfied us that those doubts are valid. Father FitzSimons is evidently a zealous theologian, and might have lived and practised at the era of Galileo, but his scientific views are somewhat extravagant. He expresses the opinion that "the English-speaking world had about settled down to the very sane conclusion that the theory of evolution was nothing more than a weariness to the spirit and a burden to the flesh, and that Darwinism had become an intolerable bore." But this is not his real indiscretion! His great mistake is in venturing to attack his co-religionist, Father Wasmann, S.J., and by implication his suggested heretical views on evolution. The latter's reply on scientific grounds is complete, and by its absolute vindication almost cruel. This brochure is well worth the perusal of evolutionary zoologists, and is a 'Catholic Fortnightly Review Reprint.' Father Wasmann's exposition of the evolutionary conception, based on a real study of authorities whose views on all subjects are not his own, is fair, masterly, and to the point. This polemic between two Catholic theologians on the subject of evolution is, indeed, a portent, but not an unfavourable one.

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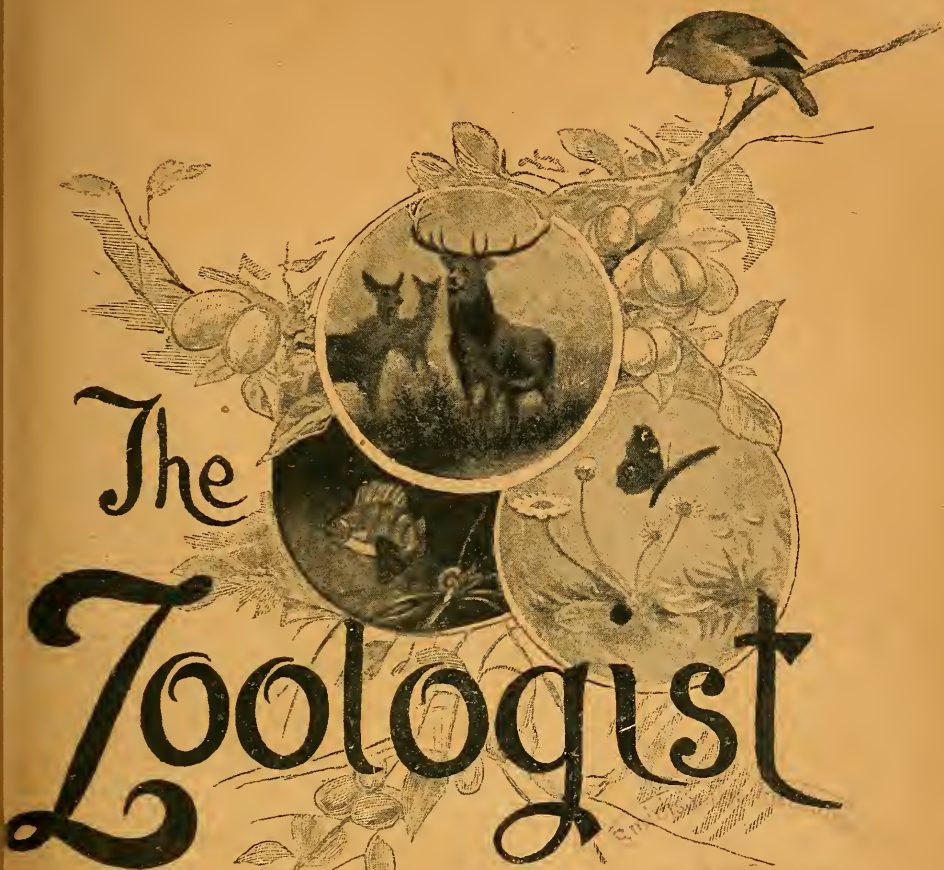
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THE ZOOLOGIST

No. 860.—February 15th, 1913.

FURTHER OBSERVATIONS ON THE FEEDING HABITS OF THE OYSTERCATCHER (*HÆMATOPUS OSTRAL- LEGUS*).

BY J. M. DEWAR, M.B.

MYTILUS EDULIS.

IN a previous paper* I gave the results of my observations on the manner in which the Oystercatcher feeds upon the Edible Mussel. There are, however, one or two matters to which it is necessary to return and some new observations to record. I stated that of Mussels buried under sand, as a rule only those are opened which present the ventral fissure, and at the time I expressed reasons for this limitation which further experience has confirmed. On another page I unwittingly created the impression that all Mussels under sand or mud are placed in a vertical position. This is, of course, not always the case. The meaning I intended to convey is that those Mussels which are placed in a vertical position under sand or mud must be opened through the posterior ends, owing to the presence of the mud which prevents the Oystercatcher from reaching any other part of the Mussel quickly enough to separate the valves. To this extent buried Mussels differ from those situated on the exposed banks where a Mussel, though it happens to rest in a vertical position, is not necessarily opened through the posterior end.

When watching the Oystercatcher engaged in turning over Limpets, I was much impressed by the nature of the preliminary

* "Notes on the Oystercatcher" ('Zoologist,' 1908, pp. 201-212).

stroke. It seemed to me analogous to the preliminary tapping of the Mussels which I have recorded as an endeavour of the Oystercatcher to see whether or not its bill would pass between the valves of a Mussel which was gaping slightly in the presence of surrounding moisture. Careful approaching and watching have, however, failed to reveal any Mussel with its valves separated to an extent likely to admit the bill, excepting, of course, at the hiatus on the ventral border. This being so, a new explanation is required of the tapping. More precise observation of the tapping shows that frequently in attacks on the dorsal border, and more rarely in attacks on the ventral border, the bill does not descend in the mesial plane of the shell, but obliquely inclined towards it, so that the bill strikes unevenly the cleft between the valves, and brings pressure to bear more on one valve than on the other. If the Mussel is relaxed and is taken unawares, that valve is depressed below the level of the other in the region of contact. That is to say, one valve is rotated off its neighbour, and an abnormal gap is formed between the edges of the valves which is sufficiently wide to admit the tip of the bill. The bill is then pushed in and moved into the mesial plane of the Mussel which can be opened up on the spot, or detached and dealt with in a more suitable place. The full beauty of this little manœuvre lies in the fact that entrance can be repeated apparently an indefinite number of times to the same Mussel, provided the bill is withdrawn in the way it entered. This is due to the persistent tendency of the Mussel to contract its valves firmly together in the abnormal, rotated position. This, then, appears to be the correct explanation of the tapping. It is an attempt on the part of the Oystercatcher to take a relaxed Mussel unawares, to rotate the one valve off the other by tapping, and thereby to gain admission to the shell. This conclusion was tested by experiments which added the following information. The valves cannot be rotated when the shells are dry and firmly closed. Rotation is impossible after the shells are warned by touching them, and also when the shells rest evenly on solid rock. While one shell is being experimented upon, the shells in the vicinity are audibly contracting their valves, and it is necessary to go a foot or two away before proceeding to tap another shell. The stroke must

be delivered obliquely into the cleft between the valves, and without too much force, in order to avoid injury to either valve. Rotation can be produced readily by a stroke made on the posterior end of a shell, provided it is made above or below the equator of the shell.

The largest Mussel I have so far found opened by an Oystercatcher measured two inches in length by seven-eighths of an inch in breadth ($2 \text{ in.} \times \frac{7}{8} \text{ in.}$). But this was quite an exceptional size. The shell had been detached and opened through the ventral fissure, and it showed no fracture.

Shells ranging from one and three-eighths inches in length by five-eighths of an inch in breadth ($1\frac{3}{8} \times \frac{5}{8}$) to five-eighths by five-sixteenths ($\frac{5}{8} \times \frac{5}{16}$) are sometimes treated in a way that differs from that ordinarily seen. The bird takes each shell in turn without selection except as regards size. A small patch of these Mussels may have the contents of every shell removed. The shell is hammered open by the application of a rapid succession of forceful blows directed obliquely through the point of the bill to the cleft between the valves, near the posterior end of the hinge. The blows crush a portion of that valve which has the more pressure to bear, and drive the fragments into the interior of the shell. The bill is pushed home through the newly formed opening, and is then employed, if necessary, to open up the shell by any one of the ways I have already described. The method can always be recognized at a glance by noting that there is no preliminary inspection or tapping; the bill is raised clearly off the shell in the intervals of the succession of blows; there is no real downward progress until the final blow breaks the shell; there is an extraordinary hurry and display of brute force; and very often there is no laterally inclined or rotary leverage, as the blows usually make a hole in the shell big enough to allow of the whole contents being removed without separating the valves, or the leverage and scooping up of the contents are combined in one operation. The peculiar manner of hammering the shell distinguishes this method from the more usual one in which the bill is pushed home between the valves by a series of thrusts without intermediate recoil, and in which leverage is always requisite to open up the shell and allow of the contents being removed. Shells which present the ventral border are

also hammered, and the blows are delivered into the hiatus in the border of the shell. That this should be so in the absence of any apparent necessity to hammer is peculiar, but it probably represents the continuity of a habit fixed for the time being. The hammering method has two advantages and a number of drawbacks. It is a rapidly and fairly assured way of getting food. The birds may be seen to rush from one shell to another, hammer each one open in turn, lever the valves apart if necessary, and wolf the contents. In three minutes a single bird opened and cleared twenty-six shells, varying from one inch to three-quarters of an inch in length. Another worked at an average rate of seven to eight shells per minute, the shells varying from seven-eighths to five-eighths of an inch in length. It maintained this speed for three-quarters of an hour, and continued to open shells, though less quickly, for another quarter of an hour. Thus it must have cleared the contents of upwards of four hundred shells in one hour. The drawbacks are considerable, but they evidently do not outweigh the advantages of rapidity and comparative certainty. The output of energy is enormous. One can scarcely doubt that the birds are making violent exertions, and, though a small amount of visual selection is exercised over the sizes of the shells as the birds hurry from one to another, yet a considerable proportion of the shells successfully resists the hammering, and the birds have, perforce, to pass on to others. As a rule, five to eight strokes with the point of the bill are sufficient to perforate the shell. In one case the bird returned three times, making four attacks altogether on a single shell. Each attack consisted of twenty to thirty powerful blows, making some eighty strokes in all, before the onslaught met with success. In another, the bird hammered five or six times without result. At once pressing the point of the bill firmly and obliquely on the summit of the shell, it walked round through quarter of a circle, and in its new position applied several thrusts downwards. Still keeping up pressure, it walked back to its old position and hammered seven or eight times, the last stroke sending the bill deeply into the shell. In other cases the hammering was preceded by firm pressure of the point of the bill on the summit of the shell for a few seconds with, at the same time, vigorous shaking of the

bill sidewise. These examples indicate the difficulties the birds sometimes meet with, and they also bring out an interesting point. In the ordinary Mussel shell presenting the dorsal border the two valves meet at an acute angle, and by their mutual interaction offer the maximum resistance to pressure from without. Partly from direct observation and partly by the inspection of the shell-remains, it became clear that the special purpose of the two manœuvres last described was to rotate the one valve partially off the other, thereby to deprive the one of the other's support, and so make it the more easily crushed. In these two cases the attempt was made to depress the one valve below the level of the other by sheer force in small and comparatively weak Mussels which were, however, presumably resisting to their utmost. A third disadvantage is brought to light by examining the Mussels after the birds have left. The shells are usually cleaned out *in situ*, and, in general, it is not common for a shell opened by hammering to be removed to a bare place as a preliminary to the removal of the contents. Most bear evidence of having been opened through the dorsal border, and show the ordinary line of fracture extending from a point on the border posterior to the hinge to the anterior end. When the elliptic portion remaining with the hinge is broken into two portions, the posterior part shows marked depression. In addition, when the two valves are approximated, a hiatus remains in one valve posterior to the hinge, and generally the part corresponding to it is found in fragments inside the shell. In some shells this hiatus alone is present, and shows that levering had not been necessary.* A few show that they were hammered open through the posterior end, and a still smaller number through the ventral cleft. In these last the bill was driven truly between the valves, but the margins show signs of rougher usage than do the margins of shells opened by thrusting, and, as in the majority of these, there is no fracture. The shells are rarely well cleaned, the attachments of the mantle to the valves being generally left untouched, and the birds refuse those portions of the flesh which have got mixed with the fragments of the shell driven into them

* Cf. *ibid.*, p. 204, where I have advanced the depression of the posterior fragment and the presence of a hiatus as material evidence of the *accidental* opening of the larger shells where no leverage was required.

by the process of hammering. There is, thus, a considerable loss of feeding material. This loss is the third disadvantage of the method.

Still smaller shells—that is, those ranging from five-eighths of an inch to half an inch in length ($\frac{5}{8}$ in. to $\frac{1}{2}$ in.)—are treated in a cavalier fashion commensurate to their feebler powers of resistance.* They may be entered by a single, even, downward thrust of the bill between the valves and then levered open, or they may be hammered open with or without subsequent leverage. These shells are much crushed. Sometimes they are seized crosswise within the tips of the mandibles, and either jerked from their anchorage, or pulled off with an apparently gentle to and fro motion of the bill, or levered up by raising the tip of the bill and depressing the head, a neighbouring shell being used as a fulcrum. These easy ways differ markedly from that accorded to the larger shells, which need powerful tugging to detach them from the rocks. Then, the shells which have been removed so easily are set down on a bare place and hammered open. If wide separation of the valves is necessary, the requisite leverage is very often combined with scooping-up of the contents; and the acme of the process is reached when a bird enters a small shell either by thrusting or hammering, jerks it off the rock, scoops up the contents in mid-air, and casts away the empty shell by a vigorous shake of the head, leaving the soft body of the Mussel within the tips of the mandibles. This proceeding takes place so quickly that it is inconceivable the bill can have been introduced into the shell otherwise than slightly open, and in one instance, at least, I believe the relative positions of the mandibles never changed from the beginning to the end of the operation, though at no time was it possible, as viewed at the range of observation, to say that the mandibles were even separated.

MODIOLA MODIOLUS.

The Oystercatcher searches for immature individuals of the Horse Mussel near low water and in the pools between tide-marks. Very often the shells are scattered rather than crowded

* Cf. *ibid.*, p. 210, where a method of opening these shells is first described.

together, and, as a rule, they are well hidden amongst vegetation, or in the sandy concretions of diverse materials that clothe the rocks in many places. In consequence, the search for *Modiola* takes the form of a close and extensive inspection, with frequent, vigorous probing into the concretions in selected spots. The shells are entered and opened up precisely as if they were those of the Edible Mussel. But in the majority of cases they are dragged from their anchorage before being levered widely open and cleared of their contents. This difference is no doubt due to the difficulty which would be experienced in separating the valves amongst matted vegetation or miscellaneous concretions. After detaching the shell, the Oystercatcher selects some kind of support, such as a crevice in the rock, on which to rest the shell before levering it open. A support is the more necessary when the shell has been entered through the hiatus in the ventral border, owing to the rounded form of the dorsal surface. For a similar reason nesting is occasionally employed.

The shells vary in size from two and a quarter inches in length by one and a quarter inches in breadth ($2\frac{1}{4}$ in. \times $1\frac{1}{4}$ in.) to nine-sixteenths of an inch in length by five-sixteenths of an inch in breadth ($\frac{9}{16}$ \times $\frac{5}{16}$), the average size of a hundred shells being one and three-sixteenths inches by five-eighths of an inch ($1\frac{3}{16}$ \times $\frac{5}{8}$). These hundred shells include eleven which were opened by the hammering method. Of the eleven, the largest measures one and a quarter inches by five-eighths of an inch ($1\frac{1}{4}$ in. \times $\frac{5}{8}$ in.), and the smallest as given above, the average size being fifteen-sixteenths of an inch by seven-sixteenths of an inch ($1\frac{5}{16}$ in. \times $\frac{7}{16}$ in.). The smallest shell opened by the thrusting method measures five-eighths of an inch by three-eighths of an inch ($\frac{5}{8}$ in. \times $\frac{3}{8}$ in.). The biggest shell of the whole series is exceptionally large. It had been entered through the hiatus in the ventral border, and was uninjured. Of the hundred shells, sixty-four were entered *viâ* the ventral border, six through the posterior end, and thirty by the dorsal border. These figures roughly reverse the percentages obtained from *Mytilus edulis*. The cause, as in the latter case, is to be found in the natural position of the shells. In *Modiola* the habit of living more or less hidden under vegetation and other cover allows, apparently, of the assumption of various attitudes, and,

as a matter of fact, by far the commonest position is a more or less oblique one with the ventral border superior. Of the eleven hammered shells included in the general total, ten were opened through the dorsal border, and only one through the ventral.

Owing to the great development of soft epidermis in the growing *Modiola* as compared with the thin covering of *Mytilus*, it is possible in a large number of shells to see, from the marks made by the pressure of the bill, where the bill was introduced between the valves. The study of these impressions confirms the results obtained more or less indirectly from *Mytilus*. When the bill is pushed into the shell through the dorsal border and leverage is applied, one valve splits along a curved line extending from a point near the posterior end of the hinge to the anterior end. When the bill is introduced through the ventral hiatus, no fracture is caused, as a rule, and if one does occur it runs transversely across the shell, or more rarely it takes a quadrangular form. In one of the shells opened by the thrusting method, the bill, after being pushed into the shell through the hiatus in the ventral border, had perforated a worn part of the shell an eighth of an inch obliquely behind the posterior end of the hinge; in another case entered similarly, the bill had been pushed through the dorsal cleft just behind the hinge, causing comminution and eversion of the edges of the valves at that point. In two of the hammered shells the blows had been delivered so evenly between the two valves in each case that a semi-ellipse of each valve had been driven inwards before the bill. As it happened, one shell had been attacked at the summit of the dorsal border, and the other through the hiatus in the ventral border.

TAPES PULLASTRA.

The shells of *Tapes pullastra* are found in the same localities as are those of the Horse Mussel. But, in comparison with the latter, the *Tapes* are much better hidden from sight under vegetation, in sandy concretions, or in colonies of *Mytilus*, while a proportion of them resides in the holes made by rock-boring molluscs. The Oystercatcher discovers the shells by a laborious process of inspecting and probing the materials in which they are imbedded, and having found a shell it has usually no difficulty in gaining admission, owing to the great protrusion and slow

retraction of the foot and the syphons. The bird forces its bill well in between the valves by a series of powerful downward thrusts which merge imperceptibly into as powerful upward jerks, for the purpose of extracting the shell from its home. The shell is then carried to a suitable crevice in the rock, on which it is deposited hinge downwards, and where it is opened up by firmly applied lateral leverage. The mollusc is torn out in successive portions, adherent fragments of shell, if any, being vigorously shaken off before each mouthful is swallowed. The greater number of the shells is detached apparently for the same reason as that applying to *Modiola*, and, owing to the form of the region of the hinge, a support to the shell is essential before leverage can be applied. The bird may spend some time in uncertain wandering in search of such a place, and once a suitable crevice is found it may be used repeatedly by nesting the shells. Usually a depression in the rock is utilized, but an irregularity in the concretionary matter adhering to the rock or a bristly tuft of vegetation will serve. I found a shell resting between a Limpet and a low ridge of rock, and another placed endwise against the same ridge.

Of one hundred and six shells, the largest measures one and an eighth inches in length by one and a half inches in breadth ($1\frac{1}{8}$ in. \times $1\frac{1}{2}$ in.), and the smallest three-eighths of an inch by five-eighths of an inch ($\frac{3}{8}$ in. \times $\frac{5}{8}$ in.), the average being eleven-sixteenths by fifteen-sixteenths ($\frac{11}{16}$ in. \times $\frac{15}{16}$ in.); 77 per cent. are entire and 23 per cent. are fractured. The lines of fracture are very various, and bear no apparent relation to the size of the shell. Perhaps the commonest form is a transverse fracture about the equator of one valve, with comminution of the ventral portion. But vertical and oblique fractures are not infrequent, removal of either the anterior or the posterior end of one valve sometimes occurs, and a general crushing of the valve is by no means rare. Owing to the comparative hardness of the shell and the absence of epidermis there are seldom marks to indicate the mode of entry. I have found abrasions at the middle of the ventral border in a number of cases, and in one a V-shaped nick had been made in the truncated end of one valve. Judged by direct observation, the usual mode of entry is through the ventral border.

The treatment of shells situated in *Pholas* or *Saxicava* borings depends on the amount of room around the shells. If there is plenty of room, the shell may be extracted and dealt with as in the other cases, or it may be laid open and cleared of its contents *in situ*. If the shell is a tight fit so that it can neither be expanded nor extracted, a fragment is broken transversely off the end of one valve (the posterior end) by vigorous lateral leverage, and through the enlarged opening the contents of the shell are removed.

PHOLAS CRISPATA.

On each of several occasions, when watching Oystercatchers at work on the shales, I saw one bore very deeply through the sand-covering portions of the shale, and shake the bill vigorously and repeatedly from side to side in such a way as to suggest that the bill was being resisted laterally by the solid rock. Swallowing movements followed in each case without the bill having been withdrawn into view. Though suspecting *Pholas*, I was unable to exclude the possibility of a deeply seated *Tapes*. At the same time, I was aware that many borings occupied by live *Pholades* were wide enough at the entrances to admit freely the bill of an Oystercatcher. The matter was eventually settled by the discovery of a *Pholas crispata* in a pool not far from an empty boring in the shales, and soon after the Oystercatchers had left. The two valves had been separated, and lay on their external surfaces slightly apart. One valve had been fractured transversely an eighth of an inch from the posterior end, which was awanting. Fragments of flesh were still adherent to the valves, showing that the specimen had been recently opened. The entire valve measured nine-sixteenths of an inch in length by seven-eighths of an inch in breadth. The apophyses were intact.

PURPURA LAPILLUS.

Since the preliminary note relating to this species was printed,* I have examined two hundred and ninety-four shells, all of which bore evidence of having being dealt with by the Oystercatcher. Of these, four (1 per cent.) reached the first stage of opening, and sixty-one (21 per cent.) the second or completed stage, the remaining two hundred and twenty-nine

* 'Zoologist,' 1910, pp. 109-112.

(78 per cent.) being accounted failures. Of the sixty-one which reached the second stage, four (6.6 per cent.) were completely opened up in one stage, shell being extruded, in each case, equal in area to that more usually extruded in two portions. The average size of fifty-six shells which reached the second stage was fifteen-sixteenths of an inch ($\frac{15}{16}$ in.), the largest being one and one-eighth inches ($1\frac{1}{8}$ in.), and the smallest thirteen-sixteenths of an inch ($\frac{13}{16}$ in.). The four shells reaching the first stage averaged one and a sixteenth inches ($1\frac{1}{16}$ in.), the largest being one and one-eighth inches ($1\frac{1}{8}$ in.). A longer series, however, would probably lower the average. I did not systematically measure the failures, as they did not show visually any variance from the others. The largest measured was one and one-eighth inches ($1\frac{1}{8}$ in.) in length.

By direct observation I have seen all the methods in use at each stage of opening the shells—thrusting, hammering, or longitudinal rolling at the first stage; lateral leverage, thrusting, hammering, or longitudinal rolling at the second. Often the several modes are put in force successively when strong resistance is encountered. The birds appear to vary in the degree of pertinacity with which they attack the more difficult shells, some birds giving in after a single bout, others returning repeatedly and with renewed energy. In the first paper I recorded the introduction of the upper mandible alone into the aperture of the shell. This fashion occurs but rarely, and in some cases, at least, is apparently dependent on the mode of carrying the shell by the outer lip. The more usual plan is to carry the shell crosswise between the tips of the mandibles, and to insert the bill into the interior of the shell for the purpose of opening it.

An examination of the failures yielded some interesting results when the shells had been dealt with on rock. As a rule, each presented on the lower surface of the last whorl a single bulb of percussion, at a point on the external surface corresponding roughly to the edge of the operculum inside, and in the second stage, when not completed, at a point in line with the margin of the first opening and the edge of the pillar. Experimentally, similar bulbs can be produced by making five or six thrusts inside the shell, but it is difficult to adhere to a single

spot. In a few of the naturally treated shells, several or many bulbs were present. In some, longitudinal or oblique scratches or grooves were visible on the lower surface of the last whorl, and usually had associated with them a diffusely abraded area on the lower surface of the second last whorl. These scratches cannot be reproduced by simple longitudinal or obliquely inclined rolling of the shells under pressure. It is necessary, in addition, to impart a small amount of bodily movement to the shells in the direction of pressure.

PATELLA VULGATA.

According to Robert Gray,* the Oystercatcher inspects the Limpets one after another, in order to see whether or not the shells are at all raised from the rock. On meeting such a one the bird promptly pushes its bill under the Limpet, and neatly turns it over. One foot is then placed on the shell, and the body of the animal is "taken out as cleanly as if done with a knife or other sharp instrument."

When the Oystercatcher is about to overturn a Limpet it lowers its head and inclines the bill at a low angle towards the ground, the attitude and purpose of the bird being similar to those of a battering-ram in action. For a reason which I shall explain immediately, the bill is directed downwards and forwards, with its sides at right angles to the plane of the ground. In this peculiar attitude the Oystercatcher delivers a sharp push or clipping stroke to a portion of the edge of the selected Limpet. With a small Limpet the stroke, if successful, shifts the animal bodily from its seat. The advancing edge of the shell catches in some obstruction, and the shell topples over. With larger shells the stroke has usually to be followed up by firm and evidently laborious pushing, assisted, it may be, by swaying of the bill from side to side, with finally a raising of the head and the bill, or a to and fro rotation of the bill through barely a quarter of a circle. In these larger shells the bill is obviously forced under the animal, and the process of overturning is usually completed by means of some more patent form of leverage. The Limpet is then seized and carried by the flesh, the edge of the shell, or by being held in the line of its breadth

* 'Birds of the West of Scotland,' p. 270.

within the tips of the mandibles. It is deposited in a suitable crevice of the rock or on sand, and the contents are separated from the shell by chipping through the friable attachments of the mollusc to the internal surface of the shell, the process of detachment often being completed by the bird shaking its bill, and flicking the shell off the body of the mollusc as the head is raised.

The shells vary from one and three-quarter inches in length by one and a half inches in breadth ($1\frac{3}{4}$ in. \times $1\frac{1}{2}$ in.), to half an inch in length by seven-sixteenths of an inch in breadth ($\frac{1}{2}$ in. \times $\frac{7}{16}$ in.), the average size of one hundred and thirty-four shells being seven-eighths of an inch by eleven-sixteenths of an inch ($\frac{7}{8}$ in. \times $\frac{11}{16}$ in.). Out of one hundred and sixty-one shells, 85 per cent. are whole, or at most only abraded at one part of the margin of the shell, and 15 per cent. are fractured. In the series the occurrence of abrasion and fracture has no visible relation to the size of the Limpet, and no recognisable rule of position in relation to the margin of the shell. The fracture may be a small V-shaped chip out of the edge of the shell, a larger quadrangular fragment, or, as in a few cases, it may be semi-annular. The shells are invariably well cleaned. They are carried in about equal numbers to crevices in the rock and to sand for the purpose of removing the contents. In no case was a footmark impressed on the sand so as to overlap the shell, or its mark if the shell had been flicked away. In each case a wide gap separated the shell or its impress from the corresponding footprints. This agrees with my observations. I have not as yet been able to detect an Oystercatcher in the act of steadying a shell with one of its feet. On rock, evidence of equal value cannot be adduced, but some sort of support is of invariable occurrence in order to render the shells stable during the removal of their contents. Usually it takes the form of a crack or depression in the rock. Further, nesting of the shells is common for the same purpose, two, three, or four being piled one on the top of another, in each case as a preliminary to the extraction of the mollusc. On one occasion I found a nest of five *Tapes* and three Limpets in that order from below upwards.

After going over the evidence derived from direct observations, and from an examination of the shells, I feel there are at

least two matters which demand further explanation. One is the peculiar attitude of the bird in the moment of the attack, especially as regards the bill, and the other the nature of the pushing or chipping stroke. Having repeatedly verified the original observation that the bill is held with the sides vertical in the operation of overturning a Limpet, I have no doubt that it is actually so, and the problem comes to be, Why does the Oystercatcher instinctively ignore the expediency of pushing the bill flatly under the Limpet? The answer is bound up with the nature of the sharp push or chipping stroke. In the first place, a Limpet, when bone dry externally, adheres to the rock so tenaciously that no pressure likely to be within the capacity of the Oystercatcher is able to move it. In the second, a Limpet, when it is moist as in a pool, in the tidewash, or soon after the ebb has left it, is generally relaxed and slightly raised from the rock. The Limpets which fall into the second category are those sought after by the Oystercatcher, and it is an additional advantage if there be a slight irregularity, either in the shell or the surface of the rock, at one point on the margin of the shell. When, however, one of these Limpets is experimentally warned by tapping it gently, it draws itself tightly on to the rock, and passes into the first category. Thus the main essential is apparently a taking of the Limpet unawares, and a secondary advantage the existence of a slight local increase of the normal gap between a relaxed shell and the rock. Limpets, of course, are to be found in the tidewash with the shell separated from the rock more than enough to admit the depth of a bill, and others are attached to such hopelessly irregular pieces of rock that the insertion of the bill is an easy matter. On the other hand, a Limpet, whether it is relaxed or holding firmly, is absolutely safe when it is sunk in a depression of its own making in the rock. For such as these the peculiar method of the Oystercatcher is not called into play. After the tide has receded, and even before the rocks have dried, the average Limpet presents so small a crack between the shell and the rock that it would be impossible to push the bill under the shell without the aid of some special mechanism. This is supplied by the sharp push or chipping stroke. When it is made experimentally in the case of the smaller shells, the result is exactly as I have described it

from direct observation of the Oystercatcher at work. With the larger shells, while it is easy to reproduce the natural occurrence, it is not so easy to find out what actually occurs during the rapid succession of events. The blow must be delivered at a low angle ; otherwise it serves merely to warn the Limpet to settle down more firmly on the rock. And the instrument must be held with its sides, or rather the plane of its depth, at right angles to the plane of the ground. I find that at the moment of the stroke, made under these conditions, the instrument representing the bill does not pass under the shell, but gives a sharp blow to the edge of the shell. The blow shifts the Limpet bodily a fraction of an inch in the direction of the pressure. The animal then holds on, and the upper part of its body undergoes distortion, pressing the advancing edge of the shell firmly on to the rock, and raising the near edge against which the instrument is pushed. In some cases this proves sufficient. If the shell is out of the water, and the stroke has been made quickly, a rushing sound is heard, as of air passing in under the foot, and the shell topples over. In others the instrument must be passed under the shell. To do this, hard pushing is required to distort the body of the Limpet, and to raise the near edge of the shell still more. Probably the obliquely truncated tip of the bill, as it occurs in at least some Oystercatchers, assists in raising the edge of the shell under pressure. After getting the tip past the edge of the shell, the instrument must then be pushed under the edge of the foot, a proceeding which is made easier by swaying the instrument from side to side. This manœuvre produces an abrasion on the edge of the shell similar to that proceeding from a similar cause in nature. As soon as the instrument passes to a varying distance under the foot the rushing sound is heard, and the shell topples over. If, however, the movement is carried out slowly the rushing sound is not heard. Leverage by raising the base of the instrument is a disadvantage at an early stage, as in the likely event of failure the Limpet gets a better grip of the rock during the return movement. It, however, hastens the overturning when the hold of the animal is weakening. Instead of this form of leverage, rotation of the instrument through barely a quarter of a circle is equally helpful at this later stage. Experimentally, the instrument passes more easily under the

shell, with its sides parallel and not at right angles to the ground. But the Limpet is well able to retain its hold, owing apparently to the slight separation of the foot from the rock. No rushing sound is heard. Leverage proves impossible, and when it is tried the steel instrument bends under the strain to the point of snapping. Further, its withdrawal, after the failure to overturn the Limpet, is a matter of very real difficulty. Thus the use of the bill, with its sides vertical to the ground, is an advantage and a safeguard. It necessitates the edge of the shell being raised to a greater height than is the case when the bill is used flatly; it favours, by this greater separation, first, of the edge of the shell, and, secondly, of the edge of the foot from the rock, the entrance of air or water under the foot; and it renders the withdrawal of the bill from under the Limpet more easy in the event of failure.

Though in the above description I virtually make out that the admittance of air or water is essential to the overturning of the shells, my strict position is that in many cases a rushing sound is heard just before a shell which is out of the tide topples over, and the sound is more like that of air entering a vacuum than of air escaping from a cavity under pressure.

TECTURA (ACMÆA) TESTUDINALIS.

I found one shell of this *genus* and *species* amongst a quantity of Limpets which had been overturned by the Oystercatcher. It measured five-eighths of an inch in length by half an inch in breadth ($\frac{5}{8}$ in. \times $\frac{1}{2}$ in.), and was fractured at the larger end. Some friable material still remained along the line where the body of the animal had been attached. The record is interesting, if only on account of the evenness of the edge of the shell, which does not favour an attack at any particular part of the circumference.

A DIARY OF ORNITHOLOGICAL OBSERVATION MADE
IN ICELAND DURING JUNE AND JULY, 1912.

By EDMUND SELOUS.

ON May 29th, 1912, I sailed—or rather steamed—for Iceland, and was met on board, on June 2nd, by Mr. Sigurdsson, with whom I had arranged to stay. We reached the farm, travelling in the usual way—on ponies, that is—on the 4th, and set out next morning for some cliffs, overlooking a large lake, at no great distance, amidst the ledges of which a pair of Sea-Eagles (*Haliaëtus albicilla*) had for years laid their eggs, which had for the same time been sold to various daring men whose enthusiastic love of nature had led them to these undisturbed, wild spots, with no other purpose than that of making such romantic purchases from the very hands of the native inhabitants in them, or of the far-travelled dealer. Our course lay along the bank of a river which, issuing from the great lake (now close at hand) rushes along in an impetuous, boiling torrent, amidst rocks and great cliff-like fragments fallen from its banks, which here form veritable precipices. Dismounting a little above the outlet, where the lake forms a small bay, we crossed it in a very little boat, with a very big leak in it, through which the water poured almost as fast as I could bail it out, and which the waves seemed every moment on the point of swamping altogether. Owing to its being so rough, we had to land immediately opposite to the point from which we started, instead of rowing to the vicinity of the eyrie, which necessitated carrying everything up to the top of the cliffs, and then, proceeding along them, to descend at a point where they again became scaleable, a little beyond the place. First, however, we visited it *expeditus*. Before we had gone very far, one of the Eagles went up from somewhere along the line of cliffs, and floated majestically, high above us, uttering, at intervals, a monosyllabic note, quickly

repeated some five or six times, which, though it might be rendered as "yap, yap, yap," yet bore little resemblance, I thought, to the bark of a dog, to which it has been likened. To this was added a shriller cry, recalling that of the Sparrow-Hawk or Kestrel, but louder and more powerful in proportion (or perhaps not quite in proportion) to the superior size of the bird. Soon the other Eagle appeared, and the two, as they floated grandly together, not seeming to move, yet covering wide distances in their majestic circlings, presented a magnificent spectacle. When we had got down on to the beach of the lake, Sigurdsson pointed out to me a certain area of the cliffs rising out of the steep, green slopes, strewn and embedded with boulders and huge rocky masses, at one or other point of which the nest was certain to be, but long searchings with the glasses failed to reveal it. It was, indeed, absolutely hidden from below, amidst the grass and tall, burdock-like plants, mingled with flowers, which covered the particular ledge that the birds had chosen, so that when one of them, at last, descended upon it (it was like the wind, in a shape, sweeping down), I could do no more than distinguish the head and hooked beak, with its lurid yellow sere, which, however, was sufficiently exciting. During this time Sigurdsson had gone off to make inquiries of some shepherding boys, whose house was in the neighbourhood, and with whom he, before long, returned. Detailed information in regard to the site of the eyrie was now given by the boys, which, however, I sitting still had anticipated. I had seen something more, too, for, whilst watching their glorious, imperial rule of the air, both birds together came down on the bare, rounded summit of a hill, just above the cliffs that it topped. Here they stood, for a little, and, when they took flight, again, I noted that they rose by simply spreading their wings—those "sail-broad vans"—and floating away on them. There was not one flap or even quiver—they simply soared from the ground.

The site for pitching the tent—by no means an ideal one—the site I meant, but this applies to the tent as well—having been decided upon, we now—Sigurdsson and myself, the boys had gone—started back to bring it on. First, however, a boy, who had accompanied us on foot, and been left on the other side of the

lake, with the horses, had to be rowed across (an operation which I watched), after which a partition was made of the baggage—on principles somewhat more than equitable towards myself, but I had to submit—and we laboured along with it, getting to the place, again, about 7 p.m. We found the female Eagle in possession of the eyrie, nor did she leave it during all the time in which we were engaged in setting up the tent—which perforce was nearer than I should have wished it to be—or in getting moss round about to fix in the meshes of the netting which I had brought to go over it. Shortly after 8, I was left alone in the tent.

8.15.—Bird off nest, and joins her partner in the air, as he sails grandly up. The two float together, for a little, and there comes from one, or both, the cry last referred to, which can certainly be described as a squealing, or even squeaking one. Then, after a few circles, one of the Eagles (I think the same one) returns to the nest. The nest was empty for about eight minutes. The returning Eagle, as it flew in, before commencing the circling descent, with legs stretched down, which is such a joy to witness, made a few flaps with the wings, and this is the first time I can recall their being moved, at all, by either of the birds. They have, till now, simply floated upon them, stretched to the uttermost, the tips of all the primary quills being separately visible against the sky (now blue and bright as that of Africa—long may it keep so!), their outlines sharply drawn, and not blurred, exactly as Darwin has remarked of the Condor of South America. The shape of the wings, when thus outstretched, is much that of the conventional Eagles on flags—*e. g.* those of Germany, Russia, and Austria. Indeed, there was a much greater resemblance to these crude productions than to any serious rendering I can recall, which makes me think that the former may perhaps owe their origin to the keen eye and unerring hand of generations of Stone-Age ancestors who kept seeing the beasts that they drew. Even the absolute black of these bannered Eagles is not quite so extravagant as one might think, for the real bird looks dark enough in the air. For oblitative purposes, at any reasonable distance, he would need a specially designed sky. Such a one as he floats in now could only help the Blue Bird, or that splendid cerulean variety of the

Raven (unhappily very rare) depicted in Section I. of Kirkman's 'British Bird Book.'* It would, I suppose, be quite useless to appeal to collectors to spare the eggs of this bird. They are, indeed, indistinguishable from those of the common form, but so were the St. Kilda Wren's.

At 8.45 there is the cry of Gulls in the air—the "ow-oo, ow-oo" of the Great Black-backed—and the partner Eagle floats up. The Gulls have the impertinence to molest him, but he floats grandly away from them each time that they stoop at him. As he passes in the line of the eyrie, and not now much above it, the sitting bird flies out to him, with a shrill little "quee, quee, quee, quee," as of greeting—such a cry as might be uttered by a much smaller creature. I keep the two great birds distinct, and it is the newly arrived one, who, after a circle or two with, or, rather, in the proximity of its mate, now flies in to the cliff, and takes the place of the latter on the nest. Thus there has been a change upon it, but the sitting bird has gone off, whilst the other was still on the wing. It may very well have been the same, therefore, on the former occasion, though I did not think so at the time. In any case, both sexes incubate.

Just about 9 there is an extraordinary croaking noise which, at first, I take to be made by a Raven, but which turns out to proceed from a Grouse or Rock Ptarmigan—*Lagopus rupestris*, unless the name has changed lately—which, a moment afterwards, flies, in a wild, tumultuous way, down from the cliffs, either on to a large rock, against which the tent is pitched, or on to the tent itself—now all over patches of moss—and there makes still more extraordinary sounds, which I am quite unable to transcribe. It seems like a call or challenge, but nothing, I believe, comes of it. Earlier in the afternoon I had seen one of these birds, for the first time. My attention was directed to the rock on which it sat, and with which, as a general proposition, it harmonized. Also, as a general proposition, I could not, for some time, see the bird, but I did see, very quickly, a particular part of it, namely, the patch of red above the eye, and this blazed out so brilliantly that I at first thought, with wonder, that I was looking at some gorgeously plumaged small bird, and then did not know what to make of it. Of course, predaceous

* Plate i., to face p. 10.

species, accustomed to prey on the Ptarmigan, would know very well what to make of it, and the vermilion spot, once seen, would instantly betray the bird. I saw nothing whilst I was in Iceland to harmonize with this brilliancy, or which it could be supposed to simulate. If the general coloration of the plumage, therefore, is protective, and due to natural selection, it is impossible that something which violently contradicts it, and must go far to discount its good effects, can have been acquired in the same way. It is only during the breeding season that this brilliant comb or wattle appears, so that we have here something which seems obviously due to the agency of sexual selection, and the very fact of its being altogether antagonistic to the protective principle which has, in general, asserted itself, bears evidence to the importance of the results brought about through this agency. A special object has, at a special time, to be achieved, and it is worth while achieving it even by the temporary suspension, or partial relaxation, of those measures which have been taken to ensure the more general object. Natural selection, on this view, does all that it can to protect the male bird from outside hostility, throughout the year, consistently with allowing it sufficient facilities for recommending itself to the female bird, in competition with rivals (inside hostility) during a certain season of the year.

It is now 10.30 p.m. There is a great silence and stillness, and though perfectly light, so that I am writing this without a candle, still there is something—a sort of deadness in nature—which seems to proclaim it to be night. The sitting Eagle, at any rate, seems to have taken her place for the night, whilst her mate has not been visible since the last change, and is probably roosting somewhere in the vicinity. Each time that these Eagles have come on to the nest, they have made movements upon it, before settling down on the eggs, which I have not been able satisfactorily to follow—they seem much more than should be required for the turning or otherwise moving the eggs.

Besides the Gulls, as I have noted, a pair of Ravens, earlier in the day, molested, or attempted to molest, one of these Eagles.

June 6th.—About 4 a.m., as I lie awake with the cold, there

is a bird cry which sounds like a human one—quite startling, so that I hastily draw up the window of the tent, but can see nothing. A little while afterwards I come out of the tent, and, as I sit close to it, by the side of the rock, an Eagle “swims into my ken,” and, coming rapidly up, the sitting bird, whilst he is still some way from the nest, but within its aerial region, so to speak, flies out, to join him, with the little unimpressive squeak, for it hardly deserves a better epithet. They sweep about, for a little, then one of them descends on the eyrie, but almost immediately flies off it, again, to circle with its mate, as before. After a little time, there is a second descent on the nest, and the bird seems to settle down on it, but in a minute or two leaves it, as before, and again joins the other, as Eagles understand the expression. And now, for some time, they sweep, sail, and circle, on wings spread and motionless, smoothly and largely, like planetary bodies in space, sometimes disappearing beyond the horizon of the cliff-line, then, after a little, floating up again, passing and sweeping away from one another, returning “from the ends of opposed winds” and re-meeting “as over a vast,” never really together, often widely asunder, yet still in a spacious companionship; for the speed at which they move, in their effortless flight, as, no doubt, their great range of vision, extends the limits of neighbourhood, for these birds, far beyond our own poor conception of it—great fields of air are as a cosy corner to them. Much finer cries now drop from the air, but these are so Gull-like in their intonation that as the Eagles have now passed beyond the hemmed-in limits of where I can see to, I cannot feel sure that it is they who are uttering them. No Gulls, however, come into sight, and the cries seem stronger and wilder than anything I have heard Gulls utter. They are wild and impressive, and their strength seems proportionate to the size of these great, lordly birds. All this, however, may be—probably is—due to imagination.

It is about 4.45 a.m., when one of the Eagles comes down, with a fine, rushing swoop, on the eyrie, where it stands in full view, for some seconds, before sinking down into the cavity of the nest, which unfortunately, with the exception of the head, hides it completely—for I am looking up at, not down into it. I cannot even see the nest itself, but only the spot where it is,

amongst the green grass and moss of the ledge. I cannot now say which of the two birds it is, the one that flew off the nest to join its mate, or this latter.* One fact seems establishing itself, *viz.* that the sitting bird does not wait on the nest for the other to relieve it, but flies out to it, when it appears. It is now 5.30 a.m., and the Eagle is still sitting.

A little while after this, the tent having sagged down considerably, being one of the few vices (another was leaking) which I found it in time to possess, I very unfortunately went outside, again, in order to tighten the cords, and, as I came round it, saw one of the Eagles quite near. I am caught, as it were. Which one it is, I cannot say, but as I creep into the tent again, and look through the window, I see both of them sailing together. They float away, and return again, several times, sometimes uttering the disquieted cry of yesterday, that which has been called a bark, though it has only a fanciful resemblance to one. One then makes, once or twice, as if about to descend on the eyrie, but appears to think better of it, both pass together over the brow of the cliff, and up to now (6.45) they have not returned.

At 7 one of the birds flies close over the nest, but does not go down on it.

7.45.—Both are now back, in the neighbourhood, and one passes close above the nest twice (unless each does so successively), but still without alighting. I cannot discover that the birds show any apprehension. I have heard, just before, the little squealing cry, which seems to be one of greeting, and not of alarm.

8.5.—One of the Eagles down on the nest, and broods the eggs with great care, spreading its wings, and, as it were, flattening itself on to them. The white tail is also spread out, and, as it seems, moved from side to side. This is what I seem to make out before the bird disappears in the cup (if it has one) of the nest. What object these actions may serve, or whether they stand in any special relation to the eggs, it is not easy to say.

* At this stage I had not come to distinguish the two surely. The female, however—or the one that, almost alone, brooded the eggs—was more hoary than the male, who was browner. Relative size, under the conditions, was not a very distinguishable feature.

8.25.—The other Eagle passes, at a height, and I see him again, thus sailing, a little while afterwards, farther off. At 10.15 he again appears, floating grandly in the high air. It would appear to be the general habit for the one bird to keep on guard whilst the other sits. But this is not constant, for during the whole time of setting up the tent yesterday—it can hardly have been less than two hours—the non-sitting bird was away. Had it been anywhere in the neighbourhood—anywhere, that is, but *far* away—when we came the second time, it must have seen us, and would no doubt have kept, for some time, at least, near about—as construed in its own wide way—in a state of disquietude, as it did before.

Just a little before 1 p.m. (during most of the interval I have been asleep) the sitting bird—the bird then sitting, that is to say—comes off the nest. For a moment or two after its first float upwards, it raises the wings, sinks the legs, suspends the motive impulse, and appears to go through the actions of stretching itself, in the air, after the long hours of incubation—for I doubt not it has been on the nest all the while. It then floats, in its habitual manner, and, being joined by its mate from over the crest of the cliff-line, the two sweep and circle in the most magnificent manner. Nothing has ever been said or imagined, or could be said or imagined, to rival in, descriptive force, the actuality of grace, power, and majesty exhibited in the flight of these birds. It is a thing so superb and beautiful to see—now in the midst of an azure sky and air flooded with sunlight, over waters as blue and as bright—that, seeing it, one wonders how anyone who ever had the like grace vouchsafed him could wilfully do, or wish to do, anything to diminish the numbers of so grand and glorious a being. Simply for the purpose of keeping such beauty in the world, there might well be societies to protect it, even though not one in ten—or ten thousand—of their members knew of it other than by repute; just as one might worthily join such a body, to save the great sculptures of antiquity from destruction, though one never had seen or were likely to see very many of them. That such a sight should cease out of the world makes the heart, as one gazes on it, sick to think upon. Still they float, and in a sky that might overarch Mount Olympus. Magnificent, however, as is the flight of the

Eagle, there are not a few who consider its blown egg, in a cabinet, a still grander object of contemplation.

After the two Eagles have thus floated and circled together—a large togetherness—one of them, with a great rush of wings, shoots down, in a slant, towards the lake, and sweeping on, close to its surface, when seeming on the point of immersing itself, just dips with his claws, and floats upwards to the peak of a cliff. Here he alights, and, though the distance is great, I can see him, through the glasses, once or twice lower his head to his feet, and raise it again, after the manner of birds of prey, when feeding. It seems evident, therefore, that he has caught a fish, yet I could make out nothing in his claws as he flew. Probably they were pressed to the breast, and hidden amongst the feathers, the fish being only a small one. After the meal, the birds continue their wheelings, and I notice that whenever they pass over the headland, at the end of the line of cliffs, they are assaulted by a bird that looks like a speck in proportion to them. It gives, at the distance, the impression of a mere Sparrow—a “small bird”—but the glasses show it to be one of the Eagle’s own kind. It must be, I think, a Merlin or a Hobby—probably the former. Evidently a pair of them have their nest in the cliffs of this headland. The little doughty knight dashes at its big relatives, most temerarily, and, as shown by their manner of avoiding it, is evidently an annoyance to them. It is possible, even, that they cannot avoid its small activity, and get a peck or two, but this I cannot quite make out.

After this both Eagles disappear for some time, and it is not till 2.30 p.m. that the female floats up alone, and comes down on the nest or the nesting-ledge. But, in the same way as yesterday, she goes up again almost directly, and it is not till 4.45 that she returns and broods the eggs. At 7.40 she comes off, and floats majestically around, as though enjoying the relaxation, offering a splendid spectacle. Then, as before, she descends on the eyrie, only to stay there an instant, and, having descended upon various peaks and pinnacles, floats out of sight. At 8.20 she returns and re-broods the eggs, but leaves them again at 9 (for which possibly I am responsible); and now, as she sails grandly about, she is mobbed by a party of three Gulls—Great Black-backed—who dash at her—sometimes a pair of

them, sometimes all three together—with reiterated cries. So close do they come, as they dash at her, that one might think they really meant to peck her, but they always turn off, generally with an upward dart, before this point is reached. To the eye it looks as though there might be a foot's space between them when the swerve is made, but in reality, perhaps, it may be more. For the Eagle, she is clearly annoyed; her most pronounced motion, as the Gulls approach her, is a sudden tilt of the body, upward, on the side exposed—for it is from above that the enemy threaten—the beak being, no doubt, turned defensively, but this I cannot see. Gradually the clamour of the Gulls subsides, and at 10 both Eagles are floating together again, unannoyed.

(To be continued.)

THE DISTRIBUTION OF BRITISH ANNELIDS.

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(Continued from vol. xv. p. 374.)

27. MIDDLESEX. — Numerous records will be found under Chelsea and Kew which may be of service, but in those cases we have to remember that foreign influences have been at work. Reference may also be made to "Some Annelids of the Thames Valley," contributed by me to the Linnean Society, 1912, for notes on annelids other than *Lumbricidæ* found in and around Middlesex. In 1892 I contributed to 'Science Gossip' an article entitled "The Earthworms of Middlesex," in which all that was then known on the subject was summarized. I find, on reference to this article, the following species are recorded:— (1) *Lumbricus terrestris*, L., from Miss Edwards, of Haydon Hall, Eastcote, near Pinner, who wrote as follows: "Reading this morning in 'Science Gossip' that you want worms, I am sending a few dug up in a copse, in our garden, and found under logs or in the mud at the edge of a pond in the said copse." The specimen was interesting, as it had papillæ on segment 11, but none on segment 15, where the male pores are found. On the occasion of a visit to the "Zoo," I found one specimen of the same worm in Regent's Park, but the *Common Earthworm* appears to be rare in Middlesex. (2) *L. rubescens*, Friend (= *L. festivus*, Dugès) was taken at Hornsey, but this again appears to be rare. (3) *L. rubellus*, Hoffm., seems to be more common, and was recorded as occurring at Hornsey and Pinner; while the same localities also yielded (4) *L. castaneus*, Sav. Passing to the genus *Allolobophora*, I find (5) *E. fætida*, Sav., or the Brandling recorded by Dr. Gray for Hammersmith. Mr. Chaloner dug up specimens for me in his garden at Hornsey, and Miss Edwards sent a capital series from Eastcote. It was accom-

panied by (6) *Dendrobæna subrubicunda*, Eisen, plentiful in both localities in garden refuse and vegetable mould. The Green-worm (7) *A. chlorotica*, Sav., is noted, though specimens had not been seen by myself; and (8) *A. turgida*, Eisen, was reported as received from Miss Edwards. The long worm (9) *A. longa*, Ude, was found in Regent's Park and Hornsey, and this is the worm which usually passes muster as the Common Earthworm. Reference is also made to another species (doubtfully named *A. complanata*, Dugès), but so far I have failed to obtain further light as to the species. Nor has time brought us any nearer a solution of the question what Oerley means by *A. rubida*, which he reported for Woolwich. So many changes have been made in nomenclature in the course of time that it is sometimes a little difficult to be certain about the earlier records. Chronologically they stand as follows:—1865, 'A Catalogue of British Worms,' by Dr. Johnston, in which *L. terrestris*, *L. minor*, *L. anatomicus*, and *L. fœtidus* are credited to Dr. Gray, with Hammersmith as the locality. 1885, Oerley, 'A Palæ. övben elo terri. rev.,' reports *O. complanata*, Oerley, and *O. rubidum*, Oerley; but the species remain in doubt. 1892, Mr. Chaloner, of Hornsey, collected for me, on March 28th, *Eisenia fœtida*, *A. longa*, *A. turgida*, *D. subrubicunda*, *L. castaneus*, *L. rubellus*, and *L. festivus* (= *L. rubescens*). Miss Edwards sent me shortly after *E. fœtida*, *A. turgida*, *D. subrubicunda*, *L. castaneus*, *L. rubellus*, and *L. terrestris* from Eastcote. Dr. Woodward wrote me on April 11th, 1892, respecting an earthworm described by him, which he believes, on the authority of Beddard, to be *A. longa*, a worm which is frequent in Regent's Park and elsewhere. There seems to have been nothing done on this important subject during the past twenty years, and the list still stands very low. Total authentic species, 9.

28. NORFOLK.—The records for this county have recently been carefully tabulated for the 'Trans. Norfolk and Norwich Nat. Soc.,' and the history may be read in vol. ix. pp. 394-405. Aided by Mr. Robert Gurney, at whose laboratory I worked in the summer of 1911, and Mr. Mayfield, I have been able to record fifteen species of *Lumbricidæ*, besides many species of *Enchytræidæ* and *Tubificidæ*. They stand in the following order in my report:—(1) *L. terrestris*, (2) *L. castaneus*, (3) *A. chlorotica*, (4) *Allurus*

tetrædrus, (5) *A. longa*, (6) *A. turgida*, (7) *Eisenia rosea*, (8) *O. lacteum*, (9) *L. rubellus*, (10) *E. fætida*, (11) *Dendrobæna arborea*, (12) *Bimastus eiseni*, (13) *D. subrubicunda*, (14) *L. rubescens* (= *festivus*), and (15) *O. gracile*. Total, 15.

29. NORTHANTS.—My study of the annelids of this county dates from 1891. During that year I received from Mr. Henry Blaby, of Brackley, sundry consignments containing eight well-defined species. Concerning these and some others an account appeared the following year in two articles contributed to the 'Field Club.' My original records stand thus:—(1) *L. rubellus*, (2) *A. turgida*, (3) *A. chlorotica*, (4) *A. longa*, (5) *L. terrestris*, (6) *L. castaneus*, (7) *D. subrubicunda*, (8) *Eisenia rosea* (= *A. mucosa*). In February of the following year (1892) I received (9) *Eisenia fætida*, and in revising the material found also (10) *D. arborea*. In April a further consignment brought me, in addition to the foregoing, (11) *D. mammalis* (= *celtica*), a form which I have named (12) *A. cambrica*, which needs revision in the light of modern research, and a species of *Octolasion*, which must be referred to (13) *O. profugum*, because the tubercula extend over segments 31–34. Eight of the foregoing species reached me again on June 7th, 1892. One or two other species of a critical character still remain doubtful, but it seems pretty clear that *constricta*, *putris*, and *eiseni* are to be found there. Total record 13.

30. NORTHUMBERLAND.—The only records for this county known to me are found in Dr. Johnston's 'Catalogue of British Worms,' published in 1865. Some of these it is difficult to determine, but it seems clear that six species were then known. In the terms of modern science these may be given as: (1) *L. terrestris*, (2) *L. rubellus*, (3) *A. longa*, (4) *A. chlorotica*, (5) *Eisenia fætida*, and (6) *L. festivus*. These are credited to Dr. Johnston himself, who found them at Berwick. Total record, 6.

31. NOTTINGHAM.—This county has received a good deal of my attention, largely through the kind aid of Prof. Carr, M.A., and I am publishing my results from time to time in the 'Trans. of Notts. Nat. Society.' Reference may be made to this publication for details (1910 and following years). The list contains:—(1) *Allurus tetrædrus*, with var. *luteus*, Friend, (2) *Eisenia rosea*, (3) *E. fætida*, (4) *A. caliginosa*, including both *turgida* and

trapezoides, (5) *A. longa*, (6) *A. chlorotica*, (7) *D. subrubicunda*, (8) *D. arborea*, (9) *D. mammalis*, (10) *B. eiseni*, (11) *Octolasion lacteum*, (12) *O. cyaneum*, (13) *O. gracile*, (14) *L. rubellus*, (15) *L. castaneus*, (16) *L. terrestris*. Some very interesting discoveries have been made during the past year, and it was a pleasure to find (17) *Helodrilus oculatus*, Hoffm., in a locality which places it beyond suspicion as a native Lumbricid. This is one of the finest county records, totalling 17 species.

32. OXFORDSHIRE.—My researches into the Annelid fauna of this interesting county go back over two decades. In 1892 my Brackley correspondent, Mr. Henry Blaby, sent me consignments, particulars of which were published in the 'Banbury Guardian' of Aug. 25th. This was, so far as I can discover, the first occasion on which any attempt was ever made to deal with the subject scientifically. The collection included seven species, viz. (1) *L. rubellus*, (2) *L. castaneus*, (3) *A. chlorotica*, (4) *A. trapezoides*, (5) *Eisenia rosea* (= *A. mucosa*), (6) *D. subrubicunda*, and (7) *D. mammalis* (= *celtica*). When twelve years later (April 7th, 1904), I addressed a letter to the same paper on the subject, it was possible to add five further species to the list. I had earlier in the year paid a personal visit to the University City, and examined the Botanic Gardens, and a worm was found on that occasion which, though numerous there, has hitherto been found nowhere else. This was (8) *Eisenia veneta*, var. or subspecies *tepidaria*, Friend; (9) *Allurus tetrædrus* was found by the river, (10) *O. cyaneum* in the Gardens, (11) *A. longa* on the pavement near the Martyrs' Memorial, and the twelfth species was the Brandling (12) *Eisenia fætida*. In May, 1904, under the presidency of Dr. Veley, I gave a lecture before the members of the Ashmolean Nat. Hist. Soc. on British Annelids, with special reference to Oxford, and was able to record fifteen native species. To the foregoing had been added (13) *L. terrestris*, (14) *O. profugum*, and a species which I mistook for *A. tyrtea*. Later examination, however, showed that this was new to science. In the 'Gardeners' Chronicle' for March 12th, 1904, I gave an account of some of the worms, figuring *O. cyaneum*, which was new to Britain, and the girdle of *tepidaria*. But it was not till Nov. 27th, 1909, that I published in the same paper an account of the new Oxford worm, which now appears as (15) *A. inter-*

media, Friend. So far the species seems never to have been found elsewhere. In 1902 Mr. Günther published a 'List of Oxford Annelids,' which I compiled at his request, which agrees with the foregoing. It also notes a second variety of *Eisenia veneta*, found in the Gardens, but as yet unnamed. The Gardens have not been carefully worked for Annelids any more than the county generally, or our list might probably be considerably extended. Authentic list, 15.

33. RUTLAND.—No records. The records for Scotland, Wales, and Ireland are not given in the present contribution. For Sheppey, see Kent and the Thames Valley paper.

34. SHROPSHIRE. — In May, 1909, I had occasion to visit Shrewsbury, and during my stay there worked a little at the Annelids. The gleanings were not rich, but contained (1) *L. rubellus*, (2) *A. trapezoides*, (3) *A. chlorotica*, (4) *A. constricta* (a worm which appears to be somewhat rare and local), and (5) *Allurus tetrædrus*. In October of that year Mr. H. Forrest sent me, in addition to the first three named above, (6) *L. terrestris*, (7) *L. festivus* (which is the rarest of the true Lumbrici in England), (8) *A. longa*, (9) *A. turgida*, and (10) *Octolasion studiosum*. A little later (Oct. 21st) were added (11) *L. castaneus*, and (12) *D. subrubicunda*. In November I again visited Shrewsbury, in order to try and ascertain what worms had helped to bury the old Roman city. We then found (13) *D. arborea*, (14) *Eisenia rosea*, and (15) *D. mammalis*. In May, 1910, Mr. Goodwin sent a collection from Uffington, containing *A. longa*, *E. rosea*, *O. studiosum*, *D. subrubicunda*, and (16) *E. foetida*. This latter worm, known as the Brandling, is common in old gardens and manure, but had not previously been met with in Salop. Authentic county list, 16.

(To be continued.)

NOTES ON THE YARMOUTH HERRING FISHERY
OF 1912.

BY THOMAS J. WIGG.

THE autumn fishing commenced much earlier than usual this year, and those connected with this industry began to arrive at Yarmouth and Lowestoft during the third week in September, but it was not until near the end of the month that work was begun in earnest. Great preparations had been made for an early start, and merchants and their workpeople gathered from all parts of the English and Scottish coasts in readiness for the harvest of the sea.

A large number of boats were at sea during the last two or three days of September, and, meeting with a great shoal of Herrings within easy distance of Yarmouth and Lowestoft, heavy catches were made, and about 20,000 crans (1000 fish = 1 cran) were landed at each port in one day. Prices at this time ranged from 32s. 6d. to 20s. per cran, according to quality and the quantity landed. A Yarmouth boat, the 'Sunbeam,' beat all records by making a haul of 320 crans (or approximately 320,000 fish). Two boats were required to bring this prodigious catch to port. The fish, when sold, realized £520.

All boats were not so fortunate, for during the middle of October the catch and delivery were so great that thousands and ten thousands of crans of Herrings were landed day by day. On Monday, Oct. 12th, about 200 boats came in with the great average catch of 50 crans, and on Tuesday about 150 Scotch boats swelled the great catch by an average of 60 crans per boat, with the result that prices fell to 10s. and 12s. a cran. Wednesday's catch averaged 35 crans from 250 boats, while the 500 boats which arrived on Thursday brought in a total of 25,000 crans.

Lowestoft boats also made remarkable catches during this week, and showed a total of over 80,000 crans more than at the

corresponding period of last year. The great catches of October were continued well into the first or second week of November, when the weather became unsettled, and the fishermen were in the same position and anxious to end the season. Many Scottish crews, having made a good fishing, were anxious to go north. I am informed that the steam-drifter, 'The Light,' returned to Fraserburgh from Yarmouth, having earned over £1000.

The abnormal catch of this season upset all calculations, and the curers found that the ordinary stock of salt and barrels was quite inadequate for the extraordinary demand.

What a change came during the last week of November! The majority of the Scottish boats had returned to the north, and the deliveries of fish were very poor.

In former years the season has lasted close up to Christmas, but compared with last year some strange results may be noted. In 1911, the month of November was nearly over before the heavy fishing began, whereas this year the great catches were all over in the early days of that month in 1912. Compare the figures for the week ending Nov. 16th. At Yarmouth the catch for the week was 18,866 crans, and in the corresponding week of 1911 it was 70,696, but the *season's* catch on the same date was 151,770 crans better than at the corresponding period of 1911.

'The Fish Trades' Gazette' of Dec. 7th, 1912, says:—"From every point of view the fishings at the two chief centres (Yarmouth and Lowestoft) have been an unqualified success. The quantity of Herring caught creates a record in the history of the trade. . . . The thousands of shore hands employed in the great industry have also profited by the bountiful harvest of the sea. . . . There may be—indeed, there are—a few fishermen, as is always the case, who have been unfortunate in the loss of gear, but, taken on the whole, there has never been a Herring fishery in East Anglian waters, or anywhere else, which has been of so much general benefit, and for which there is so much occasion for all-round gratitude."

The following statement shows a Return of Herrings landed at Great Yarmouth and Lowestoft in 1912:—

At Fish-wharf :—

Month.	Crans.	Month.	Crans.
April	131½	Brought forward ...	6,046
May.....	251	September	97,019
June	105½	October	397,145
July.....	226	November	102,219
August	5,450	December	2,548
Carried forward.....	6,046	Total	604,977

At Gorleston :—

Sept. 14th to 30th	5,976
Oct. 1st to 31st	57,965
Nov. 1st to 23rd.....	7,818
	<hr/>
	71,759

At other Wharves :—

September	39	Fish-wharf	604,977
October	6,110	Gorleston	71,759
To Nov. 9th.....	1,473	Other wharves	7,622
	<hr/>		<hr/>
	7,622		684,358

The number of Yarmouth boats was about 204

„ „ Scotch and other boats was about 732

Total 936

Return of Herrings landed at Lowestoft in 1912 :—

Month.	Lasts.	Month.	Lasts.
January	9	Brought forward ...	196
February	—	July	31
March	5	August	85
April	94	September	4,241
May	81	October.....	29,773
June	7	November.....	7,990
	—	December	394
Carried forward	196		<hr/>
		Total ...	42,710

This quantity is equal to 427,100 crans.

The number of Lowestoft boats was about 337

„ „ Scotch and other boats was about 311

Total 648

NOTES AND QUERIES.

MAMMALIA.

The Hedgehog in the Highlands.—Gathering from some recent remarks by Mr. J. A. Harvie-Brown and others, in 'The Scottish Naturalist' and elsewhere, that the Hedgehog is considered to be rare—if not of recent introduction—to some parts of the Scottish Highlands, I have turned up some of my old journals, and the following results may perhaps be worth putting on record:—In 1877 I saw a Hedgehog on the side of Ben Cruachan, on the slopes facing the Pass of Brander, and allowed it to continue its way unmolested. This is, of course, on the north bank of Loch Awe, in Argyllshire. It is well known to gamekeepers in that county, in several places; a few, for example, are still killed annually in the neighbourhood of Glendaruel. In Glen Urquhart, Inverness-shire, it used to be trapped in numbers some twenty years ago, and is doubtless still not uncommon there. On April 13th, 1887, I had noted having passed "a dead Hedgehog lying at the roadside," in walking from Loch Maree Hotel to Kinlochewe, in Ross-shire. From recollection I think this was near Talladale Bridge, and I believe I have seen others in that county, though up to the present I have not found any notes made of them. No doubt the animal must be known to many of your readers to occur in these and probably many other Highland localities, but records of "common things" are rarely considered to be worth while putting into print, and the often-felt want of them must be my excuse for thus troubling you.—GEORGE BOLAM (Alston, Cumberland).

Albinic Example of *Mus sylvaticus*.—A very beautiful specimen of a perfectly white Long-tailed Field-Mouse has been brought to me. It was one of a litter of six, the rest of the family being of the ordinary colour. The nest was made in a stubble-field near this village, and was turned up by the plough. It can be imagined what the very prominent beady eyes of a Field-Mouse are like when they resemble drops of Stephens's red ink—that is the nearest description of their colour. The little white one has been reared by hand, and has become very tame, though at one time it used its teeth freely on being handled. By diligent search, which, however, may have missed an entry, only one instance of an albino Long-tailed Field-Mouse has been found throughout the whole series of 'The Zoologist' from

1843, and this is reported (1884, p. 226) as having "the slightest possible tinge of colour." One also was mentioned in the 'Field' for Jan. 18th, 1873. Three years ago, so one of the gardeners tells me, he caught a pure white specimen with pink eyes whilst moving sheaves of oats in a field close to this village; it was full-grown, but died a day or two after capture. This looks as if there may be some family connection between these two albinos.—H. MARMADUKE LANGDALE (Compton House, Compton, Petersfield).

AVES.

The Ruff in the Isle of Islay.—On Sept. 11th, 1912, a Ruff (*Machetes pugnax*) was shot near Port Ellen, in the Isle of Islay. This species is not included in Harvie-Brown's work on the birds of Argyllshire and the Inner Hebrides, and is probably new to the fauna of the island. Mr. J. Ramsey, of Kidalton, who has taken a keen interest in the birds of this district for a number of years past, assures me this is the first authentic capture that has come under his notice. The bird—a male in winter plumage—was feeding on the banks of a small loch, and was so tame that it allowed itself to be approached within six or seven feet, and even then was loth to take wing. Unlike most waders, I have found that the Ruff will freely enter thick grass, and this individual proved to be no exception to the rule, for on one occasion I noticed the bird force its way through a patch of short but dense herbage with almost as much confidence as a Land-Rail. During my stay in the island I shot three Coal-Tits for my collection. Two of these had the cheeks very slightly suffused with pale primrose-yellow, in which respect they approached the Irish form, *Parus ater hibernicus*; the third example, however, in no way differed from the typical British bird.—COLLINGWOOD INGRAM.

Black-headed Gull in Breeding Plumage.—It may interest the Rev. H. Marmaduke Langdale, who refers to a specimen of *L. ridibundus* in summer dress, obtained on December 16th last (*Zool. ante*, p. 37), to know that in my 'Birds of Northumberland and the Eastern Borders,' p. 620, he may find references to the early assumption of this plumage on the Borders on several occasions, the earliest on December 7th, 1903, and again on 16th of the same month. On both these occasions quite a number of the birds were noticed, in the neighbourhood of Berwick-on-Tweed, with black heads. I have in addition to these a few other records of the black hood being assumed during December in Northumberland. — GEORGE BOLAM (Alston, Cumberland).

CRUSTACEA.

Large Edible Crab.—In 'The Zoologist' (1912, p. 272) reference is made to the weight to which the Edible Crab (*Cancer pagurus*) may attain. The figures given seemed to be taken very much on hearsay evidence, which is not always proof positive. When passing a local picture dealer's shop a few days since, I saw mounted on a shield in the window what I at first glance thought was a pair of small fallow-deer's horns! On a second look I found they were a pair of pincer-claws of the Edible Crab, and was allowed to measure them. The curving free chela was no less than 6 in. in length; the girth of the first section—the "hand" which contained the points—was 9 in.; and the probable length of the whole claw-leg, judging by the length mounted, would have been quite 18 in. I was given to understand the Crab was recently trawled up on the Portuguese coast. To arrive at the probable weight, when alive and "full," I purchased an 8-oz. Scotch Crab, and, measuring it, found the free chela was $1\frac{1}{2}$ in., with a girth of the corresponding end section of 3 in. The carapace was $4\frac{1}{2}$ in. wide by 3 in. across it, from the eyes to the back part. On this scale the larger Crab's carapace must have been undoubtedly quite 14 in. by 10 in. The entire Crab might have been 10 lb. or more in weight; my small and not very full specimen weighed half a pound. I was told that the crew of nine hands sat down to the banquet on board the trawler, unfortunately breaking the carapace in the scramble.—ARTHUR H. PATTERSON (Ibis House, Yarmouth).

PALÆONTOLOGY.

A Surrey Hippopotamus.—In the course of a report of the Asylums Committee to come before the London County Council at Tuesday's meeting, a discovery made in a part of the estate of Cane Hill Asylum, at Coulsdon, Surrey, is mentioned. The land at this spot is about 400 ft. above sea-level. In the course of the digging some bones were discovered, and Sir James Moody, the Medical Superintendent of the Asylum, having made an examination, was satisfied that they were of great antiquity. He consulted Mr. Henry Dewey, of the Geological Survey, and the authorities of the British Museum, and ascertained that the discovery consisted of remains of the head of a Hippopotamus, and two pieces of an ivory tusk, probably that of a Mammoth. The fragments comprised portions from the head of the Hippopotamus, with teeth in position in the jaw, the articulation of the jaw-bones, two of the larger teeth, and one of the vertebræ. A number of small parts of bone, so far, it had not been possible to

“piece” together. Photographs of the remains are to be exhibited at the County Hall, and the Asylums Committee suggest that they should be preserved in the Horniman Museum.—(‘The Observer,’ Feb. 2nd, 1913.)

OBITUARY.

THE EARL OF CRAWFORD, K.T., F.R.S.

THE world of science sustained a great loss in the death of Lord Crawford on January 31st, at the age of sixty-six. Himself an active man of science, his lordship was in sympathy with all its branches, and the nation, as a whole, is indebted to him for much that is both valuable and interesting.

It is, however, the loss of a patron of the science of zoology that we particularly deplore in these pages. Some fifteen years ago Lord Crawford was compelled through ill-health to pass the winter months abroad in order to avoid the changes of our English climate, and it was during these years that his now celebrated yachting cruises to the South Seas and Eastern Tropics took place. The extent of these cruises may be better understood when it is pointed out that such remote localities as the islands of South Trinidad, Tristan d’Acunha, and Borneo were visited, and the stormy seas off Cape Horn negotiated.

Lord Crawford realised what great opportunities would present themselves for enriching the collections at South Kensington, and for this reason a naturalist was almost invariably numbered amongst the party on board,

Three of these voyages are described in an interesting manner by Mr. M. J. Nichol in ‘Three Voyages of a Naturalist,’ published some five years ago after a cruise round Africa. It is only to be expected that many new forms of birds, beasts, and insects would be collected during these trips, and the types of these, together with the whole collections made, are deposited in the National Museum. Rarely visited and remote islands always have a strange fascination for the traveller-naturalist, and it was such places as this that Lord Crawford made a point of visiting in his splendid full-rigged ship, the yacht ‘Valhalla,’ whose decks bore a striking resemblance to a menagerie towards the close of a long winter cruise.

As one who had the good fortune to make a long cruise to the Tropics on board her, the writer can testify to Lord Crawford’s general sympathy towards Natural History and interest in strange animals and birds, whether alive or dead. His interests, however, were many-sided; a distinguished astronomer, he visited Cadiz in 1870 to witness the eclipse of the sun, and Mauritius in 1874, on the occasion of the Transit of Venus. He was elected a Fellow of the Royal Society in 1878, and President of the Royal Astronomical Society in 1878 and 1879. He was also an ex-President of the Royal Photographic Society, and a Trustee of the British Museum.

G. MEADE-WALDO.

NOTICES OF NEW BOOKS.

A Vertebrate Fauna of the Malay Peninsula—Reptilia and Batrachia. By GEORGE A. BOULENGER, D.Sc., Ph.D., F.R.S. London: Taylor & Francis.

THE above is the first of a series of volumes descriptive of the Vertebrate Fauna of the Malay Peninsula, published under the authority of the Federated Malay States Government, and edited by H. C. Robinson, Director of Museums in that Dependency. It is supplemental to, and designed on the same method as pursued in, the well-known 'Fauna of British India,' and carries on the faunistic work of that publication beyond the confines of the British Indian border to as far south and east as Singapore. This important faunistic contribution to the histories of our colonies has already been followed in some volumes on the 'Fauna of South Africa,' and we may expect the enterprise to be elsewhere carried on, for it has come to stay. Such publications have a world-wide scientific value; in the Malay Peninsula they will prove a boon, indeed, to all who are interested in zoology, and we well remember a sojourn there nearly fifty years ago, when Cantor's 'Catalogues' were the principal literature for consultation.

Dr. Boulenger is particularly entitled to write this contribution, not only on the ground of his wide knowledge of the subject, but also because he did the same service to the 'Fauna of British India.' The two monographs thus become continuous, possess a common classification, and depend on the same high authority. These valuable qualifications will be properly estimated by those workers on zoological distribution who have sometimes on the same subject to consult different writers of diverse views on classification and nomenclature.

Mr. H. C. Robinson, the Editor, contributes the Preface, and gives a bibliography of the most important memoirs on Malayan herpetology. He probably omitted by accident one written by the late Dr. W. T. Blanford, "On a Collection of Reptiles and Frogs chiefly from Singapore" (Proc. Zool. Soc. Lond. 1881, pp. 215-227).

The Feeding Habits of Serpents. By RAYMOND L. DITMARS.
Published at the Zoological Park, New York.

THIS booklet forms a separate part of the publication known as 'Zoologica,' consisting of contributions to the New York Zoological Society, and is the result of a long study of the feeding habits of these reptiles in captivity. The information is of a most interesting and important character, and affords support and also qualification to many zoological generalisations.

The viperine poisonous snakes are for the most part short-lived under observation, have an utter disinclination to feed, while they "remain more timid than their innocuous allies, which become readily accustomed to change of environment." Another interesting conclusion relates to the Regal Python (*Python reticulatus*) from Malaysia. From repeated examinations of the crates of newly arrived specimens of this species, Mr. Ditmars is convinced that the big specimens, when in their native environment, feed often upon the Indo-Malayan wild swine. "Examination of the excreta in sixty per cent. of a series of about forty specimens investigated showed liberal traces of the bristles of *Sus cristatus*, and in numerous cases the horny coverings of the feet." During recent years Mr. Ditmars and his assistants have discovered that an annual fast of several months' duration has increased the longevity of valuable reptiles in this collection. "The writer is convinced that the impossibility of keeping alive the big tropical vipers for more than a year's time has resulted from feeding during a period when the animal has secreted fatty sustenance to carry it past a period of hibernation or æstivation, as the case may be." More startling still is the recognition of the method by which reptiles may be employed in economic agriculture. "Members of such genera as *Zamenis*, *Coluber*, *Pituophis*, and *Ophibolus* may be regarded as of marked economic value in the vast grain belts of the United States, and their introduction into localities infested with the smaller sciurine rodents is well worth serious trial and extended observation. The species of *Pituophis* should be particularly useful owing to their strictly terrestrial habits and inclination to prowl into the burrows of small mammals."

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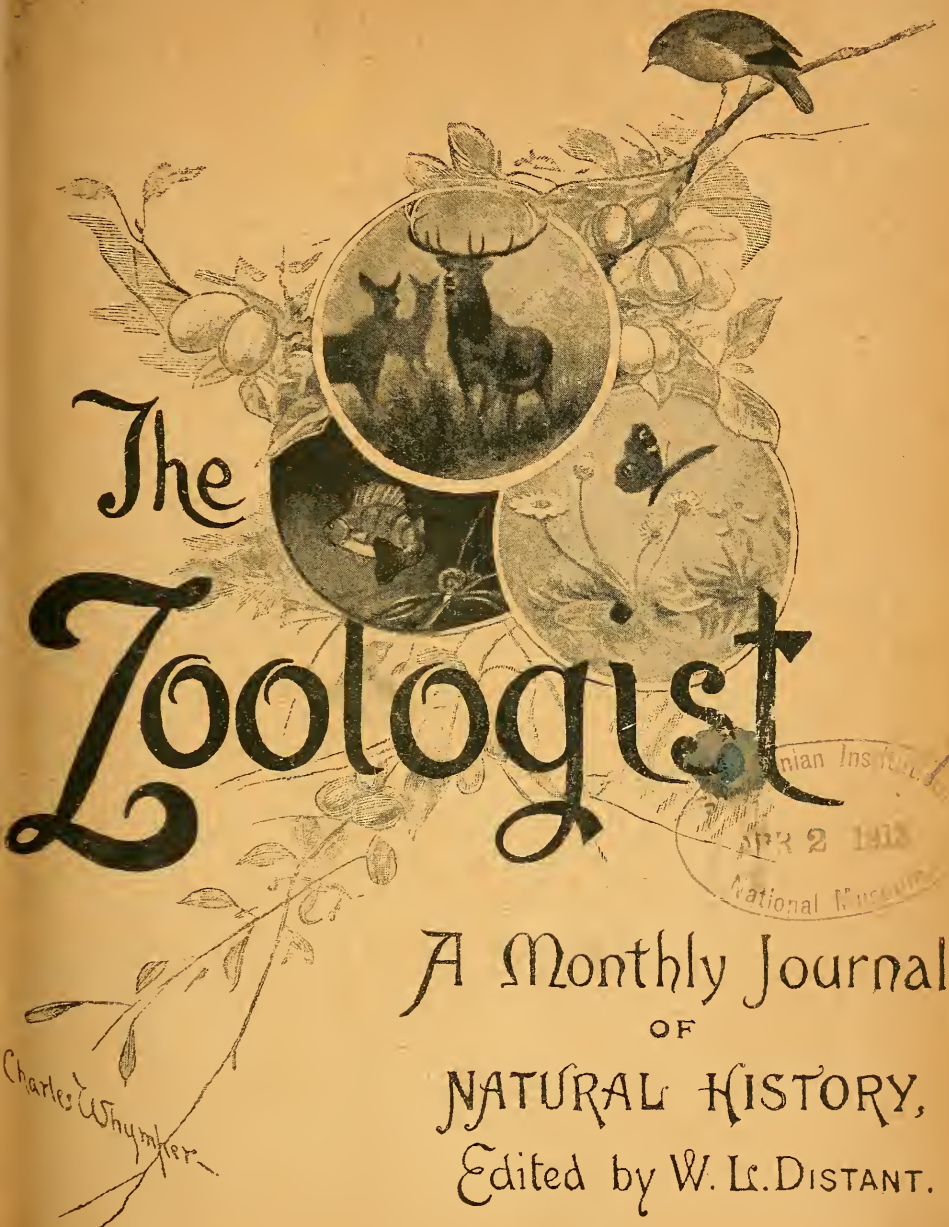
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A KEY TO BRITISH HENLEAS.

BY THE REV. HILDERIC FRIEND, F.L.S., F.R.M.S.

WHEN my brief paper on British Henleas appeared in the *Zoologist* (1911, p. 464), it was impossible to foresee that in another year the number would be raised from eight to a score and a half, and that a key would be necessary in order to enable the student readily to distinguish one species from another. Aided by a Government grant, however, it has been possible for me to make many new discoveries in different parts of the country, and in this way greatly to extend our knowledge of this group of Enchytræids. Having during the past year given a somewhat full account of this genus in the 'Journal of the Royal Microscopical Society,' and in other journals enumerated in the Bibliography, it is not necessary to go over the same ground in detail. Since, however, several new species have been found since the principal of these articles was written, and some of these species have not yet been described, the key would be of little value without a few preliminary remarks.

The genus *Henlea* pertains to the Enchytræids, a family of Annelids belonging to the order Oligochæta. One of its chief characters is the forward position in which the dorsal vessel arises, usually from or near a bulbous swelling of the intestine, and the frequent presence of œsophageal glands in that locality. It now appears that the dorsal vessel often arises in or near the girdle, and it may be desirable eventually to separate the two groups into different genera. At present, however, it suffices to use this difference for purposes of classification within the genus.

Thus we have for our guidance the presence or absence of salivary glands, œsophageal glands, spermiducal glands, atrial glands, and the like; the shape of the brain, the point of origin of the dorsal vessel, the structure of the nephridia, the cœlomic corpuscles, the setæ, and other characteristics. After careful study of many hundreds of specimens from various parts of the country, it has gradually been borne in upon me that, while the setæ in the genus *Fridericia* are so constant that they can be absolutely depended upon as a species-character, the setæ in the *Henleas* are still in a fluctuating condition. In one and the same species they vary widely in number, and this applies to specimens collected at the same time in the same locality, as well as to those taken at intervals from different sites. Age and development have to be taken into account, and it is of the utmost importance that final diagnoses be based upon adults whenever possible.

In my former article (1)* eight species of *Henlea* were recorded as British, while a ninth was tentatively admitted in an Addendum. My next catalogue (2) contained no fewer than nineteen species, with the statement that "since this paper was written in May, 1912, one new species has been found by me in Ireland, making the twentieth British species." The description of the twentieth species duly appeared in the 'Irish Naturalist' (3) for January, 1913, the creature being named *Henlea glandulosa*, Friend. In the meantime further collections had been made in Derbyshire, Nottinghamshire, and elsewhere, with the result that other species apparently new to science were brought to light. Some of these, which were first found in Nottinghamshire, have been reported on in the 'Transactions of the Notts Nat. Hist. Soc.' (4). One has been named *H. mariona* on account of its resemblance to certain species of *Marionina*, which was formerly written *Mariona*. Others are very small, as the names *pusilla*, *parva*, *minuta*, and the like are intended to imply. In two or three species we find four pairs of septal glands, and in one case there are three setæ in each bundle throughout, for which reason it is named *H. trisetosa*.

In order that the key may be as complete as possible, it is necessary to add a brief description of those species which have

* The numbers in brackets refer to the Bibliography.

been discovered since my latest reports were published. A very careful revision of the whole of my material during the month of February showed that no fewer than twenty-nine species may now be regarded as British. *Henlea variata*, Friend, is proved to be the same in all essentials as *H. rhætica*, Bret., whose description must be extended to admit our native specimens. As no fewer than two out of every three of our indigenous species are destitute of œsophageal glands, it is proposed to divide the material into two groups, and retain the name *Henlea* for the one, adopting that of *Henleanella* for the other.

Subjoined are the descriptions of new species:—

1. HENLEA ALBA, sp. nov.

Length when alive 12–15 mm. Segments 50. Transparent, white. Three pairs of septal glands in the normal positions. Setæ 3–4 in the lateral, and 4–5 in the ventral bundles. Spermathecæ with ampulla or bulb midway between the two ends of the duct. No glands at the 4–5 opening. The normal salivary glands wanting, but a pair of nephridia-like bodies (or apparently three) between the second and third pair of septals. If these are œsophageal glands they are abnormal in position and appearance. Similar glands are found in *H. inusitata*, and Bretscher has drawn attention to a like anomaly in *H. gubleri*.

Girdle as usual extending over segment 12 to the setæ of 13. Cœlomic corpuscles of the brown, horny type so characteristic of several species of *Henlea*. Chloragogen cells large. The pre-clitellian nephridia found only in three segments, 8–9, 9–10, 10–11; but they often vary in number and position in different species. The dorsal vessel arises in the girdle, or in segment 13–14, where the intestine enlarges. No other species of *Henlea* has hitherto been found with the vessel in so backward a position, though it is frequent in *Enchytræus* and *Fridericia*. The œsophagus goes gradually into the intestine behind the last pair of septal glands, where the bulb usually occurs.

Collected at Netherhall, Bretby, Derbyshire, November 22nd, 1912, near an old tree-stump.

2. HENLEA INUSITATA, sp. nov.

Length 6–10 mm. Segments 30–35; white and transparent. Setæ 3–6 behind, 5–8 in front in the lateral bundles, sometimes

from 6 to 9 in the ventral; shortest in the middle, as in *Fridericia*. Three pairs of septal glands normally disposed, the hindmost pair being different from the others. Between the second and third pair nephridia-like glands occur. They differ from those of *H. alba* described above, but apparently belong to the same class, though at present it is impossible to decide whether they are œsophageal or salivary glands. Their unusual character explains the specific name. Bulb in segment 8, and dorsal vessel in the intersegment 8-9. Girdle covering segment 12 to setæ of 13 with gland-cells recalling those of *Fridericia bulbosa*, Rosa. Brain slightly longer than broad, somewhat wider behind than in front; slightly concave when stretched; but straight or convex behind when at rest. Cœlomic corpuscles granulated, not horny or brown. Sperm funnel very small; no conspicuous atrial glands, penis or male pores. Spermathecæ consisting of a simple duct without distinct ampulla, bulb, or glands. Large blunt anteseptal, the whole nephridium resembling a leg of mutton.

Collected at Rolleston Junction, Notts, March 26th, 1912, in a heap of earth. Also found at Cauldwell, near Burton-on-Trent, June 11th, 1912.

3. HENLEA MINIMA, sp. nov.

Length 5-6 mm. Segments 25. Setæ 4-5 posteriorly, as many as six in front, growing smaller towards the centre of the bundle, as in *Fridericia*. But the Henleas vary in this matter a great deal. Three pairs of septals in normal position, small in front, medium, and large behind. No œsophageal glands; no salivaries; no nephridia-like glands between the septals. Brain similar to that of *H. inusitata*. Spermathecæ in the form of a tube, widest near the opening and narrowing towards the intestine. No ampulla, bulb or glands. Girdle extending as usual from segment 12 to setæ of 13. Cœlomic corpuscles large and clear, not horny; somewhat oval in shape. Intestine widens in segment 8, dorsal vessel arises in 10-11. Small anteseptal and large postseptal with duct as long as the latter, from whose mid-region it arises. Very fine sperm-duct opening into an atrial-gland in segment 12.

Collected with *H. alba* at Netherhall, between Bretby and Hartshorne, where I have taken *Rhyacodrilus* and other rare

annelids, autumn, 1911; but hitherto regarded as a minor variety of one of the larger species.

4. HENLEA MULTISPINOSA, sp. nov.

Formerly looked upon as a mere variety of *H. dicksoni*, which it somewhat closely resembles at first sight. A fairly stout worm, about 12 mm. in length, transparent, of 40 to 45 segments. Setæ from 4-6 behind, to 8 in the middle, and as many as 10-12 in front. Salivary glands present, resembling those of *F. bulbosa*, Rosa; slender and slightly forked at the tip. No œsophageal or nephridia-like glands. Spermathecæ composed of a duct which varies somewhat in size but has no distinct bulb or ampulla. Small glands sometimes occur at the 4-5 opening. Brain of the typical shape and size, slightly incised behind. Very prominent girdle when fully adult, with large pores. Nephridia with medium-sized anteseptal and large post, from about the middle of which a long duct emerges. Found nephridia as far forward as 4-5. Œsophagus enters bulbous intestine in segment 7, the dorsal vessel arising in the middle of the eighth. The normal septal glands (three pairs) present. Cœlomic corpuscles oval and granular, not brown or horny.

Found under moss by the canal at Nottingham, December 16th, 1912, and reported as a multispinose variety of *H. dicksoni*.

5. HENLEA QUADRUPLA, sp. nov.

Separated from *H. tenella*, with which I formerly associated it. *H. tenella* has never been satisfactorily worked out; but the species which I regard as approaching it most nearly is now found to be quite distinct from this, which is readily distinguished by the septal glands being quadrupled.

Length 6-10 mm. Segments up to 50 in number. Setæ 2-4 behind, 3-4 or 5 in front. One pair œsophageal glands in segment 8, large salivary glands filling up much of the cœlom in front of the first pair of septal glands. Nephridia with posterior ending in a narrowed duct. This form of nephridium is at present only recorded for one other species in this group; but in *Henleanella* at least four species (*H. marina*, *H. curiosa*, *H. parva*, and *H. rosai*) present it. Spermathecæ with short duct, large ampulla and glands. Brain of normal type. Dorsal

vessel arising at the base of the pair of œsophageal-glands, *i. e.* in 8-9.

The Addendum to my article in the 'Zoologist' (1911, p. 468) refers to this species under the title *H. tenella*.

Found at Acresford, near Ashby-de-la-Zouch, November 28th, 1911, and the same week at Overseal, the adjoining parish. Also Netherhall, November 22nd, 1912, and Bretby, February, 1913.

6. HENLEA TRISSETOSA, sp. nov.

A small worm, measuring about 5-6 mm., with 35-40 segments. Setæ sigmoid, 3 in each set throughout. Like the last it has 4 pairs of septal glands, but there are no œsophageals, so that it falls into the *Henleanella* group. The dorsal vessel arises in 9-10. The most advanced pair of nephridia found was in 8-9; small ante- and large post-septal, with duct as long as the latter arising from the neighbourhood of the septum. Brain about as long as broad, of normal type. No salivary glands. Cœlomic corpuscles not of the horny type.

We may now proceed to notice some of the methods by which the ever-increasing number of species may be distinguished.

THE SETÆ.—In the genus *Fridericia* one is able in many instances to come to a definite conclusion, merely by the study of the setæ in front of the girdle. Where 4, 6, or 8 setæ occur in each bundle, the innermost are the shortest. It often happens that this diversity occurs also among the *Henleas*; but the rule is not a constant one, and the setæ of *Fridericia* differ in shape from those of *Henlea*. Generally speaking, we may say *Henlea* setæ are needle-shaped, *Fridericia* setæ are crochet-hooked, *Enchytræus* setæ are sigmoid. The species which have shorter inner setæ are *H. dicksoni*, *H. nasuta*, *H. ventriculosa*, *H. variata*, *H. mariona*, and *H. fridericioides*, with possibly some others.

THE BRAIN.—As with the setæ, so with the brain; *Fridericia* and *Henlea* each has its type. In *Fridericia* it is very rarely concave behind, whereas in *Henlea* it is almost always so. When the brain of *Henlea* appears otherwise than concave behind it is nearly always due to tension or position. It must always be viewed from above, and is usually somewhat longer than broad.

ŒSOPHAGEAL GLANDS may be present or absent. When pre-

sent they usually occur at the point where the œsophagus merges into the intestine. They may also vary in number; and few characters are more helpful to the systematist than these glands. They are not found in *H. tenella*, *H. marina*, *H. curiosa*, *H. lampas*, and some others, and we name this group *Henleanella*.

SALIVARY GLANDS are present in *H. curiosa*, *H. rosai*, *H. dicksoni*, and *H. tenella*, among others. They vary a good deal in size, shape, and position. In *H. inusitata* and *H. alba* we find glands of a special nature.

SPERMATHECÆ are present in all adults. In *H. puteana* there are two pairs. This, however, is unique, not only in the genus, but in the family. In all the other species one pair is found opening in the intersegment 4-5. There are no diverticula, as in *Fridericia*, but glands are frequently found near the external aperture, as in *H. marina* and *H. fridericioides*. *H. attenuata* has never yet been found adult, though the species is far from rare.

THE DORSAL VESSEL usually takes its origin in front of the girdle, and may frequently be seen as a white sac or a kind of pump, throbbing and pulsing vigorously. It is not unusually found near the œsophageal glands, about segments 7-9; but some of the more recently discovered species show the presence of the vessel in or behind the girdle, as in *Enchytræus* and *Marionina*. These may eventually form a new genus. In *Fridericia* its position is usually between segments 15-20, or even further back. The blood is always colourless.

SEPTAL GLANDS are present in all known species. The normal number is three pairs, situated in segments 4-6; but the number occasionally varies. In one species, which I formerly described as *H. tenella*, but now regard as a new species, we find four pairs of septal glands. The same applies to the new species described above as *H. trisetosa*. This number is exceeded in some other Enchytræids, but is not at present known to occur in any other species of the genus *Henlea*. One species in each group has only two pairs.

CÆLOMIC CORPUSCLES occur in all Enchytræids, and vary greatly. Some species of *Henlea* have corpuscles which look like horny discs. They are round or oval and brown, almost like encysted protozoa. Others conform to the regular type.

Though each species has its distinctive characteristics, some

are so similar in general appearance that they may readily be confused. Thus *H. dicksoni* may easily be mistaken for *H. rhatca*. *H. curiosa* and *H. lampas* have much in common. *H. attenuata* is easily distinguished from *H. heterotropa* by its attenuated form.

I have come to the conclusion that the conditions under which these tiny annelids exist greatly affect some of their characters. Under stimulating conditions not only do they attain a larger size, but the setæ frequently increase in number. Hence there are two or three species which have polychæt varieties, the number of setæ reaching 8-12 per set in each segment. Thus an individual with 50 segments would have no fewer than 2000 setæ, though not more than half an inch in length.

It is now possible to present our facts in a systematic form, and in preparing the following key I have followed the lines laid down in my former paper (2), which is here extended to include all the known British species.

SYNOPSIS OF THE GENUS.

- i. Two pairs of spermathecae present. One species only, viz. *Henlea puteana*.
- ii. One pair of spermathecae present. Varying much in character.
 1. Consisting of a simple duct.
 2. A duct with median bulb.
 3. A duct with ampulla attached to the intestine.
 4. Glands at the 4-5 opening.

We find further species with:—

- i. No œsophageal glands present; these we name the *Henleanna* group.
- ii. One pair of œsophageal glands—
 1. In segment 7.
 2. In segment 8.
- iii. Two pairs of œsophageal glands. One species only, viz. *H. ventriculosa*. These may be regarded as the true *Henlea* group.

Finally we have another clue in the septal glands, as follows:—

- i. Two pairs of septals in *H. mariona* and *H. fridericioides*.
- ii. Three pairs in all others, except
- iii. Four pairs in *Henlea trisetosa* and *H. quadrupla*.

The exceptions are always easy to find, but for the bulk a key is required.

Finally we note the species with nephridia-like glands, whose character is not yet determined.

KEY TO THE GENERA.

Two Groups are recognized, *viz.*:—

- I. Species lacking œsophageal glands . HENLEANELLA.
 II. Species possessing œsophageal glands HENLEA.

The following belong to Group I.

HENLEANELLA: Œsophageal glands absent.

1. Two pairs of septal glands *H. mariona.*
2. Four pairs of septal glands *H. trisetosa.*
3. Three pairs of septal glands—
 - i. Setæ not exceeding five per set—
 - a. Dorsal vessel clitellian—
 - † Salivary glands absent *H. marina.*
 - †† Salivary glands present *H. curiosa.*
 - ††† Abnormally placed glands *H. alba.*
 - β. Dorsal vessel anteclitellian—
 - † Sperm-funnel spindle-shaped *H. tenella.*
 - †† Sperm-funnel pear-shaped *H. lampas.*
 - ii. Setæ exceeding five per set—
 - a. Two pairs of spermathecæ *H. puteana.*
 - β. One pair of spermathecæ—
 - † Duct of nephridia from posterior—
 - * Salivaries present *H. rosai.*
 - ** Salivaries absent *H. parva.*
 - †† Duct of nephridia from anterior—
 - * Salivaries present—
 - (1) Slender or forked *H. multispinosa.*
 - (2) Sac-like in 4–5 *H. minuta.*
 - (3) Unusual type of glands *H. inusitata.*
 - (4) Of normal form *H. dicksoni.*
 - ** Salivaries absent—
 - (1) Dorsal vessel arises in 7–8 *H. glandulosa.*
 - (2) Dorsal vessel arises in 8–9 *H. arenicola.*
 - (3) Dorsal vessel arises in 9—
 - α. Length 2–3 mm. . . . *H. perpusilla.*
 - β. Length 7–8 mm. . . . *H. rhatica.*
 - (4) Dorsal vessel arises in 10–11 *H. minima.*

The following belong to Group II.

HENLEA: Œsophageal glands present.

1. Two pairs of œsophageal glands *H. ventriculosa.*
2. One pair of œsophageal glands in segment 7—
 - Three pairs of septal glands—
 - a. Dorsal vessel arises in 7–8—
 - * Salivary glands present *H. attenuata.*
 - ** Salivary glands absent *H. heterotropa.*
 - β. Dorsal vessel arises in 8 *H. nasuta.*

3. One pair of œsophageal glands in segment 8—
 a. Two pairs of septal glands *H. fridericioides*.
 β. Three pairs of septal glands—
 * Dorsal vessel arises in 8 *H. pusilla*.
 ** Dorsal vessel arises in 8-9—
 (1) Sperm-funnel about 2×1 *H. fragilis*.
 (2) Sperm-funnel about 4×1 *H. hibernica*.
 *** Dorsal vessel postclitellian *H. triloba*.
 γ. Four pairs of septal glands *H. quadrupla*.

As it is a great convenience to the student to have these facts presented in various ways, I append a numerical key as well:—

1	{	Œsophageal glands absent (<i>Henleanella</i>)	2
	{	Œsophageal glands present (<i>Henlea</i>)	15
2	{	Two pairs of septal glands	<i>H. mariona</i> .
	{	Three pairs of septal glands	3
	{	Four pairs of septal glands	<i>H. trisetosa</i> .
3	{	Setæ not exceeding five per set	4
	{	Setæ exceeding five per set	8
4	{	Dorsal vessel clitellian	5
	{	Dorsal vessel anteclitellian	7
5	{	Salivary glands absent	<i>H. marina</i> .
	{	Salivary glands present	6
6	{	Normal in type and position	<i>H. curiosa</i> .
	{	Abnormal in type and position	<i>H. alba</i> .
7	{	Sperm-funnel spindle-shaped	<i>H. tenella</i> .
	{	Sperm-funnel pear-shaped	<i>H. lampas</i> .
8	{	Two pairs of spermathecae	<i>H. puteana</i> .
	{	One pair of spermathecae	9
9	{	Duct of nephridia from posterior	10
	{	Duct of nephridia from anterior	11
10	{	Salivaries present	<i>H. rosai</i> .
	{	Salivaries absent	<i>H. parva</i> .
11	{	Salivaries present	12
	{	Salivaries absent	13
12	{	Slender or forked	<i>H. multispinosa</i> .
	{	Sac-like in segment 4-5	<i>H. minuta</i> .
	{	Unusual form of gland	<i>H. inusitata</i> .
	{	Normal type of salivary	<i>H. dicksoni</i> .
13	{	Dorsal vessel arises in 7-8	<i>H. glandulosa</i> .
	{	Dorsal vessel arises in 8-9	<i>H. arenicola</i> .
	{	Dorsal vessel arises in 9	14
	{	Dorsal vessel arises in 10-11	<i>H. minima</i> .
14	{	Length of the type 2-3 mm.	<i>H. perpusilla</i> .
	{	Length of the type 7-8 mm.	<i>H. rhætica</i> .

15	{ Two pairs of œsophageal glands	<i>H. ventriculosa.</i>
	{ One pair of œsophageal glands	16
16	{ Glands in segment 7	17
	{ Glands in segment 8	19
17	{ Dorsal vessel in 7-8	18
	{ Dorsal vessel in 8	<i>H. nasuta.</i>
18	{ Salivary glands present	<i>H. attenuata.</i>
	{ Salivary glands absent	<i>H. heterotropa.</i>
19	{ Two pairs septal glands	<i>H. fridericioides.</i>
	{ Three pairs septal glands	20
	{ Four pairs septal glands	<i>H. quadrupla.</i>
20	{ Dorsal vessel arises in 8	<i>H. pusilla.</i>
	{ Dorsal vessel arises in 8-9	21
	{ Dorsal vessel postclitellian	<i>H. triloba.</i>
21	{ Sperm-funnel about 2 × 1	<i>H. fragilis.</i>
	{ Sperm-funnel about 4 × 1	<i>H. hibernica.</i>

In conclusion, a few special features may be pointed out. *Henlea puteana* alone has two pairs of spermathecæ, and *H. ventriculosa* is the only known species with two pairs of œsophageal glands. *H. alba* and *H. inusitata* have abnormal glands, which may be œsophageal or salivary. In *H. fridericioides* and *H. mariona* there are only two pairs of septal glands, but one is a member of the Henlean group, the other belongs to *Henleanella*. In certain cases the dorsal vessel arises in or behind the girdle. At present *H. triloba* stands alone in this respect in the Henlean group. Some of the species have the duct of the nephridium arising near the septum, in others it is posterior, and in others it has a median origin. The spermathecæ present great variety, but they never have diverticula, as in *Fridericia*.

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A DIARY OF ORNITHOLOGICAL OBSERVATION MADE
IN ICELAND DURING JUNE AND JULY, 1912.

BY EDMUND SELOUS.

(Continued from p. 66.)

June 7th.—A loud and continuous clamour of Gulls obliges me to look out, when I see one of the Eagles mobbed by a crowd of them. What I have said in the last entry applies now, but the scene is more interesting, for the Gulls—always the same species—besides being more numerous, seem more indignant. Yet they appear to me to keep at a warier distance than yesterday, as though fear, for some reason, were more in the ascendant. As for the Eagle, he (for I think it is the male) is not deflected, in any great degree, from his path through the fields of air. There is no need that he should be; he can go where he will, for the Gulls, though they clamour and dash, always give way to him. Still, he seems annoyed and put out by the noisy, hostile troop. At length he comes down upon an accustomed promontory, and here the Gulls stoop at him, just as they used to at me in the Shetlands, when I sat down amidst their breeding haunts. They, however, give him a very wide berth. It is amusing to see them stretch down their legs, as though to flick his head with them (for their habits, in this respect, are the same as the Skuas') at a quite futile distance, before sweeping up again—not nearly so near, in fact, as several of them came to me. Still, some come nearer than others, and, for these, the sitting Eagle has a negligent upward turn of the head, with implied threat of beak, from which they mount, with a sudden discretion. He sits, thus insulted, till past 7, and then floats to another point, where I cannot see him, but his presence is still marked by the same cries and actions of the Gulls—for they are vociferous all the while. At length there comes silence, with neither Gulls nor Eagles to be seen, when,

sitting against a great rock, near the tent, as I make this entry, one of the latter passes me quite close, over the water, at about the same height as I sit, on flapping wings—flapping continuously, as a Rook flaps his—and, without appearing to notice me, flaps straight for a promontory, round which he disappears. “Oh, the difference of man and man”! and, no less, of Eagle and Eagle, or of the same Eagle, at different times. Flying like this, he looked no more than a large brown bird plodding—yes, *plodding* laboriously along—that ever I should write so of such a bird as he has been! This was at 7.30. From then till now, at 8.10, all is still, and not a sign of either of the Eagles. At 10, however, one of them goes off the eyrie, and again I notice the fallen manner of its flight, for instead of floating lightly and grandly, as before, this bird now—no longer an Eagle—gives a series of flaps with the wings, at short intervals, and only floats, or, rather, just holds itself up with them, for a few seconds, between each series. I cannot, at first, understand this sad change, but, all at once, it occurs to me that the wind has sunk since the early morning, and that it is now a dead calm. This then, evidently, is the explanation. Wind is necessary; not even an Eagle can float or soar in a motionless atmosphere. To do so, probably, on a morning like this, it would have to ascend into the upper air-currents, which is not now convenient for it. These lords of the winds, then, are reduced to flapping, on a calm day.

Almost as soon as the Eagle leaves her eyrie, she is pursued by Gulls—always the Black-backed kind, I have seen no others on the lake—and, perhaps to avoid them, settles on a favourite promontory of both the birds, and, unless it is the other of the pair, is still there when I re-enter the tent, about 11; but I cannot make out any bird on the nest. Towards 11.30 she flies off over the brow of the hill, and I then go to sleep till about 1 p.m. The nest is then still empty—whether it has been occupied for any time in the interval, I cannot, of course, say. At 2 or 2.30, the bird—it is always the same one, and the female—comes down by it, but it is only to fly off again. There is now a long, dreary interval—nothing is more dreary than sitting in a tent, and seeing nothing—till almost 5, when the Eagle floats grandly up (the wind has, for some time, been

rising, and is now at its highest), and goes quietly on to the eyrie. At 5.45, 6.35, 8.10, 9, and 9.40 she is still there. This watching from a tent, and being afraid to go outside it, is horrible confinement. In one short previous ramble, however, I had made the following observations.

On the summit of the cliffs, here, into which the first steep green slopes, rising almost from the shore, break, is a little green-peaked hillock, making the loftiest point hereabouts. Seated upon it, one seems to look directly down upon the waters of the lake, so that, still as they now are, one can see to the bottom of them, for some way out. A pair of Mergansers—the male in fine nuptial garb—are coasting along, and constantly diving for food. All their actions, in procuring this, can be followed, though in a shadowy way, through the glasses. They search the rocks, stones, boulders, with which the bottom of the lake is strewn, or rather covered, and whatever they get is evidently close to their surface. As they often go through the actions of pursuing something, the prey must be active—some kind of rock-fish perhaps. At other times they stop, and appear to be probing into chinks, crannies, &c., and, when they do this, they certainly have the appearance of sitting or crouching (as, before, they had, sometimes, of walking) on the rocks, for their bodies look as though flat upon them, and the way they sometimes move, then, for a moment or two, also gives this idea. Certainty upon the point, however, is hard to obtain, for they do not come in quite close to shore, but seem to prefer the water to be of a moderate depth. In the descent to the bottom the feet are alone used, as one can plainly see, the wings being pressed to the sides, whilst, in rising, the propelling power seems to be a matter of pure physics, for the bird presents every appearance of merely allowing itself to rise. However, it keeps itself in position, which must imply steering, for the ascent is always in a steep slant, never perpendicularly. The motion is continuous, without any jerking—a long glide up—and the idea gained, though it is difficult to see this, is that the legs trail behind, and play the part of a rudder, as with those birds—Penguins, Puffins, Razorbills, &c.—who habitually use them so, whilst swimming, with the wings, under water. These Mergansers dived and came up at what seemed very regular intervals, and it

may have been owing to this merely that the male seemed always to wait for the female to dive, and, shortly, to follow her. What is really waited for is, I believe, the requisite breathing space, so that, with this regularity, a pair would tend to precede or follow one another, according to which one had first gone down.

June 8th.—At about 4 a.m., when I look, I can see no bird on the nest. At 6.30 the head and yellow beak are plainly visible. At 7, and now, again, at 7.10, I do not see them.

About half an hour after this, I catch a glimpse of one of the Eagles on a projecting, rocky bastion of the cliffs, from which he appears to leap down, and I lose him. A little afterwards I see him, or the other one, flying across the lake. It is a perfectly still, calm morning, the sky everywhere obscured under a high-hanging canopy of white or grey clouds, yet still bright—the lake a dead calm. Accordingly, the Eagle, in crossing it, flaps quite heavily. He flies low; a Gull thinks it worth his while to follow and demonstrate against him.

A little while after this—towards 8 a.m.—there is a great noise and clamouring, and I catch a sight of both the Eagles on a distant, rocky headland, yet not so distant but that, a moment afterwards, the glasses give me a fine view of them. One of the two, which I judge to be the male, seems to be making all the clamour. He throws up his head in exactly the way that a Gull—say, a Great Black-backed Gull—does, and utters a series of cries which may be very fairly rendered in this way: “*Quee, quee, quee, quee—pudja, pudja, pudja, pudja, pudja*”—cries which I have heard, several times, during the early morning, without being able to affix them. The last of the two sounds has a guttural intonation, is strongly uttered, and really does bear a considerable resemblance to the word by which I have rendered it—to my own ears, at least. The “*quee*” which precedes it is that small, squeaking note which seems common to the birds of prey—Sparrow-Hawk, Kestrel, Buzzard, Merlin, &c., all have it. Of course the strength of the sound is greater here, conformably with the greater size of the bird—still, it is a thin and weak one, for that size. Here also “*quee*” (or “*ee*”) seems to me a fairly just rendering of the note. These cries of the Eagle seem to exasperate, make mad, the pair of little

Hawks or Falcons—Merlins, I take them to be—before-mentioned. They dash fiercely at the clamouring bird, coming down, like little, black, angry arrows, almost upon him, shooting up again, when just beyond his reach, wheeling and again shooting down. The Eagle, for his part, gets angry too. He bends his great bill against his small, would-be assailants, lunges up at them, as they descend, and even sometimes makes a jump, to meet them. The Merlins draw off, after a time, return, with fresh anger, upon a fresh vociferation, and then desist as if it was no use. A little afterwards the Eagles adjourn to a much nearer promontory, offering a flatter and more commodious space, and here they stand quite close together, preening themselves, and sometimes, perhaps, bestowing a touch with the beak on one another, but of this I cannot be sure. Their actions show affection, but seem to have no more special import. Before this, they have sat with a space of a few yards between them.

At 8.16 one of the pair flaps heavily up, and at once broods the eggs. At 9 the other Eagle flies past the nest, turns and flies back past it. He makes the squeaking note, as he passes, and, on coming down upon a grey spike of rock which I have sometimes mistaken for himself, indulges in the guttural "pudja." This Eagle is browner than the other one, the head less white, and the white not so far extended downwards. I take him to be the male and the younger of the two, yet the bill is much lighter, not of nearly so vivid a yellow. The body, but not the bill, of the female seems faded with age.

At 9.15 or thereabouts, on looking again through the window of the tent, I find that the sitting Eagle has joined her mate, and stands perched close beside him, on another spike of rock. Both birds, now, as I have the glasses upon them, throw up their heads, and clamour, together, in the way that the one has formerly done. Again it is a fine, wild sight, but the cries themselves are not of a grand-sounding or impressive character. The cry of the Great Black-backed Gull, when thus vociferating, has a wilder and more spirit-stirring ring in it. They, too, throw up their heads and shriek, together, in just the same way, presenting, then, so fine an appearance as accuses all who speak disrespectfully of this species—and there is none towards whom

greater licence of speech is commonly indulged in—as greatly wanting in poetic sensibility and appreciative perception. Never, hardly, is this handsome bird mentioned without a heated denunciation, which often takes the form of mere abuse—“brute,” “pest,” “nuisance,” and the like—but one might watch till one starved before one saw it do a millionth part of the harm that being able to see it does not more than a million times atone for, and it would be well if those who are most unrestrained in their epithets would pause, in the midst of them, and ask themselves this question—just this: Whether, over the whole British coast-line, there is any wild, rocky foreshore, any inlet, bay, islet, “stack,” “ness,” or green, rounded

. . . “Summit of the cliff
 - That beetles o'er his base into the sea,”

that could not better spare *their* presence than this bird's. As for the delinquencies urged against it, some are fabulous or take place at very long intervals, whilst others are artificial crimes, merely, and of no consequence whatever to humanity, looked at from a large point of view. But the high æsthetic pleasure which the sight of this, the largest and most imposing of our Sea-gulls, gives to all who are capable of feeling any, *is* of consequence to humanity—to humanity at large, the best part of humanity—and of very great consequence, too: it is a pleasure analogous to, and strongly enhancing, that which the landscape itself—which the very rocks and waves afford. Also there is the natural history, which belongs to every species and ceases with it. It is, for instance, more interesting and instructive to record what I have recorded of this mobbing by Gulls of an Eagle, than to get rid of the former out of mistaken sympathy for the latter, which is itself being got rid of still faster. I do not say that this is or is amongst the reasons brought forward for the persecution of this and others of our Gulls, but, if it were, it would be on a par with some that have been, and *ex uno disce omnes*.

After the Eagles have thus vociferated, they continue to sit together, each on its rocky spicula, for some time. They preen themselves, turn themselves this way and that, seeming, from time to time, to take an extended view of the blasted and Hades-like landscape around them. They are very close to one another, sometimes their heads seem almost touching, and one

might imagine them exchanging remarks. To watch them and think that they are really Eagles, living their life and unconscious of a human presence, is very pleasurable, but the cramped and constrained attitude which a small tent pitched on an uneven surface, and which persists in sagging down, alone permits of, makes it impossible to do so for long, continuously. To see is to be racked, and not to be racked is not to see, so, when I next look, the male Eagle is gone. The other, now sitting solitary on its crag, every now and then turning its head towards the lake below, is a fine sight. Suddenly, from the other side of the tent, where all is invisible—for it is pitched against a rock—there is a tremendous rushing sound. I have heard it before, under much the same circumstances, and if it was the stoop, upon prey, of the other Eagle, am sorry indeed to have missed the sight of it. I think it must have been, for it is just the grand and terror-causing sound that a pair of them made when stooping on some Rock-Doves in Cashmere, once—the latter, by the way, eluded every stoop with wonderful activity, looking each time—and no doubt quite truthfully—the very picture of terror. In this case, however, the stoop may have been on a fish, as before. Whatever it is, the sound, joined to the majestic figure on the rock, makes an effective whole, bringing Tennyson's lines on the Eagle strongly to my mind:—

“ He clasps the crag with crooked hands ;
Close to the sun, in lonely lands
Ring'd with the azure world, he stands.

“ The wrinkled sea beneath him crawls ;
He watches from his mountain walls,
And like a thunderbolt he falls.”

Great poets may see everything, without going afield, and the way they are baited by mere great clever men, with nothing of poetry about them, “is a heartbreaking.” (Tenez, Messieurs, . . . &c., car c'est à vous.)

After a little, the female Eagle leaves her place, her flight being followed (as is common both with great poets and Eagles) by the cries of Gulls. At 11.30 she returns to the nest, but has hardly settled herself on it when my walking-stick camp-stool, which I had used for supporting the constantly sinking-in roof of the tent, falls with a slight noise, and she goes off again. It

must, I suppose, have made a flash past the window, for she can hardly have heard the sound. This is a horrid nuisance.

At 2 p.m., as arranged, Sigurdsson and his brother come for me in the boat, and we get away by about 3. The Eagle has not come back again, but she has stayed away as long and longer before, and I think without my frightening her.

I will add a few remarks on the subject here touched upon—somewhat a painful one for me, as there is nothing I less like to do than to disturb injuriously, or at all, if I can help it, any bird that I watch. As the Eagles were incubating when I commenced my observations, but had presumably abandoned the eggs (which were never hatched) when I returned, in July, it would occur quite naturally to anyone (more particularly to anyone who had cherished designs on them)* that I was the cause of their desertion. I will, however, mention some points that seem to me to raise a doubt in regard to this, the benefit of which I should be glad to give myself. These points are as follows:—

(1) Sigurdsson felt sure that we should find the eggs hatched on our arrival, and supposing them to have been healthy ones, it may be assumed that they were, at least, in an advanced state of development. In such circumstances, the female bird would, ordinarily, sit very close, and not be easily driven away. This was so in the case of a pair of Merlins which I afterwards watched at much closer quarters, the female taking entire charge of the eggs, though I had abundant evidence that it was not fear which prevented the male from brooding them. The same rule also obtained with a pair of Sparrow-Hawks which I watched under conditions of perfect concealment.

(2) The boys I have spoken of were often about, in the neighbourhood of this eyrie, as also, presumably, the owner, or rather tenant, of the land on which it was, from time to time. The birds would, therefore, not be unaccustomed to people, nor do they appear to be particularly shy in Iceland. According to Sigurdsson they always build in the neighbourhood of human habitations or belongings, and not in the uninhabited wilds.

(3) If closely followed, the actions of the female Eagle do not seem very consistent with the theory that her frequent long

* See a note, in this connection, in the January number of 'British Birds,' p. 238.

absences from the nest were due to my presence, which I made as unobtrusive as I was able to. They were sometimes longer when I have every reason to suppose that she was quite unconcerned, and *vice versa*. Also, she showed no apprehension, but sat fast whilst three of us were putting up the tent. Assuming the eggs to have been addled, the conduct of the bird can be explained by supposing that she suspected or was becoming aware of this fact. Birds do become aware of it, and at last leave the eggs, in consequence, nor is there any evidence of the date when these were abandoned, or, indeed, that they were altogether abandoned a month or more afterwards, on my return, though I thought they were.

(4) The proprietor of the eyrie told Sigurdsson that the eggs of these Eagles were often addled (a fact which would be discovered by the daring purchaser on blowing them, or even before), that one could not say, from year to year, whether they would be or not, but that they were seldom good, two years running. This is a positive statement, and tallies with a similar one made to me, in regard to another pair, by a man who had exact knowledge of the facts, *viz.* that the eggs laid for six years in succession were infertile. In this case the female was thought to be very old, and from her greater hoariness, I may assume that the one in question was aged also. If I really caused the eggs to be abandoned, I am extremely sorry—I was vexed enough at the time—but I do not think this is likely in itself, and, in fact, I have given another explanation which must be held to be more than likely, since it is a known one. The tent was placed as far off as the conditions permitted—I would have preferred its being at twice or even three times the distance, but this was impossible without rounding a bend of the cliff which put the eyrie out of sight. It was, indeed, a bad place for observation. As I have said, the tent was (and daily and nightly I wished it wasn't) a "Mommery," of, I believe, the smallest size obtainable, made of green Willesden canvas, over which was a netting, in the meshes of which moss from round about was plentifully stuck. It was close against a great rock of cottage-like proportions, and I am tolerably sure that the birds did not mind it much in itself—the female most certainly did not. In conclusion, I may say that if I had not

bought the right of watching this eyrie, the eggs would, *as a certainty*, have been seized, and that, before leaving, I purchased for the birds, the right of bringing off their young, the following spring, should their eggs then prove fertile. No one, knowing this, can collect them, now, except through such dishonourable methods as must quite dim the lustre of the exploit.

June 9th. — After breakfast and another more substantial meal, close following it—for in Iceland they practise the food-cure—I start with Sigurdsson for the Swans. Above the third waterfall, the river widens into a small lake, and on an island not so small in proportion to it we see, as we approach, one of the pair—most probably the female—steadily engaged in incubation. As she sits, gleaming white, on the top of a great mass of brown, with her long neck upstretched, and the yellow of the bill brightly showing, it is impossible to help thinking what a splendid example of concealing coloration such a species must be, whenever a white mist conceals everything. Otherwise, however—and to-day it is otherwise—it would be hard to conceive anything more pleasingly conspicuous. It should be remembered, however, that in a country like Iceland white mists must be far from infrequent, even in the summer, whilst in winter they probably predominate, at which time their effect, in this connection, would be largely aided by snowstorms, but still more effectively, perhaps, by the bird leaving the country. In this last, we no doubt see an adaptation to particular circumstances of the same general law, since nothing is more salient than white, in the dark, and there is a good deal of mist, south of Iceland.

Just at present, however, there is no mist in Iceland itself, or, at any rate, not in this part of it, and so there, as a consequence, the Swan sits and gleams, and is, in fact, so very conspicuous that, without turning round and looking in the opposite direction, it is difficult to see any part of the landscape except in some sort of reference to this telling white spot on it. A Swan, in fact, thus fixed by her duties, becomes soon, to one's seeming through her whiteness and brightness, as the centre of a world that radiates out from her, and only through such a nucleus enjoys harmony and a proper relation of parts to the whole and one another. The principle of order, as also of love, in the

universe, seems concentrated in the breast—the “excellent white bosom”—of the sitting bird—to such an extent, indeed, that coming, any day, and perceiving her no longer on the nest (made empty both of her and hers, perhaps, by one who came not to observe, but to destroy),* the eye misses something which it in vain endeavours to do without, finding the landscape dreary and comfortless, without a heart, as it were, to beat in it. Doubtless the size of the Swan, added to her grace and comeliness, helps to produce this impression, which, fanciful as it may seem, I have felt myself very keenly, insomuch that I tried, once, to think it was concealing coloration only, and nothing else scientific, that made the bird (or rather the pair of them) thus suddenly, and ever afterwards, invisible—but it would not do.

Shortly after seeing us—and she sees us immediately—the Swan takes to the water. I am behind rising ground when she does so, but Sigurdsson calls to me, and, coming round the ridge, I see her upon it, whilst three out of four little fluffy-grey cygnets, who really have, now, a somewhat concealing coloration (which on principles not necessarily incompatible with its theory, since white mists may be more frequent than grey ones, they are shortly to lose), have followed her, one half-way to the edge, and the other two farther. The mother bird, as I take her to be, hangs about, near the bank, on the water, and utters, at intervals, a note which has very much the sound of “hoop, hoop,” whence, perhaps, as some might argue, comes the old English name of “Hooper Swan,” for it was originally spelt in this way. She certainly seems trying to call the young ones to her into the water, but they do not come, and this makes me think that they have not yet been into it.

We now set up the tent in a place where it is not visible from the island, but, before this is accomplished, I crawl to a good place of espial, and find the parent Swan sitting on the bank, with three of her cygnets under her, whilst the fourth still sits in the nest. I continue to watch after being left alone, and, after a time, the old Swan gets up and walks to the nest, which she ascends, and broods the one cygnet. The three others follow slowly and by short stages—toddling, as it were—and

* “*Collect*, the wise it call.”

one laboriously ascends the great mound, and disappears under its mother. After a little interval the other two follow, and now, at 2.15 p.m., the Swan is lying asleep, on the nest, with all four of them under her, her head pressed into the feathers of her back, as probably she was before our arrival, though, when I first saw her, she had her long neck upreared, the sign and token of her vigilance. All at once, I see the partner Swan—the male as I suppose him to be—out on the water. He floats idly upon it, looking very graceful—a wild grace, differing a good deal from that of our half-domestic species—and beautifully white. Gradually he goes in closer to the bank, which, before very long, he ascends, and lies down close to the water's edge, amidst some marigolds—that, at least, is what they look like—their gold and his silver making a pretty combination—for there is something silvery in the quality of the whiteness of Swans, both here and at home, whether real or imaginary, merely, I do not know, but always there is the suggestion.

Both parents lie asleep, now, in the warm sun, the female on her nest, and the male at some fifty yards' distance from it. The cygnets, presumably, are asleep too, under their mother's feather-bed; it is pleasant to see that there is no more fear or suspicion. This, however, returns shortly afterwards, for having tried, without success, to find a point from which I can obtain a different and nearer view of the Swans, I return to the old place, but find it impossible to place myself exactly where I was before. The birds, I suppose, catch a glimpse of my head, though it is hardly raised a foot above the ground; they seem slightly uneasy, and the male goes out upon the water again. However, as I keep quite still, with my back pressed against a slanting turf-bank, above which my head does not now rise, he soon ceases to be apprehensive, and begins to feed, after the known and noted manner of Swans, stretching down his neck in the water and throwing up his legs in the air. He continues thus feeding till about 5, when he returns to the bank again, and, standing in a shallow place, just off it, preens himself for some little time. He then swims along, close to the bank, till opposite the nest, stays there a little, as though talking to his partner upon it, then returns, and swims out into the lake again, where he feeds as before. At 6, or thereabouts, he comes

back to the bank, but soon swims out again, this time into the middle of the water, and much closer to me. Here he continues to feed strenuously, though from 12 o'clock, as a minimum, his wife and children have sat without bite or sup. At 7.30 p.m. I am so cold and hungry that I have to go to the tent, and this I do without alarming the feeding Swan, quite easily, though I have to pass in full view of him—I am soon out of sight of the other. The *modus operandi* is sufficiently simple, since he is always putting his head under water, and keeps it there, each time, for a minute.

(To be continued.)

NOTES AND QUERIES.

MAMMALIA.

The Hedgehog in the West of Scotland.—I am interested to hear that so long ago as 1877 Mr. Bolam saw a Hedgehog on the side of Ben Cruachan.* Of course, in treating of the species to the west of the watershed or backbone of Scotland in our volumes on the ‘Fauna of Scotland,’ Buckley and the present writer did not speak of it as a *decadent* or *disappearing species*, but on all occasions as of comparatively *new occurrence*, and as an advancing dispersal, dependent upon circumstantial changes in the features of the west, such as road-making and planting, and perhaps introductions. It is, therefore, not quite in keeping with the subject of dispersal to speak of the Hedgehog as “*still not uncommon*” in such and such a locality in the west. As regards the North-west Highlands, both Buckley and the present writer have had almost a lifetime experience, and in certain parts an almost yearly—and together—continuous residence, and I think what has been said in such of our volumes as treat of the areas to the west of the watershed, about the general scarcity of the animal in question, and its slow progress over the dividing ranges and advance only through certain defiles or lower lands, I say, I think what we have said fairly represents its *more recent dispersals*. These have been principally *recorded* by quite a limited number of avenues. This, however, in no way interferes with any earlier records which may be attainable since, as in the case of Mr. Bolam’s finding it on the slopes of Ben Cruachan in 1877, and the one on Loch Maree, between Kinlochewe and the Loch Maree Hotel, near to Talladale Bridge, in 1888. These two may certainly be entered as *Records*—the earliest I have from these passes through the backbone of Inverness, Ross, and Argyll; and both Buckley and I have had pretty continuous knowledge of a very large portion of the areas involved. Besides, we have, either in our possession or have examined, a very extensive series of Vermin Schedules from most of the large estates throughout the Counties of Argyll, Inverness, Ross, Sutherland, Cromarty, and Caithness, going back through many decades; so

* ‘Zoologist,’ *ante*, p. 75.

these matters can scarcely be said to have been neglected or "skipped over" as "common things," not "considered worth while putting into print." I can hardly admit that that "*blaine of burial*" can lie with us. We have always endeavoured to point out that, however interesting the history of extinct or dying species may prove to be, there is scarcely less interest in the progress of the living, and their dispersal, increase, and extension of range. The outcome of such records may not perhaps be so patent or useful at this present time *as they may become at some future date*. We have so often indicated the advisability of continuous recording where practicable that we do not care to "rub it in" further, as it had been complained we did so before! The following is a rough summary of actual records so far as I am aware:—

Sutherland and Caithness and West Cromarty: At date of 1888 we had had experience of that area, and especially of the western side of the watershed since 1865; and in square brackets or *Obs.* we said: "It is still unknown in the west, and, so far as is known to us, in all other parts of the counties"; and, "though pet specimens have been introduced, and have escaped, there is no evidence that they have established themselves in a wild state" ('Fauna of Sutherland,' &c., p. 71).

In Argyll, also, when we wrote in 1892, we do not appear to have possessed a single record of it in that area; so Mr. Bolam's, in 1877, takes long precedence, and admits it at least to the Loch Awe district.

In the North-west Highlands—in the volume on the fauna of which we bring Sutherlandshire, west of the watershed, down to date of issue—we still find it *absent* and *unrecorded* in Assynt or Edderachyllis. But at Loch Broom (West Rosshire) it "appeared in 1900 (probably imported in baled hay)"; auct. Sir Arthur Fowler, of Inonbroom's MS. Several were seen that same year, but none since, *till quite recently*, when—as I am informed by Mr. Alan A. Fowler—"it is *now* not uncommon, *i. e.* in 1912."

At Gareloch, North-west Rosshire, Mr. Osgood Mackenzie informed me: "The first seen was on 16th December, 1902." And now we have the earlier date, *further inland*, of 1888, from Mr. Bolam.

On the shores of Loch Eil, at date of 1904, we find it known on the authority of the landlord at 'Coopact Inn.' Then at Loch Moidart, right in the west and north side from Shiel Bridge and Loch Shiel, Mr. J. C. Stewart, of Kinloch Moidart, records the first

seen there by him, in July, 1912.* But two others were previously met with between Shiel Bridge and Doolin.

At Attadale, where Buckley had the sporting rights, and resided for more than one season, he had *no notes* of its occurrence there; but since he left Attadale, W. Hinxman collected evidence of several in 1894.

At Balmacana House *one* was seen, on the authority of Mr. Aira White, who was residing there, but it may have been an introduced example.

I would be glad to hear of any other actual records, *fully authenticated*, such as Mr. Bolam has supplied to 'The Zoologist' (*ante*, p. 75, *q. v.* I should perhaps mention in this connection that I do not refer to any localities to the east of the main watersheds or backbone of Scotland, though Mr. Bolam refers to such places as Glen Urquhart, Invernesshire.—J. A. HARVIE-BROWN (Dunipace House, Larbert, Stirlingshire, N.B.).

Since the above was written I have asked my friend Mr. Chas. H. Alston, who has resided for many years at the Pass of Brander, on the west shores of Loch Awe, Argyll, how many Hedgehogs he has *himself seen* in his neighbourhood. His reply is: "I have personally met with two or three here." He is informed, however, that "they are quite numerous on the other side of the Pass of Brander, at Hayfield" (*in lit. March 7th, 1913*). Hedgehogs are stated also to be plentiful at Innistrynich, on the east side of Loch Awe. Also, a middle-aged† native of Loch Etive side tells Mr. Alston that he has known them there "all his life"; also that he has known them washed up dead after a spate in the Orchy. "So," adds Mr. Alston, "so they are not a new arrival in Lorne—*so far as word-of-mouth evidence is of value.*" Quite so! but word-of-mouth evidence does not constitute what naturalists deem a *Record*—only a *guide* to further investigators, which it is not in the case of *rarer* animals *always* wise to divulge. As we are aware, some people have not yet got the fact into their heads that some animals may be actually increasing, and *are* doing so.—J. A. H.-B.

A Recent Capture of the Marten (*Mustela martes*) in Lincolnshire.—A few years ago I saw an example of this species in the

* Mr. Stewart has been resident and proprietor of Kinloch Moidart for many years, and is a keen sportsman, and observant of natural history occasions.

† In this connection readers please remember the date of Buckley and my writing the volume on "Argyll" was 1892—*twenty years ago*.

hands of a Lincoln taxidermist, but omitted at the time to record the occurrence. The specimen is now at the 'Crown Inn,' Glentham, near Lincoln, in the possession of Mr. G. H. Massam, who has informed me that the animal was a female changing from winter to summer dress, and was caught in Fenwood, in the parish of Caenby, on April 26th, 1905. This locality is not far from the ancient haunts of the Marten in Central Lincolnshire, where up to about 1875 it was a comparatively common animal. The last previous record known to me of a Marten captured in Lincolnshire is of one killed near Sleaford about the year 1888 (*cf.* Zool. 1893, p. 354), so it is probable that the species is now practically extinct in the county.—F. L. BLATHWAYT (Doddington Rectory, Lincoln).

A V E S.

Occurrence of the Stone-Curlew (*Ædicnemus scolopax*) in Co. Cork.—In the last week of February the first specimen of Stone-Curlew (or Great Plover) obtained in this county was sent by Sir Egerton Coghill from Castletownshend for preservation to Mr. Rohu, naturalist, of Grand Parade, Cork.—ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

Instance of a Black-tailed Godwit (*Limosa belgica*) Living in a Garden.—Some weeks ago, when walking through Ballybricken demesne and passing the garden-door, Mr. Lehane asked me in to see a strange bird he had wounded on the shore, which, being only slightly injured in the wing, he, not wishing to kill it, had let loose in the garden, and, as he had never seen a bird like it, wished me to examine and tell him its name. We entered the garden, and after some time looking about he saw it behind a bush, and, rushing forward, snapped it up before it could escape, and, bringing it to me, I was surprised to see the finest specimen of Black-tailed Godwit that I ever saw, in perfect plumage and in the finest condition of any wader that I ever handled, almost as fat and plump as a Partridge. Strange to say, the bird received no food of any kind save what it could pick up about the garden, and found sufficient water, I suppose, by sipping the rain and dewdrops off the cabbage and broccoli leaves. It had been living in the garden for three months, but had plenty of feeding ground to wander over, for the garden (fruit and vegetable) has an extent of between four and five acres.—ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

The Occurrence of a rare Arctic Visitor made known by a Falcon.—On Feb. 17th a man walked into the shop of Mr. Rohu, naturalist,

Grand Parade, Cork, with the remains of a Gull to show him, which proved on examination to be the wing, leg and foot, and part of the breast of a freshly killed specimen of an adult Ivory Gull (*Pagophila eburnea*). The man's story was "that as he was walking on the Marina [the embankment that separates the city park from the River Lee] he observed a large hawk on one of the trees that line the Marina, and when passing the hawk dropped something, and the man, going to see what it was, picked up the remains of the Gull, upon which evidently the Falcon was feeding." It was strange that from the hundreds of small Gulls nesting in the park the Falcon picked up this rare Arctic visitor. This is only the second specimen of Ivory Gull obtained in this county; the first was shot in Bantry Bay by the late Captain Newburgh in the winter of 1852, who presented the specimen to the late Dr. J. R. Harvey for his fine collection of Irish birds now in the possession of Queen's College, Cork.—ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

An Ornithological Primer.—These lines, composed by a famous ornithologist to teach some children the Orders of British Birds, have never before been printed:—

“*Passeres* are lark and linnet,
 Perching birds are mostly in it.
Picariæ now you must not pooh-pooh
 Woodpecker the Swift and Hoopoe.
 Then come *Striges*: all are Owls,
 These are Pallas's favourite fowls.
Accipitres: now what are they?
 Eagles, Kites and Birds of Prey.
Steganopodes on sea-crags,
 Gannets, Cormorants and Shags.
Herodiones next include
 The Spoonbill, Hern, and Bittern brood.
 With *Anseres* we hope to meet
 The Swans and Geese with webbed feet,
 And all the ducks from Teal to Wigeons.
Columbæ stands for Doves and Pigeons—
 Grouse and Partridge are *Gallinæ*:
 Pheasant with his breast so shiny,
 Gamebirds all and Quail so tiny—
 Some do *Fulicariæ* shoot:
 Crake and Rail and baldhead Coot.

Limicolæ wade on shores,
 Dunlins, Curlews: there are scores;
 Plovers, common Snipes and jacks
Œdiænemus; *Scolopax*.
 He who order *Gaviæ* learns,
 Rinks of Skuas, Gulls and Terns.
 Order *Alcæ* waddly walk,
 Puffin, Guillemot and Auk—
 But alas! we live too late
 To see the Auk they called 'the Great'—
Pygopodes don't forget,
 Grebes and Divers love the wet.
 Stormy Petrel: Mother Careys
 Ends the list with *Tubinæres*."

F. R.

 OBITUARY.

ADAM SEDGWICK.

THE world delights in personality, and British Zoology has lost perhaps its most interesting personality by the death of Professor Adam Sedgwick on Feb. 27th. He was born in 1854, and was a great-nephew of the geologist of the same name, who was professor in Cambridge from 1818 to 1873, and who was best known for his work on British Palæozoic Fossils, and for his trenchant attacks on the doctrine of Evolution. The family was a Yorkshire one, the uncle having been born at Dent, and the nephew having spent most of his early life there.

Adam Sedgwick, Jun., was educated at Marlborough College under Bradley, later Dean of Westminster, and Farrar, later Dean of Canterbury. He was designed for the medical profession, and entered King's College, London. In 1874 he came up to Trinity College, Cambridge, then the centre of Biological science in the University.

Michael Foster was at that time prælector in Physiology at the College, and he had already begun to attract around him that band of keen researchers who subsequently developed the Schools of Physiology, Zoology, and Botany at Cambridge. The late Prof. Bridge, also of Trinity College, was Demonstrator in Comparative Anatomy.

Francis Maitland Balfour was there, beginning those classical researches in Embryology, which were to give England the lead in this branch of science. The late Sir G. M. Humphrey was Professor of Anatomy, but his interests extended to every branch of Vertebrates, as his work on Comparative Myology and on the Origin of the Paired Fins amply testifies. Alfred Newton had comparatively recently been appointed Professor of Zoology; he was not a morphologist, but he had been through the evolution controversies, and was a charming and convincing exponent of Darwin's theories. About this time commenced the association of the University with Anton Dohrn's Zoological Station at Naples, which has continued unbroken to the present day.

Our undergraduate quickly fell under the influence of these men, but for him the greatest attraction was not their lectures, but the practical classes held in connection with every course of lectures delivered by the younger teachers. To convince himself he required to see every fact which he was taught. In Foster's practical course on embryology he saw the recapitulation of supposed ancestral stages in many vertebrate animals, and this gave such substance and definiteness to his ideas of evolution that he decided to throw in his lot with pure science. He recalled with warm appreciation the first course of lectures delivered by Gaskell, and this pleasant recollection was never effaced by his disagreement with him on the thorny question of the origin of vertebrates.

Sedgwick had most joyous recollections of his undergraduate days, numbering among his friends several of the present leaders in the different branches of biology. The late Prof. Milnes-Marshall he saw frequently, and among his happiest memories were the times he spent with Dr. A. S. Lea, the biochemist, both in Trinity and in their annual camp in the Fens.

Sedgwick took his degree with the highest honours in 1877, and at once threw himself into embryological research. He was intimate with F. M. Balfour, for whom he conceived an affection almost dog-like in its devotion. He soon became acquainted with the late Prof. Moseley, of Oxford, and Sir E. Ray Lankester, for whose work he had the greatest admiration. His first work was done in collaboration with Balfour, showing the existence of a head-kidney in the embryo chick, and the connection in development between the Müllerian and Wolffian ducts, ending with the discussion of the homologies of the excretory system in Vertebrates. This he followed up by three further papers on the development and homologies of

various parts of the same system in the chick, to which little has been added subsequently, in spite of the enormous improvements in technique since those days.

In 1880 Sedgwick was elected to a Fellowship at Trinity. He was still working in Balfour's little laboratory, among his comrades being the late Prof. Mitsukuri, Walter Heape, and Prof. S. J. Hickson. He was also demonstrating to Balfour's rapidly growing classes. An interesting and beautifully complete research was his account of the elaborate kidney of *Chiton*, practically unknown before.

In 1882 the University created an extraordinary Professorship in Animal Morphology for F. M. Balfour, but the post became vacant in the same year owing to his untimely death in the Alps. The young school seemed in danger of extinction, but fortunately the University trusted Sedgwick, for whom Trinity created a College Lecturership, really a special contribution from the College towards the needs of the University. A laboratory was at that time being built for the practical teaching of Zoology, but a change in the medical curriculum necessitated an enlargement, so that in 1884 the roof of a neighbouring building was bodily lifted by the Engineering Department of the University, giving a room capable of holding upwards of one hundred students, though the actual classes at that time only numbered about fifty. In the same year the University created a Lecturership in Animal Morphology for Sedgwick, which in 1890 was changed to a Readership. The Department was thus recognized as autonomous, and it continued in the same position, until it became merged in the Department of Zoology in 1907, when Sedgwick succeeded Professor Newton in the Chair of Zoology and Comparative Anatomy.

Sedgwick's position in 1882 was a difficult one. He was called upon to succeed one of the most brilliant and charming personalities that the science of zoology has known. He was of the same standing as his demonstrators, and he was little older than his students. He was called upon to teach, and subsequently to act as counsellor to, students in all branches of morphology, while his own attention had been almost exclusively devoted to vertebrate embryology. Miss Alice Johnson worked (largely in conjunction with Dr. Gadow) on the development of the vertebrate skeleton, W. Bateson on *Balanoglossus*, the late Prof. W. F. R. Weldon on vertebrate embryology and *Dinophilus*, F. G. Heathcote on *Myriopoda*, and A. E. Shipley on the Lamprey and *Gephyrea*. S. F. Harmer began that long series of researches which have so greatly clarified our ideas on the *Polyzoa*. Caldwell, in conjunction with Threlfall, was then perfecting

the first automatic microtome, but later he was sent to Australia, where he discovered the egg-laying of the Monotremes. Heape was concerned with the early stages of mammalian development, and Hickson, who soon largely took charge of the advanced teaching, was actively interested in the Alcyonaria, and made his discovery of the medusæ of Millepora.

In the midst of such activities Sedgwick's own work necessarily suffered, but his published papers show that he was thinking deeply about the origin of metameric segmentation, and of the central canal of the nervous system of Vertebrates. Balfour and Moseley had both been interested in *Peripatus*, and in 1883 Sedgwick went to the Cape, from which he brought back over three hundred live specimens. His subsequent 'Monograph on the Development of *Peripatus capensis*' obtained for him election into the Royal Society. It is a classical work, and a model of how such a research should be carried out and presented. It showed the relationship of Arthropoda to Annelida, now expressed in the use of the phylum-name Appendiculata. It suggested important considerations as to the origination of the Metazoa from the Protozoa, and of the Triploblastica from the Actinozoa. It clarified the whole question of the morphology of the body cavity, cœlom and hæmocœle in all higher animals. 'A Monograph of the Species and Distribution of the Genus *Peripatus*' followed, while W. L. Sclater, Miss Lilian Sheldon, and A. Willey at different times worked in Sedgwick's laboratory on the development of species from South America, New Zealand, and New Britain. His own last thoughts on the group were only published in 1908 in a paper on its distribution and classification.

The growth of Sedgwick's department at Cambridge and of his broader zoological activities allowed him little subsequent leisure for detailed researches. He twice served on the Council of the Royal Society, and sat for many years on its zoological committees. He was associated with Lankester in the production of the 'Quarterly Journal of Microscopical Science.' He was President of the Zoological Section of the British Association at Dover, and he was consulted not only by his old pupils (with the zoological work of all of whom he kept closely in touch), but by zoologists all over the world.

Occasionally he was stimulated to break out on some question on which he thought zoology in general was going astray. In 1894 he published his views on 'The Significance of Ancestral Rudiments in Embryonic Development,' and at the meeting of the International

Zoological Congress in 1898 he felt compelled to confess his disappointment at the results of embryology in elucidating the question of the origin of species. This speech, coming from the favourite pupil and the successor of Balfour, will probably be found to have had a far wider influence on biological research than has generally been supposed; the younger generation was stimulated to put out tentacles into fresh and little considered avenues, while the elder no longer tried to restrict but rather to encourage them.

Sedgwick's attack "On the Inadequacy of the Cell Theory," and his subsequent reply to his critic, now Prof. G. C. Bourne, met with little favour at the time. He would have nothing to do with that form of the theory which regarded the body of higher animals as a cell-republic, the real vital units being the cells. The writer heard his critics of every nationality at the International Congress of 1898, and no terms of disapproval were too strong for them. He was simply before his time, for the subsequent work of a young band of researchers in developmental mechanics has gone far to confirm his conclusions. He intended to enter the active field of research in support of his views, but he gave up these ideas, as he got no sympathy from those for whom he cared.

In 1884, impelled by a sense of duty to the needs of English-speaking students, he published (with the assistance of F. G. Heathcote) an English translation of Claus' text-book, and in 1896, with the same motive, he resigned active research in order to devote ten years of his life to a further text-book. The result is to be seen in the three volumes that have been published, the largest and most comprehensive English text-book on the subject, and a monument to the author's individual industry. His idea was to give a reasoned narrative about each group, and to make his book at the same time a work of reference by adding some account of each family and genus. Such a scheme was found to be beyond the effort of a single individual, and J. J. Lister and A. E. Shipley were called upon to write that part which relates to the Crustacea, Arachnida, and Insects. The whole was to be completed by a volume on the more philosophical and theoretical parts of the subject, but the exhaustion entailed by Sedgwick's ten years' (1897-1907) tenure of a Tutorship of Trinity in addition to his University work made him disinclined to commence. He actually sketched out a scheme, but he felt that many authors must be concerned, and he dreaded collaboration.

Sedgwick's tenure of the Professorship at Cambridge was too short for him to make any marked changes in the teaching. He was

far from well, and he got leave of absence from Cambridge in the Easter Term of 1909 for a prolonged tour round Continental centres of zoology. Then he was persuaded to accept the Chair of Zoology at the Imperial College of Science and Technology. He thought it a duty to his science and to the Empire, but it was a bitter wrench to him to leave his friends and take up life afresh.

The task of creating a department concerned with the economic developments of zoology was not really one after Sedgwick's own heart. He clearly recognized that only the highest possible scientific training, combined with considerably more than average intelligence, is likely to produce capable economic zoologists. He desired to provide advanced economic courses of instruction, which might be used by the graduates of all universities, but he found himself compelled to provide the preliminary adequate scientific training also, thus arousing considerable opposition. He found an admirable coadjutor in his former demonstrator, E. W. MacBride, who gave up his Chair at Montreal to serve under his old master. C. C. Dobell accompanied him from Trinity College as Lecturer on Protozoology, while additional special courses were instituted in Embryology under R. Assheton, Fisheries under Dr. Allen, and Entomology. The last resulted, in 1912, in the foundation of a Professorship of Entomology, the second in the Empire, to which H. M. Lefroy was appointed. Sedgwick whole-heartedly gave the last years of his life to the Imperial College, a foundation to be judged some day by its results. The writer believes that Sedgwick's work in this connection will endure to the advantage of the nation, of the science he loved, and also of kindred institutions.

As a lecturer, Sedgwick was handicapped by a somewhat halting delivery, in strong contrast to the simple vigour and directness of his subject-matter, which was easily understood and appreciated. He showed a delightful sympathy and absence of constraint when dealing with his students; in relation to his staff, he was in theory an autocrat, but in practice a socialist. He believed that a department should be staffed by men, each one of whom should be researching on a different branch of the science. He was curiously averse to the encroachment of the devotees of one biological science on another, but he always recognized that a time would come when all biology would have to be considered as one science—when the debateable border-lines between zoology, physiology, and biochemistry would become the most happy hunting grounds for the combination of researchers from each. Meantime, possibly his very loyalty to the

claims of his own subject blinded him to the present possibilities of *rapprochement* with others.

In 1892, Adam Sedgwick married Miss Laura Robinson, daughter of Captain Robinson, of Armagh, by whom he had two sons and a daughter. All survive him, his elder son being a Foundation Scholar of Trinity College.

Of the man himself, a friend can scarcely write dispassionately. His attachment to the memory of Balfour was beautiful. Sedgwick himself had a like gift of inspiring affection which he always reciprocated. He spoke only of the good in his friends, and he felt deeply any change in his relationship to them. He had a quick, vivid, bright personality and a directness and simplicity, infinitely charming. He delighted in bold and comprehensive theories of life and conduct, which were generally right though paradoxical. He was hot-tempered himself, and therefore tolerant of the same trait in others. This impulsiveness of temper and his many eccentricities only served to endear him to his friends, but made it difficult for others to understand him, whose generosity and lovable qualities were often hidden beneath a brusque and somewhat intolerant manner. His failings were, indeed, all upon the surface, and those of us who came into close contact with him are alone qualified to speak of the essential warm-heartedness and candour which made this friend unreplaceable and unforgettable.

J. STANLEY GARDINER.

EDITORIAL GLEANINGS.

NATURE RESERVES.

FORMATION OF A NEW SOCIETY.

IN his recent address to the Zoological Section of the British Association at Dundee, Dr. Chalmers Mitchell made a strong appeal for the organized preservation of the world's fauna. "It is only by the deliberate and conscious interference of man," he said, "that the evil wrought by man has been arrested"; and, again, "Each generation is the guardian of the existing resources of the world; it has come into a great inheritance, but only as a trustee"—a trustee, that is to say, for generations that are to be. That the larger wild creatures are steadily disappearing from the face of the earth with the advance of civilization needs little demonstration. But coincidentally with the wholesale extermination of mammals there is in progress a no less disastrous process of destruction among the lesser creatures—birds, fishes, reptiles, insects, and plants—also of geological remains, and in almost every case this is the result of "the deliberate and conscious interference of man."

To arrest this destructive tendency serious consideration is being given to the subject in many countries. There exist in the United States "reserves" for the vanishing human races; in Norway, Sweden, and North Russia, the Lapps are efficiently protected; in Africa and New Zealand, as elsewhere in the British Dominions beyond the seas, large tracts of land have been fenced off, and laws enacted to prevent the traffic in alcohol and other goods harmful to the primitive races.

THE SOCIETY FOR THE PROMOTION OF NATURE RESERVES.

Elsewhere the duty of maintaining particular phases of human life and of preserving natural objects is recognized and performed by the community as a whole, acting through the State; but in the United Kingdom it has been left to private enterprise and private munificence to establish and finance such refuges and nature reserves as we actually possess. Something has been attempted, it is true, to check the wanton destruction of animal life, by various Acts of Parliament, the arrangement of "close" seasons, sanctuaries, &c.,

and in the National Trust we have a body equipped with the necessary authority to take over and safeguard such gifts of land as may be made by public enterprise or private liberality. Much has already been accomplished in this direction by certain societies and individuals; but all students and lovers of Nature generally are now invited to combine in support of the Society for the Promotion of Nature Reserves.

This society has recently been formed with the following objects:—

1. To collect and collate information as to areas of land in the United Kingdom which retain their primitive conditions and contain rare and local species liable to extinction owing to building, drainage, and disafforestation, or in consequence of the cupidity of collectors. All such information to be treated as strictly confidential.

2. To prepare a scheme showing which areas should be secured.

3. To obtain these areas and hand them over to the National Trust under such conditions as may be necessary.

4. To preserve for posterity as a national possession some part at least of our native land, its fauna, flora, and geological features.

5. To encourage the love of Nature, and to educate public opinion to a better knowledge of the value of Nature study.

The society exacts no subscription; members are formally elected by invitation of the Executive Committee (marked with * below), and all interested are invited to communicate with the secretaries. The control of the society's affairs is in the hands of a representative council consisting at present of the following:—

President, the Right Hon. J. W. Lowther, M.P. Dr. I. Bayley Balfour, F.R.S., Sir Edward H. Busk, Sir Francis Darwin, F.R.S., Dr. F. D. Drewitt, *G. Claridge Druce, Professor J. Bretland Farmer, F.R.S., L. Fletcher, F.R.S., the Right Hon. Sir Edward Grey, Bt., K.G., M.P., the Right Hon. L. V. Harcourt, M.P., *Sir Robert Hunter, K.C.B., Lord Lucas, *E. G. B. Meade-Waldo, *the Hon. E. S. Montagu, M.P., the Earl of Plymouth, C.B., Professor E. B. Poulton, F.R.S., Sir David Prain, F.R.S., *the Hon. N. C. Rothschild, *W. H. St. Quintin, Dr. R. F. Scharff, W. M. Webb. *Ex-officio*: Hon. Treasurer, *C. E. Fagan, I.S.O.; Hon. Secretaries, *W. R. Ogilvie-Grant and *the Hon. F. R. Henley.

The Trustees of the British Museum have kindly given permission to the committee to use the Natural History Museum, Cromwell Road, London, S.W., as the temporary address of the society.

To carry out the objects of the society prompt action must be taken, for year by year suitable areas become fewer; and local plants and insects are found to have been extirpated when the acquisition of a few acres of land would have saved them. Such land is often unsuitable for other purposes; an isolated spot on Government property, a piece of marshland, a bird-haunted cliff, or a stretch of wood and copse where the undergrowth has been allowed to follow its own devices are admirable subjects for Nature reserves. Above all, it is essential that the land selected or reserved should as far as possible retain its primitive wildness. Such lands still exist in the United Kingdom, though each year they become more rare, and once deprived of their indigenous occupants they can never be restored to a natural state. It should be borne in mind, that if in the course of time, owing to the growth of a city, or for some other reason, a nature reserve has ceased to serve its purpose, the ground would still be valuable as an open space.

FOREIGN NATURE RESERVES.

On the Continent, as already observed, the importance of nature reserves has been widely recognized. In Germany, particularly, a large amount of land has been reclaimed, and in a recently published book, Herr H. Conwentz, Prussian State Commissioner for the Care of Natural Monuments, gives a detailed account of the work done in several States of the Empire. Bavaria, more than a hundred years ago, bought up the Bamberg suburban woods, afterwards forbidding indiscriminate forestry, and ordering the foresters to preserve and catalogue the chief natural features. Later, a general committee composed of delegates from the municipality and from local and artistic societies have been exceptionally successful in securing wild "parks" for rare plants. In Hessen and Oldenburg special attention has been paid to the preservation of primeval forest land; while in the first years of the new century Prussia began to recognize the necessity of protecting nature reserves, and these have since been regularly registered and mapped, Parliament, the Educational Department, and the Department of Agriculture and Domains acting conjointly to assist the movement. Thus, Memmert, an uninhabited island between Juist and Borkum in the German Ocean, is now reserved as a bird sanctuary, with a watcher to look after it during the breeding season; and a tract of salt marsh near Artern perpetuates the plant association of the locality. Elsewhere spots especially favoured by wild nature have been similarly secured; for

example, the Prussian Government, the local authorities and societies, and private individuals have all co-operated to secure the forest district of Chorin, near Berlin, including fenland and a small lake, also a tract of forest in the Hartz Mountains. Saxony has followed this example. In Holland, the Naardermeer, in the south of the Zuider Zee, with its rich avifauna, is now effectively isolated, while in Sweden immense stretches of country in the far north and elsewhere have been closed to the collector, not before it was necessary. It is common knowledge that before the reservation of the magnificent Lapland country round the *Torneå Träsk*, and simultaneously with the opening of the Baltic-Atlantic railway, the district was ruthlessly over-collected by dealers and others; in one summer a single individual is credited with the removal of 10,000 plants. In Hungary there are several reserved areas; one of them at Puszta-Pészer, in the Pest Comitatus. In France good work has been done by the Forest Board in the protection of undergrowth and by some local prohibitions in the departments of Isère and Savoie on behalf of a few Alpine plants. Much the same may be said of Switzerland, where a few Cantons have issued edicts against the destruction of edelweiss and other "threatened" flowers. In Belgium, though at present little has been done officially in the way of protection, the Royal Botanical Society has completed an admirable survey of desirable natural sites ("Pour la Protection de la Nature en Belgique." Jean Massart, 1912), and this work has aroused general public interest.

In the United States, where it is obvious that the conditions are entirely different as far as the acquisition of primitive land is concerned, the system of "National Parks" has been inaugurated, but unfortunately too late to save a large part of the indigenous fauna. Canada, Australia, New Zealand, and South Africa have set the Mother Country a splendid example of what can be done in this direction. In England, where space is limited and the population numerous, a beginning has been made by the acquisition for the nation of a part of Wicken Fen, in Cambridgeshire, the shingle and salt-marshes of Blakeney, in Norfolk, and the "Ruskin Reserve" near Oxford: all these retain their primitive character. Much more remains to be done, and it is hoped that the "Society for the Promotion of Nature Reserves" will meet with wide and sympathetic support.—(Reprinted from the 'Times'.)

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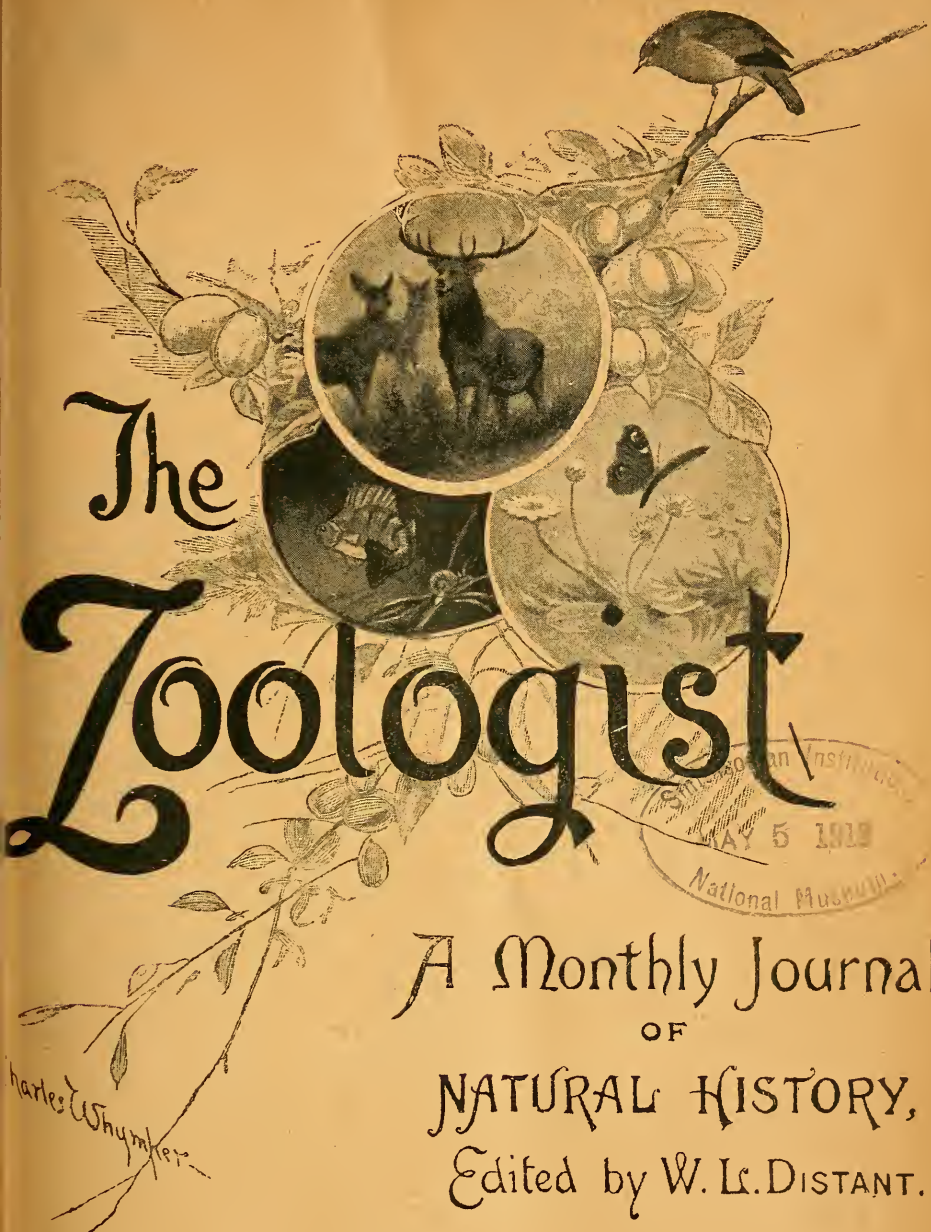
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THE ZOOLOGIST

No. 862.—April 15th, 1913.

NATURAL HISTORY BUREAU RECORDS, 1912.

(CORPORATION MUSEUM, TULLIE HOUSE, CARLISLE.)

BY LINNÆUS E. HOPE & D. LOSH THORPE.

THE early days of 1912 were characterized by mild unseasonable weather. There was a short exception early in February, when 27° Fahr. was registered at Carlisle. This spell of frost brought quantities of wildfowl on to the Solway, and was responsible for the records of Smew on the Eden, and of Little Auk and Great Northern Diver on the Solway. The spring and summer which followed could scarcely be dignified by those terms; the rainfall was the greatest and the sunshine the least within living memory.

There did not, however, appear to be much noticeable diminution in the numbers of our avian summer visitors, except perhaps the Swallow and House-Martin, which species are perhaps more readily noticed than those birds which frequent more rural areas.

We should like observers to pay particular attention to the approximate numbers of any particular species in their district, and record the numbers as near as possible. Such records may have great scientific value.

We are glad to be able to record the first definitely authenticated instance of the breeding of the Turtle-Dove in Cumberland, near Carlisle, in June, 1912. On June 20th the nest contained one young bird and one addled egg. After the nestling

flew, the addled egg and the nest were presented to the Carlisle Museum.

Some curious nesting-sites are again recorded, the strangest being that of a Thrush, which built its nest on the steam-pipe of the brake-gear beneath a North British Railway passenger coach whilst standing during the strike at Edinburgh in April. After the strike ended, the coach left Edinburgh at 6 p.m. on April 13th, and arrived at Carlisle at 8.42 p.m. with nest and eggs intact. Several nests of Blackbird and Song-Thrush were situated on the rain-water pipes and gutters of houses, and at Belle Vue Mr. Dawson had a pair of Robins nesting in an outhouse, which chose for their first nest an old saucepan hanging against the wall, and for their second brood utilised a watering-can hanging in the same shed.

Dr. Chalmers Mitchell's address on the protection of animals to the British Association for the Advancement of Science, at Dundee, in 1912, has borne fruit in the shape of a "Nature Reserve Association"; it has a good work before it, and we wish it every success.

In Carlisle, however, we had already taken a step in this direction, and had secured Kingmoor Common as a "Nature Reserve." This piece of common land has long been noted by Carlisle botanists, entomologists, and ornithologists as a rich primeval tract. In recent years, however, the common has been less productive owing to partial cultivation. It has now been handed to the Museum Committee by the Corporation, and a number of Wardens have been appointed to take charge of it.

An Association has been formed under the name of the "Cumberland Nature Reserve Association," which will administer and protect the "Kingmoor Nature Reserve," and probably others in the county, if opportunity arises.

The Roedeer still maintains a precarious existence in the woods of North Cumberland, and the Badger yet exists in the same area. Reports reach us now and then of these persecuted animals. During the summer of 1912 a Badger was trapped by a rabbit-catcher in the Eden Valley, and one was reported to have attacked a sheep-dog at Cumwhinton.

The Grayling was introduced into the River Eden, in its upper reaches, about twenty years ago. It has now spread

almost the entire length of the river, and is frequently taken at Carlisle. We examined one caught at Carlisle on April 23rd, 1912; it weighed just over 7 oz.

SOUTHERN LAKELAND NOTES FOR 1912. BY ERIC B. DUNLOP.

During the spell of frost at the end of January and beginning of February a number of unusual avian visitors were noted on Lake Windermere. On Feb. 5th I saw a Red-necked Grebe in full winter plumage; several Divers were also noted—I think both Red-throated and Black-throated species were represented. In addition, six Sheld-drakes were seen.

On February 15th a party of four Great-crested Grebes was recorded from the same lake, and an Oystercatcher was seen a few days later by the same observer. A Great-crested Grebe was recorded, in the local Press, as being shot at Milnthorpe towards the end of the month.

On March 30th I found that a Peregrine Falcon had already laid; this is a very early date.

It may be of interest to give the numbers of eggs in clutches of Ravens noted in 1912. I either examined myself or had reliable information concerning eight nests. In two cases only two eggs were deposited; in one, three; in two, four (one of these was a second laying); and in the remaining three instances the clutch consisted of six eggs.

The most interesting record of a mammal is that of a Whiskered Bat that was taken at Windermere on April 22nd.

If any further demonstration were needed of the invaluable services rendered by the Barn-Owl, it is surely given in the case of a nest of this species which I examined on the evening of June 15th. It contained three young Owls. When first examined the following remarkable collection was spread out near the young birds:—Ten Short-tailed Field-Voles, eight Long-tailed Field-Mice, and three Common Shrews; later the same evening the birds had taken three Short-tailed Field-Voles and a Long-tailed Field-Mouse; a total of twenty-five head.

On Aug. 5th two Black Terns were seen on Windermere by a reliable observer who is well acquainted with the species. At this time numerous Common Terns were frequenting the lake.

With regard to game-birds in southern Lakeland, the young

of both Partridge and Blackgame suffered severely from the wet weather, the former being very much reduced in numbers. Both Grouse and Pheasants did well, having evidently gained sufficient strength to withstand the wet which decimated the younger Partridges. Grouse were very numerous, strong, and wild at the commencement of the season.

Appended is a selection of the notes and records sent in to the Bureau:—

1912.

January 7th.—Blackbirds and Song-Thrushes in full song; first heard four weeks ago. Very mild weather (D. Losh Thorpe).

26th.—Little Auk shot at Rockliffe by Mr. Waller (D. Losh Thorpe).

February 1st. — Smew, young male shot at Grinsdale (Wm. Johnstone).

2nd.—Great Northern Diver (a young bird), Rockliffe (J. Edgar).

5th.—Five Cormorants flew over Stanwix, going up river to feeding place on the Eden (L. E. Hope).

21st.—Sclavonian Grebe shot at Skinburness (W. Nichol).

28th.—First Curlews passing over Troutbeck, Windermere (Eric B. Dunlop).

March 5th.—Nest of Song-Thrush with three eggs in Carlisle Cemetery; first egg laid on March 3rd. Several others building (J. T. Charlton).

9th.—Grey Wagtails have returned to upland haunts (Eric B. Dunlop).

29th.—Ring-Ouzel in Cumberland (Eric B. Dunlop).

April 4th.—Two House-Martins seen near Etterby Scaur; a fine, warm, spring day (D. Losh Thorpe).

8th.—Wheatear seen at Silloth (J. C. Dove).

13th.—House-Martin (one), Swallow (one), seen at Silloth, apparently just arriving (J. C. Dove). Nest of Song-Thrush on brake-gear of a railway carriage arrived in Carlisle from Edinburgh (H. Widdowson).

14th.—Saw a Stonechat at Todhills, near Carlisle (J. B. Cairns). First Swallow seen at Kentmere, Westmorland (Eric B. Dunlop). Swallow seen at Stanwix, Carlisle (J. C. Dove).

15th.—Large number of Bernacle and Grey Lag Geese on

Long Newton Marsh, Solway (W. Nichol). A Starling in my dovecote is imitating the notes of a Nightingale, which is in full song in my aviary at Loshville (D. Losh Thorpe).

16th.—Saw and heard Wood-Warbler at Harker, Carlisle (J. B. Cairns).

20th.—Willow-Warbler and Sand-Martin seen at Gretna (W. H. Little).

21st.—Common Sandpiper seen in the Lake District (Eric B. Dunlop). Swallows, Sand-Martins, and House-Martins seen at Wetheral (W. H. Little). Corn-Crake heard at Belle Vue, Carlisle (Fletcher Ritson).

23rd.—Corn-Crake heard at Knowefield, Carlisle (J. J. Grieve). Cuckoo heard at Keswick (J. Kirkbride).

24th.—A male Redstart singing, Troutbeck, Windermere (Eric B. Dunlop). Corn-Crake and Cuckoo heard at Gretna (W. H. Little).

25th.—Wood-Warbler singing, Lake District (Eric B. Dunlop). Corn-Crake at Carlisle (W. S. Marchington).

26th.—Cuckoo heard, House-Martin seen, Pied Flycatcher reported, Lake District (Eric B. Dunlop).

May 4th.—Yellow Wagtail seen, Lake District (Eric B. Dunlop). Pair of Yellow Wagtails seen at Tebay (W. N. Donald).

5th.—Three Swifts seen at Carlisle (H. H. Hodgkinson). Four Swifts seen at Rickerby, Carlisle (W. H. Little). Corn-Crake heard at Stainton, Carlisle (W. B. Redmayne).

6th.—Many Swifts seen in Bowness Bay, Windermere, where they have been for some days (Eric B. Dunlop).

7th.—Swifts seen at Keswick (J. Kirkbride).

9th.—Corn-Crake heard, Lake District (Eric B. Dunlop). Heard Blackcap Warbler and saw Orange-tip butterfly on the wing at Todhills, near Carlisle (J. B. Cairns). Corn-Crake heard at Grey Moor Hill, Carlisle (W. N. Donald). Wild Geese seen on Rockcliffe Marsh (W. N. Donald).

10th.—Swift seen at Etterby Scour, Carlisle (W. N. Donald). Heard Nightjar at Rockcliffe, Carlisle (J. B. Cairns).

12th.—Spotted Flycatcher seen, Lake District (Eric B. Dunlop).

20th.—Saw Tree-Sparrow at Rickerby Park, Carlisle (J. B. Cairns).

June 16th.—Redstart's nest in crevice of cliff overhanging the Cambeck. Watched male and female Pied Flycatchers entering nesting-hole in tree-trunk by stream. Nest contains young birds. Old birds very confiding and active. Another pair endeavoured to enter hole when owners were away. Snipe "drumming." Roedeer doe observed. Party of light-coloured Grouse, young just able to fly, at Walton Moss. Tree-Pipit's nest and eggs (J. M. Charlton).

17th.—Wood-Warblers very numerous up River Gelt. Garden-Warbler feeding young. Woodcock rose heavily from swampy ground and flew to bank, where it half fell. A young bird seen distinctly between its legs. Three other chicks found whence it rose, near Brampton, Cumberland (J. M. Charlton).

19th.—Wood-Warbler's nest with four young. Sandpiper with two young. Lesser Redpoll, four young. Dipper, five young, River Lyne, Cumberland (J. M. Charlton).

20th.—Turtle-Dove nesting near Carlisle (J. B. Cairns). Pied Flycatcher's young out of nest. Found two young Oystercatchers, just hatched, among shingle by River Irthing, Cumberland (J. M. Charlton).

21st.—Redstarts very numerous this year (J. M. Charlton).

22nd.—Woodcock seen to carry almost fledged young one when startled. Saw Roedeer fawn in pine wood. Despite the efforts of the landowner to exterminate them (almost successful two or three years ago, when a doe and fawn were shot), these animals, I am glad to see, breed here almost every year now. Grey Wagtail with young, Cumberland (J. M. Charlton).

23rd.—Tree-Sparrow with fully fledged young. They seem to breed in some numbers in the Irthing Valley, in the hollow trunks of willows and oaks (J. M. Charlton).

24th.—Young Oystercatchers took to water and swam across stream on my approach. Pied Wagtail's nest and eggs. Sedge-Warblers and young. Tree-Sparrow in company with female House-Sparrow, and apparently paired, as no others were near. Saw a male Blackcap-Warbler near Irthing. Lesser Whitethroat's nest with one egg, near Brampton, Cumberland (J. M. Charlton).

30th.—Great plague of Rats in this district; all peas and cauliflowers destroyed. Tawny Owls sat on trees near holes at

dusk, and probably caught some of them, near Brampton, Cumberland (J. M. Charlton).

July 5th.—Corn-Crake with young seen to cross main road near Brampton, Cumberland (Stewart Steele).

6th.—Corn-Crake's nest, six eggs, at edge of hayfield. Old birds very anxious, skimming close over grass, like Swallows, as it was being cut. Rooks were seen to destroy the eggs, near Brampton, Cumberland (J. M. Charlton).

8th. — Captured young of Corn-Crake in hayfield. This species was remarkably numerous here this year; I heard no fewer than five calling within half a mile near Walton. Visited Lesser Whitethroat's nest; female half fell off and fluttered along the ground, four eggs, near Brampton (J. M. Charlton).

16th.—Spotted Flycatcher's nest, two eggs. Roused pair of Woodcock at 12.30 p.m., which had been feeding, judging from freshly turned leaves and holes in soil made by beaks, near Brampton (J. M. Charlton).

18th.—Woodcock, startled from the wood, uttered a distinct chuckle of alarm, and looked round at me. Had evidently been asleep. Discovered Kingfisher's nest, 30 ft. above the Cambeck, at top of a sandstone cliff, Cumberland. Song of young of Common Wren very puzzling. Swallows observed catching wind-blown feathers of Geese (J. M. Charlton). A single Mute Swan seen flying due west about 20 ft. above ground near Brampton (S. G. Charlton).

20th.—Sand-Martins nesting in banks of Rivers Irthing and Kingwater in larger numbers than ever before observed, near Brampton, Cumberland (J. M. Charlton).

29th.—Two young Seals were in Silloth Harbour to-day. One was caught (W. H. Little).

August 20th.—Wind, north-west. Flock of thirty or forty Mallard making due east. Owl hooting all day in sunlight near Brampton (J. M. Charlton).

30th.—First party of Meadow-Pipits travelling from moors. Swallows congregating and settling on lee-side of hawthorn hedge to pick off flies, chattering continually, near Brampton (J. M. Charlton).

September 3rd. — Saw Great Spotted Woodpecker during heavy shower of rain, near Brampton (J. M. Charlton).

October 1st.—East wind, strong; flocks of twenty Golden Plover flying east (H. V. Charlton).

3rd.—Flock of sixty or seventy Geese passed over here at 2 p.m. They came from north-west, and passed south, Heads Nook, near Carlisle (G. B. Routledge). Geese heard passing from east to west over Stanwix about 8 p.m.; a clear frosty night. A House-Martin seen at Etterby Scaur (D. Losh Thorpe). Flock of twenty or thirty Geese passed over, going due west, at 3 a.m., calling, near Brampton (H. V. Charlton).

7th.—Flock of one hundred Fieldfares passing south, near Brampton (H. V. Charlton).

9th.—Redwings have arrived near Brampton (J. M. Charlton).

16th.—Small flock of Swallows and House-Martins seen near Stanwix, Carlisle (D. Losh Thorpe).

17th.—Wild Geese flying over Carlisle about 10 p.m. (D. Losh Thorpe).

18th.—Flock of about two hundred Wild Geese flying west over Cumrew, Cumberland (T. Maughan).

21st.—A single House-Martin seen at Stanwix (D. Losh Thorpe).

November 18th.—A Peregrine Falcon seen to stoop at a Kingfisher on the Eden near Salkeld. It missed, but returned again to look for the prospective tit-bit. Jack-Snipe are very numerous here this season, Eden Valley, near Salkeld, Cumberland (H. Britten).

A DIARY OF ORNITHOLOGICAL OBSERVATION MADE
IN ICELAND DURING JUNE AND JULY, 1912.

BY EDMUND SELOUS.

(Continued from p. 104.)

HAVING had some supper and got into my fisherman's thick oilskins—for it is now cold enough—I get to my place, again, a few minutes before 8, and find the male Swan at the bank, just opposite the nest. In a moment or two he gets out, and, walking up to it, stands there, as though waiting for something. This is not long in happening, for the female, shortly afterwards, rises, and the little grey cygnets are revealed, pressed together at the top of the mound. The first thing the female Swan does, after her long sitting, is to give her wings two or three great flaps. Then she comes off the nest, and, pecking up a few bunches of grass near it, places them at its base, swinging round her head behind her, each time, in doing so. She then browses a few hasty mouthfuls, and, going to the water, drinks plentifully of it, from the bank, bending down her long neck and then throwing it up into the air, some half-dozen times. Then she enters the water and preens herself in it a little, but without going out from the bank. All the while I am expecting her to swim out, and feed, as the male has been doing, but, as will be seen, she acts very differently. The male, meanwhile, has stood most of this time by the nest and cygnets, but has not taken the place of the female, and is now out of sight, on the further side of the nest. In a very few minutes the female comes out of the water again, and, returning to the nest, she once more broods the cygnets, all in a very leisurely manner. Thus she has voluntarily fasted for some six or seven hours, and then only eaten a few mouthfuls, nor have the cygnets, all this while, had anything. Now the male comes into sight again, walks past the nest, and, just as the female has done, pecks up some tufts of

grass and places them on the ground behind him, near to it, but not quite so near. He then sits down beside them—not, I think, on them—rises in a moment, browses a little grass, and again sits down, at some ten or twelve paces from the nest. Things now seem established, and I begin to make the entry of these last details, but regret doing so, for I have only written a few lines when a commotion of white bodies catches my eye, and, as I look up, a Swan rises from right by the nest, and flies over the lake (or broad stream) with a most musical and poetry-full cry that might well be termed a song. My first idea, naturally, is that it is one of the pair, but, the next moment, I see that they are both at the nest, the male having moved from his place to it. It would seem, therefore—or rather it must be—that a stranger Swan has flown to the nest, from which he has been driven by the indignant male, the female having remained upon it. In a minute or two the male returns to the place he has left, sits down there again, and all is now quiet. Both birds have their heads upon their backs, and seem to have gone to sleep for the night.

9.20 p.m.—The male Swan rouses himself and comes down into the water. Then, all at once, he rises from it, on the wing, and flies away over the lake and low hills of its shore, in the same direction as the stranger bird, and with a cry like its, but not quite so sweet-toned.

9.33.—The male comes flying back, again, with the same melodious note. He comes down in a long graceful sweep, with outspread wings, just off the bank, a little way from the nest, and then both birds fling up their heads and utter beautiful musical cries, as though rejoicing together, the female, at the same time, rising on the nest—a lovely sight!

Since about 7 p.m., a bird has been on the water which can only, I think, be the Great Northern Diver—my first sight of this celebrated species, which scientific collecting, unfortunately (for there really would seem to be no other), is doing its best to exterminate in this its once secure home. Most of the time it has floated asleep, apparently, with its head turned upon its back. Now, however, at a little past 10 p.m., it begins uttering its strange note—a melancholy desolate wail, but with a heart-taking music in it to one who, like Jacques, can suck out

melancholy (which is a great part of poetry) "as a weazel suckes egges." It utters this sad cry at leisurely intervals. "More, I prithee, more."

10.15 p.m.—The male Swan, who, after melodising, has lain down in his place and gone to sleep again, now rises and begins to walk up the slope, at the foot of which, by the water, the nest is situated—the island being like the top of a hill. He is, I think, browsing the grass, but has now passed out of my sight. But still the female Swan sits fast, and fasting, on the nest, and the cygnets have fasted, too, for more than ten hours, as a minimum—a thing which I could never have thought.

10.20.—I can now see the male Swan browsing over the island, and getting towards the top of it. This, with the female sitting on the nest, at its base, and Colymbres diving and fishing in the cold waters, makes a fine northern picture.

10.33.—Male Swan returning towards the nest, browsing as he comes. The female is now stretching down her neck from the nest, as she sits in it, and browsing in that way. I can see her cropping the green, growing grass, very plainly, but also she takes up something from, or almost from, the base of the mound itself, and this has much the appearance of those very bunches of coarse, weedy grass which she pulled up and placed there, on leaving the nest. For it comes up as something loose, long, and stringy—brown, too, I think, and from a brown surface—it does not look as though it were just plucked, and I notice no effort of plucking. Thus it would seem as if the female Swan, on leaving the nest, had provided a little for her nourishment, later on, and, if so, then the male has also helped in this—nothing, however, is given to the cygnets. The male I cannot now see. He may be sitting near the nest, just out of sight; but, no, for now he comes into sight, swimming from that side of it, along the bank. Now he pauses and remains still, just at the water's edge, some ten paces or so from the nest.

The repast of the female, on the nest, has been a very small affair. She soon left off, and is now asleep again, an example which I feel constrained to follow. Just before I go to the tent, at 11.5, the male Swan rises from the water, this time with a mere short, hoarse note, and flies over the lake-like expansion of the river, and on, down its narrowing stream, cresting the nearest

falls. Then, as I go, comes, again, the sad wail of the Diver—
“Sad, but such as, in esteem”—

for it is pleasanter, far, to my ear than the happiest and pleasantest sounds of the human voice, to say nothing of those shrill, strident trebles and gruff growls, the more frequent representatives of what we conceive to be such.

June 10th.—Very unfortunately I sleep till past 8, for which the cold, applying itself to my feet, in particular, and keeping me awake for a very long time, to begin with, is chiefly responsible—however, I should not have gone to bed at all. I have only made a few steps towards my observatory of yesterday, when I see both the Swans, with all the four cygnets, on the water. As I watch them, one of the two makes a short flight out—not more than some twenty yards or so—over its surface, and coming down upon it, again, turns, and, in a moment or two, flies back, each time with clear musical cries, and these are continued in unison, and ring forth more loudly, when the two parents, meeting again, after this short separation, swim proudly, together, about the cygnets, seeming, most plainly, to rejoice and exult in their family, as happy and charming a domestic scene as can be imagined—even in bird life. Shortly afterwards, the other Swan flies out, and returns in just the same way, and the scene is re-enacted in every particular. All then disappear round a promontory, and, as I crawl after them, one Swan comes flying back, round another projecting point of land, from behind which, as well as the other, I must necessarily be invisible—showing clearly that my presence has had nothing to do with these little flights. There is, however, another presence, which may have had, for now a third Swan—doubtless the stranger of yesterday—comes swimming up the stream, passing me at only about fifty yards distance, so that I can see, through the glasses, the curious red of the cheeks, like a sort of film or fine netting stretched over them, which, Sigurdsson tells me, comes with age, independently of the sex of the bird.

The pair of Swans, with the cygnets, now swim towards the nest, and when a little way off the shore of the mainland nearest their island, one of them flies out towards the stranger bird, who has, meanwhile, flown back to the same end of the lake, on the opposite side. The Swan that thus flies out is, I believe, the

female, and when she is half-way towards the intruder—for as such she is evidently considered—the latter flies, as it were, to meet her, on which she reverses, and returns, when there is the same scene of rejoicing between the two parents, over the cygnets, as I have before described, but more marked and yet more musical. The stranger Swan, meanwhile, has come down on the water, some seventy to one hundred yards away, as I reckon it, from the family group. It is evidently too near, and, this time, the male goes out against her—at least, I think it is he, though the stranger, which might seem to make this unlikely, is almost certainly of the opposite sex. She does not await him, however, but rises in flight, when he has only got half-way towards her, upon which, with little apparent animosity, he wheels and comes flying back again, and then there takes place the finest and most interesting of these remarkably beautiful scenes. The female Swan swims to welcome the male, on his return, just as he has done her, upon the former occasions, and the two, now, turned three-quarters towards each other, lift up their long, graceful necks, and, in unison, wave their magnificent, shining white wings, whilst repeatedly uttering their most lovely, most musical cry. This is all done over the cygnets, as it were, and makes such a picture of grace, beauty, and happiness, such a lovely bird group, so charming a scene of bird rejoicing, as words—at least, my words—are altogether inadequate to convey. Some time afterwards it is all done over again, upon land, and then, once more, in the water; for, whilst I have been entering this, all the family have swum round the island into another blue, out-broadening of the stream, on that side of it, and on a little projecting point of the grassy margin of this, I find them, now, on cresting the intervening low hill. The cygnets are lying down, whilst their parents stand, fronting each other, on either side of them, as though to guard them, and still lift their heads, wave their wings, rejoice, exult, and make music. All at once, one of them flies out over the water, and, at the same time, I see the stranger Swan upon it, who takes flight, as before. Upon this—also just as before—the pursuing bird desists and returns, the one that has been left with the cygnets flies, with the usual music, to meet it, and as they come down together, front to front, on the water, they almost touch, or perhaps

quite, and there is the same beauteous scene between them. It is still continuing, though the most exalted transports are over, when, all at once, the four little cygnets come running into the water, to their parents, whether in response to a low "hoop, hoop" on their parts, I cannot say, for I am at too great a distance to hear this, though the strong melodious cries fill the air. I believe, however, that one of the two—probably the female—made a pause in the symphony, to give them this signal.

Three or four times, after this, there is the same approach on the part of the stranger Swan, and the same out-flying and putting of her to flight when she is adjudged to be too near. On all these occasions it is the female, I think, who flies out, and more than once, on her return (when there is always the same scene) she brings down her wings upon the water, right over the cygnets, as though claiming them. But the three or four times have become five or six, or more, now. It all keeps continuing, the poor lonely Swan—for there is a powerful alloy to the happy side of the picture—time after time coming down on this sheet of water, as she did on the other, and sometimes flying quite close up to the group, and circling round them, to pass on and come down, as before. Every time, without exception, one of the happy pair flies out to chase her off, circling back, now, almost as soon as she rises (when she, as soon, comes down again), and every time this one is the female, if a slighter build, and, especially, a much thinner and slenderer neck, can settle it. Always there are the same rejoicings after each homecoming, but as the occasioning incident becomes more and more frequent, they grow less marked.

But there has been another scene in this strange drama, which I only now find time to note—one which throws light upon its whole meaning, and especially explains that early struggle, at the nest, in which it originated, unless, indeed, as I think is most probable, it had been going on before I arrived. When the pair of Swans, with their family, entered the fresh sheet of water, the single bird did not immediately follow them, but went first to the nest—now no longer within the view of its owners—which she ascended and stood in, but did not, during the few minutes I remained, sit down; and thus I left her, upon

starting in search of the pair. I wish, now, that I had stayed a little longer, to see if she settled herself down—though, if she did, it was not for long—but the essential thing is that she took possession of the nest immediately upon the departure of its owners, which makes it more than probable that her struggle, by it, with the male, originated in a similar attempt.

The explanation which I place upon the whole of the above facts is as follows :* That the stranger Swan is a desolate bereaved mother, and that the strong object of attraction for her is a family of cygnets, not her own, has, for some time, been growing more apparent to me, and will perhaps be disputed by hardly anyone, after what I have just set down. The poor bird evidently longs ardently for what she has, by some means, been deprived of, and the taking of her eggs “in the interests of science” must be included amongst the various causes by which such bereavement and suffering may have been brought about. Nay, since, on this same stream, only a short distance off, there is now an empty Swan’s nest which, up to a few days ago, had eggs in it, on which the Swans were sitting, and since a Danish dealer, working specially, so I was told, for an English scientific collector, has lately passed here, in his wide-extermimating rounds, it is even possible that the female of this pair, thus made childless, is the very stranger bird who has had all this heartache inflicted on her, and who still, at this moment, floats near to a point of land on which the objects of her envy and longing are established, like the Peri at the gates of Paradise. And now, once more, she is driven from those gates, and, this time, grappled in the air, by her more fortunate sister. This last incident—the first of the kind I have seen—took place at only a little distance from where I was (and am still) lying. The pursuing bird did not seize the plumage of the intruder, which she could have done, and as one might have expected her to, but bit at its beak, an action which was met in the same way, by the latter. This pecking, however, was quite ineffective, and hardly delayed the single Swan in her retreat. Within a very few minutes, however, she returns, and is again

* This conclusion is strengthened by my observations on the habits and character of our own Mute Swan, and by what the keeper has told me in this connection.

driven away, and so afflicted is this poor bird that she seems to take very little notice of my presence, coming down, and remaining on the water, quite near me. Naturally, I do not put myself more in evidence than I need to do ; still, she cannot but see me, and the fact of her permitting such an unusual proximity is evidence of her distracted state of mind.

Now, as it appears to me, it is not a creditable thing thus to bring sorrow into the hearts of other beings, even when those beings are not human ones, a distinction which, in the light of evolution, has no real force or validity. To have made a being suffer for our whim (thus breaking the golden rule) cannot in itself, I suppose, be a subject of gratulation to any one. If one wishes to go on doing so, he had better not watch birds very closely—and especially not Swans; though for my part, I wish he would, since the result might possibly be a happy one. The only plea which can be seriously urged in justification of these practices is, of course, the benefits which they confer on science; but will science kindly consider (I wish she would, in time) which is likely to be of most benefit to her, the possession of birds' eggs—even including the simulative ones of the Cuckoo, the interest of which I am very far indeed from denying—or ornithology as a whole, for the continued existence of the last is getting more and more to depend upon the speedy renouncement of the first. The end will not come quite in our time, but is there not a moral obligation to think a little of posterity?—and has science no regard for morality?

(To be continued.)

DESCRIPTION OF A NEW FORM OF LONG-
TAILED TIT.

BY COLLINGWOOD INGRAM.

Ægithalus caudatus taiti, subsp. n.

RECENTLY, while examining the large series of Long-tailed Tits in the British Museum (Natural History), I came across two specimens from Portugal. These at once struck me as being very dark-plumaged birds, obviously distinct from *Ægithalus caudatus irbii*, Sharpe & Dresser, which form is generally supposed to inhabit the entire Iberian Peninsula. On careful comparison with other geographical races, they appeared to exhibit certain distinctive characters, sufficiently well pronounced to warrant their separation as a subspecies. I propose to name this Portuguese race in honour of Mr. W. C. Tait.

They resemble *Æ. c. irbii* in having practically no rose-coloured feathers on the shoulders, but the mantle is very much blacker, only a few (or no) slaty feathers being apparent on the back. Sides of face and pectoral band very distinctly streaked with sooty blackish.

Length of wing, 59 mm. ; tail, 80 mm.

Hab. Coimbra, Portugal. October, 1886.

Type in the British Museum.

THE PHARYNGEAL TEETH OF FISHES.

BY COLONEL C. E. SHEPHERD (Indian Army).

(Continued from vol. xvi. p. 459.)

CHARACINIDÆ.

THE *Characinidæ* are furnished with formidable teeth in their jaws; their pharyngeal teeth, however, are feeble in comparison.

Alestes nurse, a Nilotic fish, has seventeen long, fine, horny gill-rakers on the first cerato-hypobranchial arch, and thirteen on the epibranchial. The inner and outer sides of the other arches are thickly set with the same kind of delicate gill-rakers, also carried up to the top of the epibranchials, those on the outer sides being a trifle longer than those on the inner side. No pharyngeal teeth apparent; a thickening of the mucous membrane into a seeming boss where the first, second, and third hypobranchials join the basibranchials, and the surface at these places covered with papillæ.

Citharinus citharus, a Nilotic fish, has a number of small bristle-like gill-rakers on the inside top of the first three branchial arches extending up the epibranchials. No pharyngeal teeth apparent.

Distichodus niloticus, as its name implies, a Nilotic fish, has minute hair-like gill-rakers standing up both on the inner and outer sides of the branchial arches, which are also carried up along the epibranchials to their upper part. No pharyngeal teeth apparent.

Erythrinus salmoneus, from British Guiana, has four, short, horny gill-rakers, followed by six tubercular lumps on the first cerato-hypobranchial arch, with one short gill-raker and some tubercles on the first epibranchial. These gill-rakers and tubercles bear teeth. The other arches have horny tubercles, but not toothed. The upper pharyngeal teeth are minute, and placed on the heads of the second, third, and fourth epibranchials. The lower pharyngeals are similarly minute.

Hydrocyon brevis has eight horny gill-rakers, which are rough on the inside ; these grow between the angle and the end of the hypobranchial, and there is a rudimentary one on the first epibranchial. Very small, almost rudimentary ones exist on the outside of the second and third arches. The inside faces of all the arches are smooth. A patch on each side of minute villi-



Fig. I.—HYDROCYON BREVIS.

form teeth represent the upper pharyngeal teeth ; the fifth branchial arch carries two triangular patches covered with papillæ, but teeth could not be seen or felt on them. The junction of the hypo- with the basibranchials forms distinct little prominences, visible in the illustration (Fig. I.).

Macrodon trahira, the Haimara of British Guiana, has five short (half the length of the gill lamina below it) toothed, horny gill-rakers ; along the first cerato-branchial the hypobranchial is bare of gill-rakers ; there is a teeth-bearing tubercle at the angle and a couple on the epibranchial ; the upper surfaces of the hypo- and epibranchial are covered with minute teeth. The other branchial arches are all bare of gill-rakers or tubercles, but have minute teeth on them. There are for upper pharyngeal teeth a small collection of minute teeth on the head and along the limb of the second and third epibranchials, the latter being the stronger ; there is an absence of those distinct patches or shields common in other fish. Joining the third and fourth epibranchials is a broad patch of villiform teeth. The lower

pharyngeals are in two long patches of minute teeth, with a stronger row on each of the inner margins. The basibranchials also are covered with minute teeth. All the teeth in the gullet, minute as they are, offer considerable resistance to the feel if a finger is drawn over them against the direction of the swallow.

Myletes setiger, the Pacu of British Guiana, has nineteen short, horny gill-rakers on the first cerato-hypobranchial, and sixteen on the epibranchial; they are non-denticulated. The longest—the first few near the angle—are about one-third the depth of the gill lamina below them. The other arches bear shorter but numerous gill-rakers on each side, making a very good filter. The gill-slits run very far into the fissures covering the basibranchials, leaving but a very narrow slip in the middle line between the slits on each side; some minute teeth on the upper part of the second and third epibranchials represent the upper pharyngeal teeth, and some similar teeth at the back of the mouth on the fifth branchial arch represent the lower pharyngeal teeth.

Myletes ellipticus has fifteen moderately long, horny gill-rakers on the first cerato-hypobranchial arch, the longest about one-half the depth of the gill lamina below it; they are not denticulated. The other arches carry numerous small gill-rakers on each side, making a good filter. The gill slits in this fish do not run up so closely to each other on opposite side as in *M. setiger*. The pharyngeal teeth are minute and similarly placed as in the last-mentioned fish.

SILURIDÆ.

In this family the teeth visible in the jaws and front of the mouth are feeble, especially when compared with those of the *Characinidæ*, but their pharyngeal teeth are more effective.

Bagarius yarrelli is, however, an exception; its visible teeth in both upper and lower jaws are long and pointed, its upper pharyngeal teeth are strong and cardiform, and resemble miniature tiger claws; they were referred to in the opening article of this series.*

Ælurichthys gronovi, from Demerara, has cardiform teeth

* 'Zoologist,' November, 1910, p. 418.

for the upper pharyngeal teeth, and similar teeth for the lower pharyngeals.

Arius proops, from British Guiana, has on the first ceratohypobranchial ten long horny gill-rakers. There were, however, eleven on the left side first arch. They are about four-fifths of the gill lamina immediately below the longest ones. The first seven from the angle are much of a length, after that they diminish. On the first epibranchial there are five similar ones on each side. There are no gill-rakers on the inner sides of the arches. Those on the outer sides of the second, third, and fourth arches reach across with their points to the inner side of the next outer arch. Those on the third and fourth arches are placed distinctly apart, and as they stretch across to the next outer arch make little square openings for the escape of water to the gills. There are no pharyngeal teeth on the second epibranchial; an elliptically shaped shield of villiform teeth grows on the third and fourth epibranchials. The lower pharyngeal teeth, also villiform, are in a long narrow V shape, the two limbs and apex being distinctly apart.

Arius spixii, from British Guiana, has thirteen horny upstanding gill-rakers, feebly toothed, on the first ceratohypobranchial; the longest of these is just a trifle shorter than the gill lamina below it. On the first epibranchial there are five similar gill-rakers. The inner sides of the other arches have very small outstanding, and the outer sides have upstanding, gill-rakers. A small but distinct patch of ellipsoid shape is attached to the third and fourth epibranchials, covered with minute cardiform teeth. The lower pharyngeals are on two narrow strips, barely visible in the mucous lining of the floor of the mouth.

Arius parkeri, from British Guiana, has ten upstanding gill-rakers, about four-fifths of the gill lamina below them in length of the longest, on the first ceratohypobranchial arch, with four on its epibranchial, and a few rudimentary ones above them. Short upstanding gill-rakers line the outer edges of the other arches, but there are no gill-rakers on the inner faces of any of the arches. An elliptical patch attached to the heads of the third and fourth epibranchials, which patch covered with minute cardiform teeth forms the upper pharyngeals. The lower are in two patches of minute teeth, narrow in shape.

Auchenoglanis biscutatus, a Nile fish, has nine gill-rakers along the first cerato-hypobranchial, seven of them long and upstanding, the other two much smaller, and two on the epibranchial. Fleshy tubercular gill-rakers grow along the sides of the second and third arches. The upper pharyngeal teeth are in two oval patches, with minute villiform teeth embedded in mucous membrane; the lower pharyngeals are similar.

Bagrus bayad, a Nile fish, has thirteen horny gill-rakers on the first branchial arch, with four on its epibranchial. The gill-rakers at the angle of the first arch, of the same length as the depth of the gill lamina below it. The inner sides of the first and second arches are smooth. The outer faces of the second, third, and fourth arches have horny gill-rakers, those on second being longer than those on the other two. The inner faces of the third and fourth arches have small but upstanding gill-rakers. The filter formed by the gill-rakers is not a very close one. The upper pharyngeal teeth, which are villiform, are in two circular shields at the ends of the third and fourth epibranchials. The lower pharyngeal teeth, also villiform, are in two triangular patches close together at their anterior apex, but diverging as they get nearer to the œsophagus.

Schilbe mystus, a Nile fish, has ten horny gill-rakers on the first cerato-hypobranchial, with three on the epibranchial. The gill-raker at the angle is the same in length as the gill lamina below it is in depth. The other arches carry gill-rakers as described for the last-mentioned fish. The pharyngeal teeth are also similar.

Callichthys littoralis, the Hassar of Demerara: this is a small fish. On the first and second branchial arches there are soft gill-rakers; on the third and fourth arches the longer gill-rakers are on the inside of the arch, and fit up against the gill-rakers of the next interior arch, a reversal of the usual plan. There is a large soft pad of mucous membrane, with a row of cardiform teeth below it for the upper pharyngeals. The lower pharyngeal teeth are very minute.

Platystoma fasciatum has twenty-three fine horny gill-rakers on the first cerato-hypobranchial, with nine on its epibranchial. The longest one at the angle measures four-fifths of the gill lamina below it. The other arches have similar fine horny

gill-rakers on their outer sides, but situated low down, shorter than those on the first arch, and getting shorter still from the outer to the inner arches. The first and second arches have none on their inner faces, but the third and fourth have. The edge of the upper surface of the branchial arches is serrated. The upper pharyngeal teeth show as two flattened spherical patches of minute cardiform teeth, and the lower pharyngeal teeth in two markedly broad triangular shaped surfaces, with a distinct median division, are of similar but even finer teeth.

Doras maculatus, the "Bombom" of Demerara, has twelve short horny gill-rakers on the first cerato-hypobranchial, the last three of which are rudimentary; the longest one is at the angle. The length of this is contained about two and a half times in the depth of the gill lamina below it. There are three gill-rakers on the first epibranchial. The other arches have tubercle-shaped gill-rakers, which are set on the outer sides of the arches and rather low down, and there are papillæ on the top surfaces of the second, third, and fourth arches, more numerous on the latter two than on the second. A round-shaped shield of villiform teeth attached to the third and fourth epibranchials forms the upper pharyngeal teeth on each side. The lower pharyngeals are in two distinct but roughly triangular patches of villiform teeth.

Synodontis schall, a Nile fish, has on the first cerato-hypobranchial arch seventeen horny gill-rakers, which are denticulated on the inner side; there are three on the epibranchial. The second and third arches have a number of closely-set gill-rakers covered with papillæ. The mucous membrane lining the upper part of the back of the mouth is covered with prominent papillæ. The upper pharyngeal teeth are in two circular patches, very low down at the back of the mouth, with minute chocolate-brown cardiform teeth. The lower pharyngeal teeth are in two diverging patches, with two rows of prominent but small teeth standing up along the inner edges of the patches, with smaller teeth outside them; these are likewise chocolate-brown in colour. It is interesting to note that Günther, in 'The Introd. Study of Fishes,'* says of this fish: the teeth in the lower jaw "have a slightly-dilated brown apex."

* P. 573.

In *Malapterurus electricus*, a Nile fish, there are ten soft gill-rakers on its first cerato-hypobranchial arch; the first four are upstanding, the others lie flat down; there are besides these and beyond them four rudimentary gill-rakers. There is one upstanding one on the epibranchial. On the other arches there are a few short upstanding gill-rakers on the outer sides only, separated from each other. The upper pharyngeal teeth are in two circular patches of villiform teeth, and the lower ones in two roughly triangular patches.

STROMATEIDÆ.

In this family we get an example of setiform or bristle-like pharyngeal teeth.

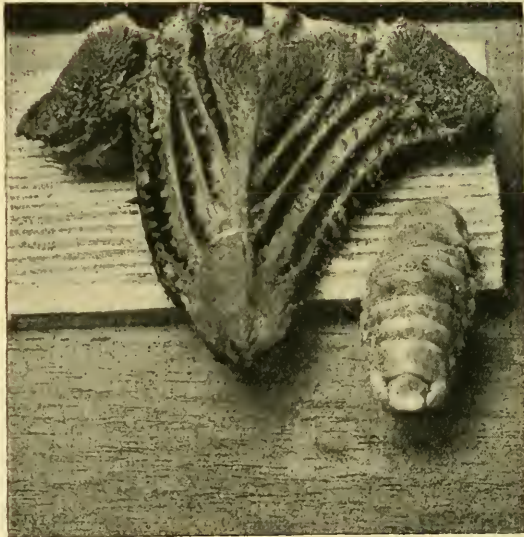


Fig. II.—STROMATEUS NIGER.

Stromateus niger, the Black Pomfret, Indian Ocean, has twelve horny, short gill-rakers on the cerato-hypobranchial of the first arch, with two on the epibranchial. The seventh and eighth from the angle are the longest, and their length is contained about two and a half times in the depth of the gill laminae just below them. The other arches have a few tubercles on them, distant from each other and small. The upper

pharyngeal teeth show as two patches, one on each side, of thickly planted bristles (Fig. II.). The upper part of the gullet

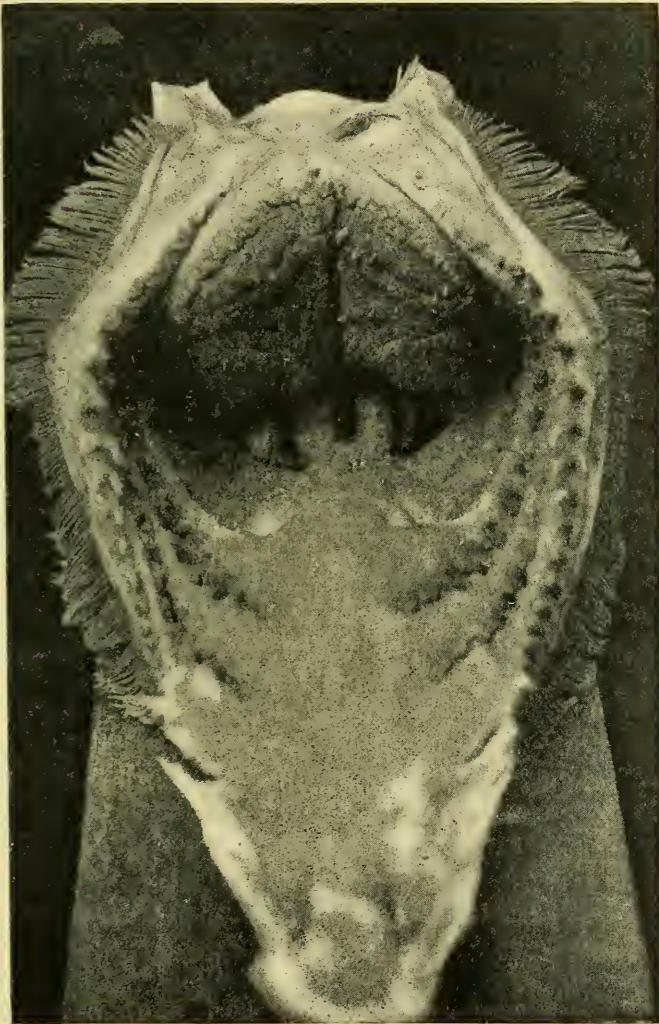


Fig. III.—*LOPHOLATILUS CHAMAELEONTICEPS*.

has been cut through and spread out, otherwise the bristles would not have shown clearly. The bristles are curved, and give the feeling to the touch of a short stiff brush rather than

teeth. The lower pharyngeals consist of the same sort of bristles. The crustacean on the right lower side of the illustration was taken out of the mouth of the fish described, but it is not, as might hastily be inferred, a specimen of one item of the food of this fish. It is an Isopod known as *Cymothoa œstrum*, a parasite that lives in the mouths especially of the *Stromateidæ*, where, as far as its life-history is known, it passes most of its existence. Were these fishes provided with sharp, cardiform, pharyngeal teeth, as so many others are, these parasites would have a more perilous time. There is a Decapod (the *Hippa asiatica*), found in sandy beaches. At Madras it is largely used as bait by the local fishermen. This is very like in general appearance to the *Cymothoa*, but very different in its habits, and is only mentioned to prevent the two being taken one for the other.

PSEUDOCROMIDIDÆ.

Lopholatilus chamaeleonticeps, the Tile-fish, living on the bottom of the Gulf Stream slope, and found in the North Atlantic at some four hundred miles or more from the American coast. This fish has sixteen horny gill-rakers on the first cerato-hypobranchial arch, the first four from the angle being much of a size, and in length about one-half the depth of the gill membrane below them; all these gill-rakers have teeth on the inner surface. There are nine gill-rakers on the first epibranchial, the upper four of which are rudimentary. The gill-rakers inside of the first and on the other arches are tubercles with a few minute cardiform teeth on each one. The upper pharyngeal teeth form (see Fig. III.) a narrow patch on the second epibranchial, with conical teeth, but not many of them, with a distinct provision of gum above and below the patch. The lower patch in two pieces, with a distinct divisional line across it, consists of conical teeth embedded in mucous membrane, but not very thickly studded with them. The lower pharyngeal teeth are in two portions, with a row of rather distinct conical teeth on their inner margins that stand well up; the other parts of them have similar teeth, but not quite so prominent. The surfaces of the basibranchials and the branchial arches are cased with a skin covered with papillæ.

(To be continued.)

NOTES FROM THE AVON VALLEY, HAMPSHIRE
(1912).

BY G. B. CORBIN.

A RECORD for the past twelve months may almost be summed up in the word "rain." A rich and bountiful harvest, damaged, and in some instances almost destroyed, by wet and unfavourable weather at the time of ingathering, followed by such mild open weather that primroses were gathered at Christmas, and in the early days of the New Year gipsies were hawking daffodils in the street quite six weeks earlier than usual! Thus the seasons seemed upside down, the wildfowl shooting proving almost a complete failure from the flooded condition of the river; only one "shoot" was possible (when about one hundred head were killed), whereas some six or seven meetings in the same period of time usually took place. Consequently the birds had a comparatively quiet and peaceful time, and my few rambling notes are not so bloodstained.

At the opening of the shooting season Snipe were plentiful, and later the handsome little migrant "Jack" was far from rare; but Woodcock were few and far between, although their nesting in the neighbourhood has long been known. The spring of 1912 having been favourable for the nesting of the Ducks, Moorhens, &c., a goodly number of home-bred birds were on the flooded river when the shooting season commenced, and were later augmented by visitors from the north, but not a rarity was seen. Wigeon were very early in appearing, the peculiar characteristic "whistle" of the species said to have been heard more than once at the end of August; certainly there was no mistaking the notes early in September, and a friend of mine shot a bird at the end of the month. Eventually Wigeon were seen in unusually large flocks, and so continued throughout the winter, and, although circumstances prevented their being disturbed or worried, they ever seemed wary and on the alert. Perhaps the same remarks may apply to the sometimes large

flocks of Teal. There is no doubt this handsome little duck nests in the neighbourhood much more frequently than formerly, and it was a gratifying sight, with the aid of glasses, to see young Shovelers amongst the fowl upon the water, confirming the fact of their regular nesting here.

A bird seen on the water, and afterwards numbered with the comparatively few that were killed, was a fine specimen of the Great Crested Grebe, a species by no means common in this immediate locality, but as it nests in another part of the county, and this is the third season I have known of specimens here, may we hope it is extending its range, and will become a "native"? At one time a considerable increase in the number of Coot was observable, especially when the water was at its highest, and migrant parties were heard at night coming in over the fields from the north-east. The number and different species of Gulls to be seen was also remarkable, especially when the water receded from its highest level. The appearance of the little Black-headed Gull was to be expected, as it has established a small colony in the Valley, whilst the Kittiwakes and Common Gulls are frequent visitors in winter, but the larger species, Herring and Lesser Black-back, are not so frequent. Of the former, it was seen in almost all stages of plumage, from the speckled to the adult; but the Black-backed caused the most comment, as some of them were in fine plumage, their parti-coloured backs and neck being very conspicuous, whether at rest or on the wing. A specimen picked up dead in a ploughed field was sent me, its plumage perfect and spotless, giving no indication whatever of how it met its death. And, if inference is to be drawn from the large flocks of Lapwing which seemed to increase as the water drew back to its usual channels, the lovers of Plover's eggs need not anticipate a speedy shortage of that delicacy; and, strange to say, the appearance of the "Peewits" was almost sure to be followed closely by one or more Peregrine Falcons. On one occasion two or three birds, one of which was said to be very large and very dark, as well as swift and destructive were seen, but all evaded the gun.

The most interesting item I know of was the sight of an Osprey taking fish on several occasions from the large lake-like piece of water to the west of Ringwood. From time to time it

has been my privilege to record the autumn "flying visit" of a fish-hawk—once, I am sorry to say, with fatal termination. In the present instance all went well, and although it was seen fishing on several separate waters, and guns were pointed at it, it escaped, as far as I could learn, without the loss of a feather. With a plunge and splash, it was seen to take fish from the waters, and in one such instance a gun fired in the direction caused it to drop the prey, which was eventually secured, and proved to be a Roach of about a pound weight. It was brought to me, and had a piece torn out of its back between the head and the dorsal fin, as if removed by the wonderful foot and claws of this grand bird.

On the higher grounds and fields to the east of the Avon an unusual number of Golden Plover resorted during the winter—they generally frequent the downlands of Wilts and Dorset, to the east—and at the same time I was informed of a pair, or at least two, hawks taking up their quarters—if not together, at least in the same locality. From description I took it to be a pair of Merlin, from the size differing so much; the smaller one was designated the "little black hawk," and was said to be the most active of the two, especially amongst the Sky-Larks, which they seemed to be worrying daily over a wide extent of country, and interested many observers. I did not hear of the Brambling in any extraordinary numbers, as they sometimes are seen in the fens, especially when beech-nuts are as abundant as they were last season. The Little Owl nested in several fresh localities, and specimens of the fierce little creatures were shot.

On account of the floods, angling—at least from the banks—was almost impracticable, but the high water was, I suppose, beneficial to the "coming up" of Salmon, as I understood over thirty fine fish were taken from the water running through one estate, most of them over 20 lb. Some extraordinary takes of Roach were also recorded. One part of the river was almost swarming with large Pike, though only one, I believe, over 20 lb. was taken, yet an unprecedented number between 16 lb. and 18 lb. were landed. The most remarkable capture during the year was a Trout, turning the scale at 15 lb. 1 oz.

A fine Roebuck was shot in a wood near here. Its presence was unsuspected.

THE DISTRIBUTION OF BRITISH ANNELIDS.

BY THE REV. HILDERIC FRIEND, F.L.S., Fellow Royal Microscopical Society.

(Continued from p. 71.)

35. SOMERSET.—Many years ago I was intimately acquainted with a gentleman in Wigton, Cumberland, who took a genuine interest in Nature Study. In July, 1891, a letter came to me from his son, stating that he was sending me a consignment of earthworms from Bath. Those in moss were dug out of clay soil, the others being from *débris*. The worms thus received from Mr. John Huddart included (1) *L. terrestris*, (2) *L. rubellus*, Hoffm., (3) *Allolobophora longa*, Ude, (4) *A. turgida*, which I find marked "variety, examine again," (5) *Eisenia fætida*, or the Brandling, (6) *Dendrobæna subrubicunda*, or the Gilt-tail, and (7) *Allurus tetrædrus*. Later on I received (8) *L. castaneus*, (9) *Allolobophora trapezoides*, which is closely allied to *A. turgida*, and (10) *Eisenia mucosa*. Finally, in May, 1902, along with the three species of *Lumbricus* already named, I had the pleasure of receiving (11) *D. celtica* (= *mammalis*), which, as far as I am aware, completes the list, though it ought to be much longer. Total number of species recorded, 11.

36. STAFFORDSHIRE.—Up to December, 1896, not a single earthworm record for this county was known to me, and even now the list is exceedingly meagre. In 1897-8 my own observations resulted in the discovery of seven species. During this time, though I resided in the county, my time was too fully occupied with other subjects to allow of an exhaustive survey. The records were—(1) *L. terrestris*, (2) *L. rubellus*, (3) *L. castaneus*, (4) *A. longa*, (5) *A. chlorotica*, (6) *Octolasion profugum*, in my garden at Ocker Hill in plenty, and (7) *Allurus tetrædrus*, in damp places. On June 1st, 1910, I collected near Wordsley, on the banks of Staffordshire and Worcestershire, and added (8) *D. subrubicunda*, and (9) *A. caliginosa* (which includes *turgida* and *trapezoides*). In a dead tree near the Stour (10) *D. constricta*

was taken, and somewhat later (11) *D. arborea* occurred near Walsall.

37. SUFFOLK.—In spite of the fact that I resided in this county for some time, only five earthworms are on record. Yet the county must be full of interesting things, if one only had time to collect them, as is shown by the fact that wellworms occur here which have not hitherto been found elsewhere. Mr. Mayfield, my Norfolk correspondent, sent me, on February 14th, 1893 (1) *L. terrestris*, (2) *A. longa*, (3) *A. turgida*, and (4) *O. profugum*. The latter I often found in my garden at Mildenhall. I also noted other species, but omitted to record them all, except (5) *D. arborea*, in old tree-stumps near the Workhouse on the Thetford Road.

38. SURREY.—The worms of Surrey seem, in some extraordinary way, to have been quite neglected. The Kent records may be consulted, as some of my own gleanings were made on the borders of the two counties. In August, 1909, I stayed for a fortnight at Addiscombe, and also visited several places around. As a result, it was possible to record four species of *Lumbricus*, viz. (1) *L. terrestris*, (2) *L. rubellus*, (3) *L. festivus*, and (4) *L. castaneus*; with several species of *Allolobophora*, as the old genus was called before being split up. Noteworthy are (5) *A. longa*, (6) *A. trapezoides*, (7) *A. chlorotica*, (8) *Eisenia fetida*, (9) *E. rosea*, and (10) *D. subrubicunda*. Around Dorking (11) *Allurus tetrædrus* was plentiful, together with several of the foregoing. I find a query against one species (*D. constricta*), but on March 25th, 1911, Mr. F. M. Roberts, of Addiscombe, sent me the Brandling and Purple-worm, together with mature specimens of (12) *D. mammalis*.

39. SUSSEX.—This county has received a considerable share of attention on the occasion of my frequent visits to Hastings and other parts. Early numbers of 'Science Gossip,' 'Field Club,' and other journals contain reports, and from these I make the following list:—In the early days of November, 1890, my first, and in March, 1892, my second exploration took place ('Science Gossip, 1892, pp. 122, seq.). On leaving the train, on this latter occasion at Robertsbridge, for a walk to Dallington, I found (1) *Allurus tetrædrus*, then (2) *L. rubellus*, (3) *L. castaneus* (= *purpureus* of earlier records), and (4) *A. chlorotica*. At Dal-

lington, I added (5) *L. terrestris*, and (6) *A. longa*; then (7) *L. festivus* (= *rubescens*), which I had only shortly before re-discovered after it had been lost to science for many years. Here for the first time (8) *D. constricta* was added to the British lists, and (9) *D. arborea* was also found. Next came (10) *Bimastus eiseni*, a somewhat rare species, and (11) *Dendrobæna celtica*, now known as *mammalis*. On the way to Battle, the red, purple, green, and turgid worms were met with, and four additions were made to the foregoing list, viz. (12) *A. turgida*, (13) *Eisenia rosea* (= *A. mucosa*), the Brandling or (14) *Eisenia fætida*, and the Gilt-tail (15) *D. subrubicunda*. The following day (March 30th, 1892), walking from Pevensy to Hurstmonceux, I found *Allurus* plentiful in the ditches, the Brandling in dung-heaps by the roadside, the greenworm (No. 4) under stones inside the Castle, and *L. terrestris*, *L. rufescens* (= *festivus*, No. 7), *A. longa*, *L. castaneus*, and *E. rosea*, en route. All these I have repeatedly found since in these and other Sussex localities, while my mother sent me *Allurus*, *E. rosea*, *A. chlorotica*, *L. rubellus*, *L. castaneus*, *A. trapezoides*, and *D. constricta* from Dallington in May of the same year. In 1897 I compiled a list of Sussex earthworms as then known, and it contained one addition, viz. (16) *O. profugum*. On February 10th, 1894, Mr. Guernonprez wrote me from Bognor, and said he had found *L. terrestris*, *L. castaneus*, *A. chlorotica*, *E. fætida*, and some other species. During recent years my attention has been chiefly directed to the Enchytræids and microscopical Annelids, but a few interesting additions have been made to the list of Sussex earthworms. The most interesting in 1911 was (17) *Helodrilus oculatus*. This is well distributed in the South, having been taken at Boreham, August 31st, and at Hastings, June 20th and July, 1912. On July 8th, 1912, I found a small worm at Ecclesbourne, which is very nearly allied to the Square-tail (*Allurus tetrædrus*), but is much smaller and more tender. I name it provisionally (18) *Allurus mollis* (see Trans. Notts. Nat. Society, 1911-12).

40. WARWICKSHIRE.—Many years ago, while on a visit to Rugby, I collected (1) *L. rubellus*, (2) *A. longa*, (3) *A. chlorotica*, and (4) *Allurus tetrædrus*. On February 24th, 1896, Mr. S. T. Dunn, B.A., sent me (5) *L. terrestris*, (6) *L. castaneus*, (7) *Eisenia*

rosea (= *A. mucosa* of early records), and (8) *A. turgida*. The same autumn (November 23rd, 1896) I collected at King's Heath, finding all the foregoing, and adding (9) *D. subrubicunda*. Mr. T. Humphreys sent me on September 20th, 1909, some worms from Edgbaston, but they were all of the common types. I found No. 9 in Dr. Gamble's garden at Edgbaston in May, 1911. It will be seen that the list is a very poor one, and it is very difficult to interest collectors in the subject.

41. WESTMORELAND.—In the 'Naturalist' for January, 1891, p. 13, is an article on the Earthworms of the North of England, in which my first Westmoreland records are given. These include (1) *Eisenia fœtida* from Kendal, with (2) *E. rosea* (= *A. mucosa*), and (3) *A. trapezoides*. From the same locality I obtained the first specimen of *Perichæta* I ever saw. On October 19th, 1892, I collected at Ambleside (4) *L. terrestris*, (5) *L. rubellus*, and (6) *L. castaneus*; also (7) *Allurus tetrædrus*, the Brandling and Trapeze-worm, with (8) *A. longa*, (9) *A. turgida*, (10) *A. chlorotica*, (11) *D. subrubicunda*, and (12) *Octolasion profugum*. On March 5th, 1912, Prof. Gamble wrote from Birmingham University to say he had collected near Arnside *L. terrestris*, *A. chlorotica*, *D. subrubicunda*, and (13) *Octolasion cyaneum*.

42. WILTSHIRE.—On March 24th, 1892, Mr. J. Winkworth sent me a large consignment of worms from this county, numbering some hundreds. There were six species, viz.: (1) *L. terrestris*, very fine typical forms, (2) *L. rubellus*, (3) *L. castaneus*, (4) *A. longa*, one with double tail (for which see 'Science Gossip,' May, 1892), (5) *A. turgida*, and (6) *A. chlorotica*. Nothing else appears to be known on the subject.

43. WORCESTERSHIRE.—The Earthworms of this county have been treated by me in the 'Transactions' of the Nat. Hist. Soc., vol. v. pt. 1, 1911-12, published July, 1912, as well as in the 'Naturalist,' December, 1909, and April, 1910. I need not repeat what is there written, but give the names of the species as at present known. All four species of *Lumbricus* occur: (1) *L. terrestris*, (2) *L. rubellus*, (3) *L. festivus*, and (4) *L. castaneus*. Also the square tail (5) *Allurus tetrædrus*. Among the Allolobophoras we find (6) *A. longa*, (7) *A. trapezoides*, (8) *A. turgida*, (9) *A. chlorotica*, (10) *Eisenia fœtida*, (11) *E. rosea*,

and two very fine forms of *E. veneta* found in gardens at Malvern, but as yet unknown elsewhere, which I have named (12) *E. robusta* and (13) *E. dendroidea*. Then among the Dendrobene we find (14) *D. subrubicunda*, (15) *D. arborea*, (16) *D. mammalis*, and (17) *D. constricta*. Further (18) *O. studiosum* (= *cyaneum*) and (19) *O. profugum* are present; and (20) *Helodrilus oculus*. This curious worm was unknown in England till I found it in Malvern, but it has since been discovered by me in Derbyshire, Notts, Middlesex, Sussex, and elsewhere. Mr. Evans has taken it near Edinburgh, and during the month of March last I collected it at Swords and by the Dodder, in Dublin. In addition, I find (21) *Bimastus eiseni* on the golf links at Malvern, and in the Museum at Worcester are specimens of another terrestrial annelid which is still a mystery.

44. YORKSHIRE.—Many papers on Yorkshire annelids have appeared from my pen during the past twenty years in the 'Naturalist,' the 'Bradford Scientific Journal,' and elsewhere. While living at Idle I discovered *Lumbricus rubescens*, and found afterwards that it was a long-lost worm, formerly known as (1) *L. festivus*. Also common were (2) *L. terrestris*, (3) *L. rubellus*, and (4) *L. castaneus*. July 7th, 1891, is the date attached to notes on worms from Bolton Abbey and the Strid. In addition to the foregoing were (5) *E. rosea* (= *A. mucosa*), and that very rare worm (6) *A. bæckii*, which I found later near Woodhouse Grove. At Esholt *L. rubellus*, (7) *D. mammalis*, (8) *Allurus tetrædrus*, the Brandling (9) *Eisenia fætida*, and the Gilt-tail (10) *D. subrubicunda* were found; while (11) *O. profugum* was common around Apperley Bridge and Idle. Further, I found in and around this district, with Idle as the centre, (12) *B. eisenia*, (13) *Dendrobæna arborea*, and (14) *D. constricta*. (15) *A. longa* is common in the county, and at Haighbeck I found, on May 10th, 1892, with several of the foregoing *D. mammalis*. Lastly, while at Bridlington in the Easter of 1910, I found (16) *Octolasion gracile*, which I think completes the list for the county, and closes the present record for England. Wales, Ireland, and Scotland remain for treatment; but it may be remarked that Mr. W. Evans has dealt with the latter in part, and Mr. Southern with the Irish records somewhat fully.

(To be continued.)

NOTES AND QUERIES.

MAMMALIA.

The Hedgehog in the West of Scotland.—Lest it may lead to future confusion, may I point out that my Loch Maree record of a Hedgehog ('Zoologist,' *ante* p. 75) was in 1887—on April 13th—not 1888, as, owing to a slip of the pen, twice quoted by Mr. Harvie-Brown in his interesting remarks on the animal's distribution in the 'Zoologist' for the present month. As the locality is on the west of the backbone of Scotland, I may add that a friend has just told me that upwards of seventeen years ago, previous to which he resided at Dunure, in Ayrshire, he was accustomed to see a few Hedgehogs killed by the keeper in that district every year. He adds that he thinks "the damp climate of the Western Highlands may have something to do with the comparative scarcity of the animal on that side of Scotland."—GEORGE BOLAM.

MR. HARVIE-BROWN asks for "records" (*ante*, p. 107), and the following extract from my note-book may be of use, *viz.*:—"June 30th, 1901, Ardbhan Craigs, Oban; Hedgehog seen and handled on the grassy tops not far from Pulpit Hill—seemed very torpid or indolent."—HUGH BOYD WATT (77, Parliament Hill, Hampstead, N.W.).

The Marten in Lincolnshire.—In reference to the note on this now rare animal by the Rev. F. L. Blathwayt in 'Zoologist' (*ante*, p. 107) may I say that in September, 1909, I saw a stuffed specimen in the possession of Mr. George Frudd, of Sleaford, killed in that locality "some years ago" (I have no more definite information regarding it), and was informed by that gentleman that he thought he had seen one at large there only a few years previously to 1909. Nothing more was heard of it, but it seems almost impossible that any other wild animal could have been mistaken for a Marten at comparatively close quarters.—GEORGE BOLAM.

AVES.

Occurrence of Greenland Falcon in Co. Mayo.—On the 2nd inst. a very fine specimen of a female Greenland Falcon was shot by a young lady on the Island of Bartragh, Killala Bay. She first

observed the Falcon making savage swoops at the Lapwings nesting on the marsh at the foot of the sandhills, and seeing it was a bird unknown to her, she followed it among the sandhills until it settled on a little hillock, and, managing to get a long shot, knocked it over dead, very little injured by the shot. This is only the second specimen obtained in the Killala district. The first specimen was shot by a young farmer near the town of Killala, April 3rd, 1875, and was given to the late Col. Knox, of Castlereagh, who sent the specimen to his brother, the late A. E. Knox, author of 'Ornithological Rambles in Sussex.'—ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

Ivory Gull (*Pagophila eburnea*) in Ireland.—An immature Ivory Gull (female), in handsome plumage, was shot on March 25th at Teelin Pier, Carrick, Co. Donegal, and forwarded to me in the flesh. This is the fifth recorded occurrence of this rare Arctic visitor to Ireland.—RICHARD M. BARRINGTON.

Asiatic Birds in Leadenhall Market.—I am informed that about twelve years ago a large number of Pallas's Sand-Grouse were brought frozen to this country. This interesting experiment has been repeated, and during the past few days several of the Leadenhall shops have been selling *Syrrhaptus paradoxus* at fifteen-pence apiece. The birds are almost all in excellent condition, and of course perfectly fresh. Those I have examined appear to have been shot, and not trapped or netted. My colleague, Mr. P. W. Horn, found in one of the Manchurian ducks mentioned below a number of rude iron pellets, ranging in size from that of 5's shot to that of pigeon peas. An engineering friend tells me these appear to be very impure metal, and possibly the pellets are a waste product of native iron moulders.

The Sand-Grouse are accompanied by many Bearded Partridges (*Perdix daurica*), a Manchurian form easily distinguished by the soft owl-like plumage, black horseshoe, and bright golden breast—the last a noticeable feature as the birds lie displayed in rows on the stalls. This species occurred in the Manchester Market about 1900, under the name of "Hungarian Partridge." A series of frozen ducks chosen from one of these Eastern consignments and sent to me for identification last week included an adult male Gadwell (*Chaulelasmus streperus*), Long-tailed Duck (*Harelda glacialis*), Goldeneye (*Clangula glaucion*), an immature Tufted Duck (*Fuligula fuligula*), Smew (*Mergus albellus*), and male and female Baer's Pochard (*Nyroca baeri*), recognized immediately by the green or greenish head and small but conspicuous chin spot.

In 1910, from a large Chinese consignment, I secured beautiful specimens of the Baikal Teal (*Nettion formosa*) and the Falcate Duck (*Eunetta falcata*), both of which were very numerous; and with them I noticed dozens of the small eastern Bustard, *Otis dybowskii*, Tacz., *Gallinago stenura*, and one or two other Asiatic species, together with the usual Palæartic *Anatidæ*.

Perhaps the most curious find was that of the West Australian *Anthocæra* (or *Acanthocæra*) *carunculata*—one of the “Wattle Birds”—picked from amongst frozen rabbits by Mr. Horn, and mounted for our museum; and in December, 1909, a magnificent example of a large Albatross (*Diomedea exulans*, I judged it to be; it had little or no buff about the head) hung for some days amongst the Turkeys before a Leadenhall game-dealer’s shop front. When I saw it the bird appeared quite fresh, and bright red blood was dripping from its beak.

In past years large quantities of American game-birds and wild-fowl were sold fresh in the Manchester Market, and many of these passed through the accomplished hands of the Messrs. J. Holland, Wright Johnson, and J. Barlow. This note may perhaps be useful in connection with the mystery of admirably mounted Prairie Hens or Hooded Mergansers found in collections of Lancashire birds; but it is now a long time since I saw an American complexion on a game-dealer’s stock-in-trade, and perhaps this Transatlantic traffic has ceased. I have seen Waxwings, Pine Grosbeaks, Scarlet Bullfinches, Crossbills, and other northern forms in great quantities in the Manchester Market. This wholesale slaughter of bright-plumaged Continental birds for mere vulgar display is not so common as formerly, but occasional Eagle and Snowy Owls, Avocets, Bitterns, Spoonbills, and similar creatures are still used as ornaments at Leadenhall, and sometimes one notices less striking but more interesting examples of “rare” birds. Some of these, one cannot help suspecting, travel by sinister courses to unquestioning hands, for frozen birds stand transport and handling remarkably well.—FREDERICK J. STUBBS (Stepney Borough Museums).

P.S.—Since the above note was written I have received from a Leadenhall dealer a bird picked out of a lot of Black Grouse. It is an immature Little Bustard (*Tetrax tetrax*), with a culmen of no more than .9 of an inch. I am assured that it is from Northern Europe, but of course the species is best known as a southern bird.—F. J. S.

NOTICES OF NEW BOOKS.

Practical Bird-Keeping ; being Reprints of Articles which have appeared in the 'Avicultural Magazine.' Edited by J. LEWIS BONHOTE, M.A., &c. West, Newman & Co.

BIRDS in captivity are fortunately now more seldom dismal prisoners confined in wretched cages. The aviculturist of to-day is usually an ornithologist, who not only studies the habits of his pensioners, but strives more or less to produce an environment suitable to their health and happiness. Many exotic birds which formerly were only found in the aviaries of zoological gardens or in the possession of wealthy amateurs now thrive in the capacious and suitable enclosures of private aviculturists, and our excellent contemporary, the 'Avicultural Magazine,' is to be credited with not only fostering the study, but also improving the conditions and making possible the successful keeping of almost any bird that can be procured. This small book is, therefore, to be welcomed as a reprint long desired, and should prove a safe guide to those who follow the pursuit and study.

The articles reproduced are written by experienced aviculturists whose names are not unknown, and some are specialists in the birds they keep and often breed. In all the contributions there is an excellent endeavour to describe the natural environment of the bird, and to suggest its artificial reproduction, while the dietary information is full and complete. The modern study of "bird-watching" in nature has done much to give us new and unexpected information in avian bionomics, and is still only in its infancy; the real aviculturist, in his observations, is also adding to our knowledge in the questions of longevity, changes in plumage, and even episodes in courtship, so that aviculture is no longer the definition of a hobby, but represents a distinct section in the study of ornithology. Aviculture has had to fight for its scientific recognition, and the journal from which these articles are reproduced is fast becoming, if it has not already reached the status of, an indispensable magazine in ornithological bionomics.

The book is well illustrated.

EDITORIAL GLEANINGS.

ENEMIES OF TOADS.—“The Rev. H. Marmaduke Langdale writes (April 17th, 1889):—‘A curious circumstance came under my notice yesterday, which I think may be of interest to you, though it does not touch on bird-life. Toads are particular favourites of mine, and I have always upheld their usefulness and harmlessness, deploring the cruelty which often dictates their death. Till yesterday, however, I left out one from the list of their enemies. There is something about a toad which makes all animals shy of touching one with the mouth. Nature has provided the defenceless thing with a bitter juice, which can be expelled, like perspiration, from the pores of the skin, when it is being handled or used roughly. This juice makes dogs foam at the mouth when they can be excited sufficiently to seize a toad, and doubtless the same reason frees them from the persecution which sweeter tasted morsels suffer from the jaws of various vermin. Now, hard by this village (Compton), where some bricklayers are erecting outbuildings, there is a pond in a sequestered valley, surrounded with long grass, and shaded by the boughs of mighty elms, which hitherto has afforded a peaceful retreat to toads at this time of year, when they resort thereto and deposit their long bead-like strings of spawn. The building operations upset the programme sadly, however, for the lime imparted to the water from the dipment of mortar-covered buckets drove all the squamous inhabitants into the surrounding grass. Hard by, a mighty heap of turf affords asylum to a colony of rats, and these gentry sallied out at dead of night, fell upon the evicted toads, and rent them in pieces, eating portions of their flesh and dragging away the carcasses to their earthy fortress, the whole community thus coming to a fearful end. This little episode struck me as most unusual, and I made up my mind to ask you if any similar occurrence had ever come under your notice. Rats are truly regarded as omnivorous.’ Under stress of hunger any creature will devour any strange flesh, as wolf eats wolf, and it is possible that the rats did not want ‘Home Rule’ for themselves so much as to stay the pinch of hunger even with a toad. This letter of Mr. Langdale’s, whose powers of observation and humorous description are here well exemplified, would have been welcome to Mr. Frank Buckland, to whom rats were special favourites. He describes the elephant at

Clifton, whose feet were gnawed into holes by rats, the grisly portion being completely eaten away while she was asleep, but whose life was saved by removal from the rats. Mr. Buckland was very fond of trying experiments of what he called 'the law of eat and be eaten.' He tried a hedgehog with a viper. The viper struck the hedgehog two or three times in the face, where there are no bristles. Meanwhile the hedgehog munched up the viper's tail. The hedgehog did not suffer in the least; on the contrary, he ate up the viper in the course of the night, not leaving a trace of him. A gentleman of highest repute for biology in Oxford, who is at the present time Acting Professor, comments thus on Mr. Langdale's letter:—"Bell's British Quadrupeds, 2nd edition, has no mention of any such fact. Rats are very destructive to eggs and young animals. They have been known to exterminate rabbits and puffins on an island, and they have even under force of hunger slain men. The hedgehog habitually eats toads, among other things. Dogs, of course, find the skin secretion very disagreeable. The secretion of the glands, especially about the head in salamanders, causes epileptiform convulsions when injected into the blood of small animals. The toad's secretion is poisonous to a less degree.'"—"West Sussex Gazette," May 9th, 1889. "Selborne Column," conducted by the Rev. H. D. Gordon.

[The above is interesting in connection with the question on the subject asked by Mr. J. Steele Elliott (Zool. 1912, p. 234).—ED.]

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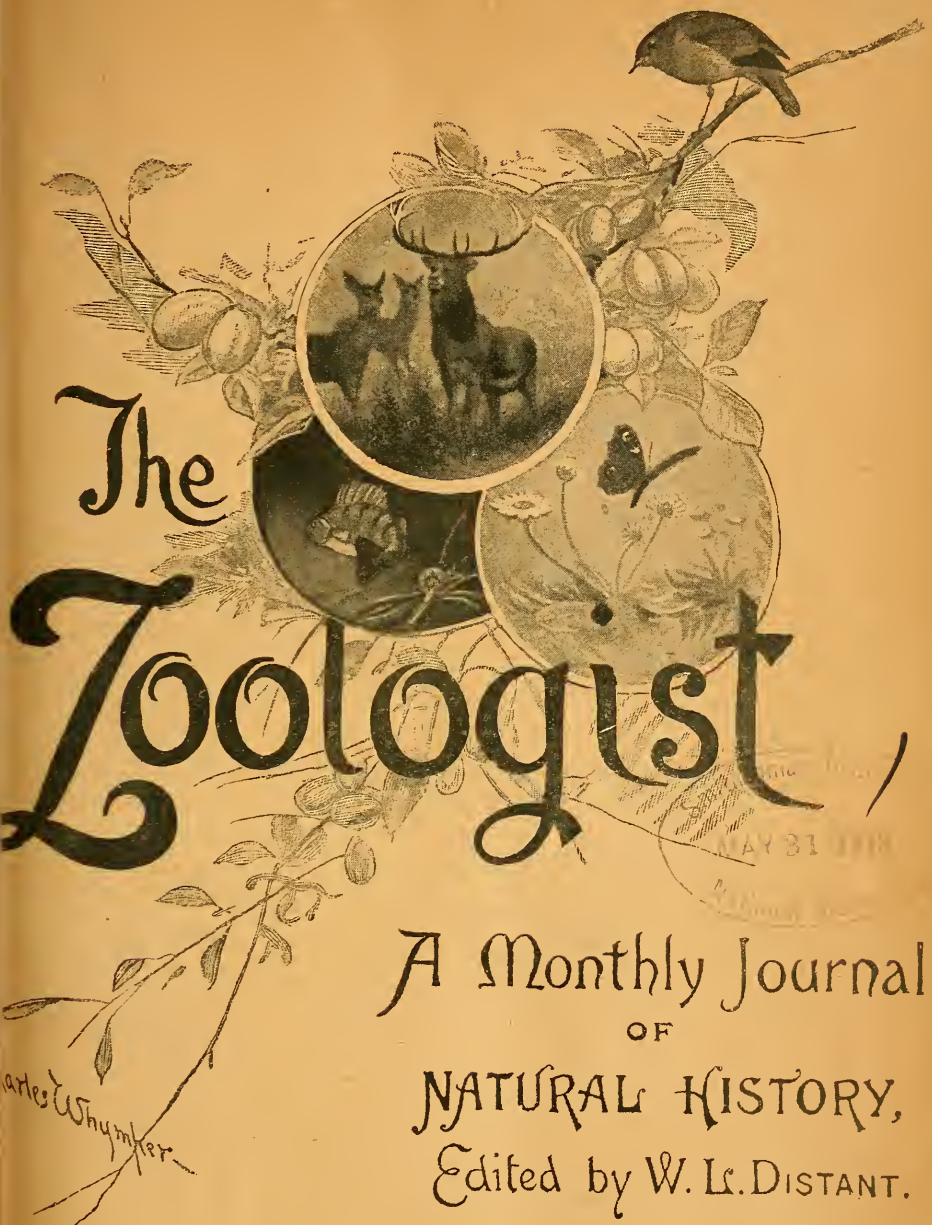
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THE ZOOLOGIST

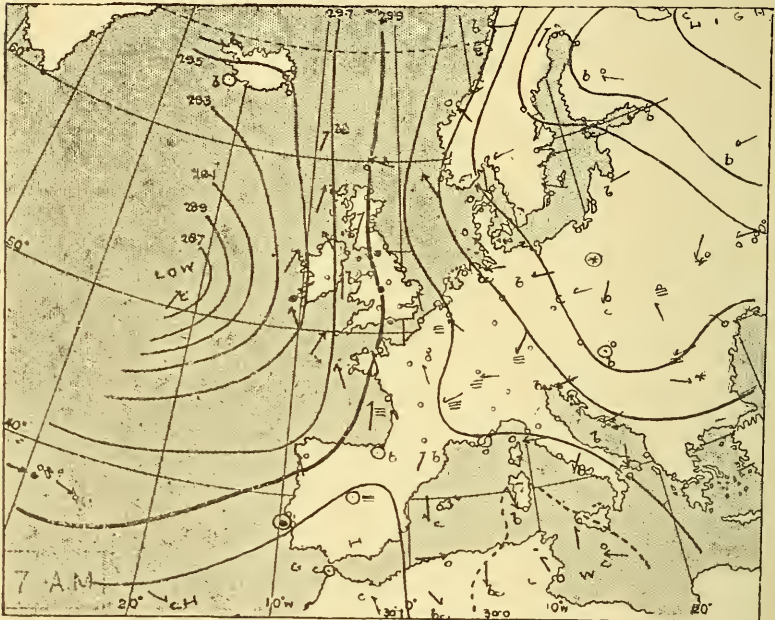
No. 863.—*May 15th, 1913.*

ORNITHOLOGICAL REPORT FOR NORFOLK (1912).

By J. H. GURNEY, F.Z.S.

THE year 1912 has been noticeable for the great rush of wildfowl which, the gales and Arctic weather combined, brought us in January not only Ducks of all the familiar species and Brent Geese, but also hundreds of Little Auks, of which 'The Zoologist' has already had some account from the pen of Mr. Arthur Patterson (*Zool.* 1912, pp. 115, 418). Sharp as was the weather in Norfolk and Suffolk, we must turn elsewhere to account for the presence of all these birds, namely, to the conditions which prevailed much further north, and especially in the north of Scotland, the Orkneys, Shetlands, and in the Faroes. In the Shetland Islands the wind blew a gale on Jan. 15th, its direction being from the south-east (S.E., force 7), and here, it seems, we have the key to this southward rush of wildfowl into England. On the 16th the wind was still higher, being S.E., force 8, at the Shetlands, and on the 17th and 18th it had reached to force 9, which is almost a hurricane, after which it dropped. On none of these days was there much frost in Scotland or the Shetland Isles, the thermometer, according to the returns, not falling lower than 38° at any station, but in Norway the readings were lower. If, therefore, the wildfowl came from Scotland and the isles beyond, as I suppose, it is evident that they were not expelled by frost, but that the rush was due to wind and wild weather.

The Breeding Season.—As far as common birds are concerned, the nesting season was fairly prolific. The breeding of the Common Sandpiper for the second time in Norfolk is an event of importance, while the nidification of the Curlew near Lynn, of the Bittern on the Broads, and of the Little Owl (on Mr. Tracey's authority) is certainly not less so; moreover, except in the case of the Owl, they are proofs of the value of protection. The spread of the Little Owl, which is general in other parts of



January 15th, 1912 (see preceding page).

England, seems to be making itself felt in Norfolk. My correspondent, Mr. Tracey, had it on good authority that some bred not very far from Lynn, and he was actually shown four eggs, besides a photograph which had been taken of some young ones.

On June 1st a flock of about twenty Crossbills was seen by the Rev. M. H. Bird, busy on a clump of fir-trees at Wroxham, and this is the only wandering band that either he or I have heard of. My gardener, who knows them well, identified a single Crossbill on the wing at Northrepps in September, and again he saw a single bird towards the end of October. This does not

look like breeding; and, as regards nests, there is not much to announce this year, save that a few may have bred on the western side of the county, and that a supposed nest was built in a fir-tree at Caister, near Yarmouth (T. W. Hogarth). Another nest was recorded in the north of Suffolk, which has been more favoured than Norfolk by Crossbills.*

The Autumnal Migration.—The movement which Mr. B. B. Riviere and Mr. S. Long witnessed in November was, as all our great autumnal rushes of birds have been before, a movement from the east. This time the advancing army must have come to England in great strength, and, as has happened before, the species were many, and their arrival more or less continuous throughout the day. When autumn migrants, and especially when migrants of many diverse species, are seen coming into Norfolk by day, as in this instance, it has generally been assumed, and with reason, that their passage has been retarded by contrary winds. It is always dangerous to theorise, but so far as local observations go, it would seem that very few, if any, migrants arrive by their own choice on the coast of Norfolk in the daytime, except Rooks and Crows, and perhaps Sky-Larks. Yet probably the Larks which we see are few indeed to what pass over in the night, for Mr. Eagle Clarke says that no other species perishes in such numbers at the light-stations as Larks do ('Studies in Bird Migration,' i. p. 230). On referring to the Daily Reports issued by the Meteorological Society, it is clear that the theory of a retarded migration is borne out by what happened on Nov. 6th and 7th. At 7 a.m. on the morning of

* The earliest notice of the Crossbill in this country, if not in any country, is contained in Paris 'Chronicle,' under date of 1251:—"In the course of this year [1251]," writes the Monk of St. Albans, "about the fruit-season [*i. e.* September], there appeared, in the orchards chiefly, some remarkable birds, which had never been before seen in England, somewhat larger than larks, which ate the kernel of the fruit and nothing else, whereby the trees were fruitless, to the loss of many. The beaks of these birds were crossed, so that by these means they opened the fruit as if with pincers or a knife; and that part of the fruit which they left was, as it were, infected with poison" (Bohn's translation). I believe my late father's notice was drawn to this passage about 1862, and in 1880 Professor Newton, who very likely received a reference to it from him, ascertained, through the medium of "Notes and Queries," that the original account in manuscript still existed at Corpus College (*cf.* 'British Birds,' iv. p. 190).

the 6th the wind was south-west in Norway, being registered S.W., force 8, at Skudesnæs, and S.W., 6, at Karlstad, Christiania and Bodo. It was south-west also at three stations in Sweden, and at two in Denmark. This south-west wind, then, may be fairly considered to have been the factor which checked the migrants bent on coming to England; they did actually arrive in Norfolk and Lincolnshire on Nov. 6th, but if it had not been for the wind they would have arrived sooner. Those, again, of which Mr. Riviere witnessed the arrival on the second day, namely, on Nov. 7th, were in all probability held back or checked by the same cause, for the wind on the evening of the 6th was again south-west in Denmark and throughout the south of Norway, reaching its maximum (S.W., force 6), according to published returns, at Christiania.

Thanks to Professor J. Thienemann, this great movement of migratory birds can be traced as far as the Baltic, but it probably had its origin still further east; in fact, there may have been, and probably was, a wave of birds moving westward at one time over the greater part of Central Europe, having its origin in Russia. It may be asked: Why do migratory birds leave Europe for the shores of England when the wind is against them? The answer probably is: (1) that the time for departure has come, or is already past, and their numbers are in danger of becoming congested; and (2) that most birds are indifferent to a moderate head-wind so long as the land is beneath them, and when they come to the sea they go flying on, impelled by that "sixth sense" which human beings do not possess.

As regards the speed of migratory birds, about which so much has been written, here again the wind comes into play, for their speed, I believe, depends largely, if not principally, on its force and direction. It is difficult to credit a hundred miles an hour as possible for any bird, except it be carried over the North Sea in one of our great easterly gales like a scrap of paper. It then ceases to be a free agent, and is very fortunate if it reaches *terra firma* alive. Under ordinary circumstances the rate of a migrant's speed probably does not exceed thirty miles an hour, and it would be much less with a strong head-wind, I am persuaded. It is true that this does not coincide with the opinions expressed by H. Gätke, but it agrees with the later and more

matured conclusions of Mr. Eagle Clarke ('Studies in Bird Migration,' i. p. 25; ii. p. 29). There is a well-authenticated story, vouched for by the late Mr. W. B. Tegetmeier (*cf.* 'The Field,' July 9th, 1898), of a Homer Pigeon, released in the Shetland Isles, which, with a good wind at its back the whole way to England, did five hundred and ninety-one miles in sixteen hours, and this, though considered to be one of the fastest flights on record, only works out at thirty-seven miles an hour. It is, therefore, evident that a hundred miles an hour must be a very unusual speed for a bird of whatever species. The fastest flight on record of a monoplane up to the present has been only ninety-seven miles, and of an express train much less. Supposing that the birds seen by Mr. Riviere kept up a speed of twenty-five miles an hour, they would have taken five and a half hours to travel from Holland, or thirteen hours to travel from Denmark, or thirty-four hours from Rossitten, in the Baltic, where, as will be mentioned presently, Professor Thienemann reports "a great migration" on Nov. 5th.

Principal Rarities.—The principal Norfolk rarities for 1912 were: A Little Bustard and a Great Skua in January; a White Stork in April; a Scops Owl in June; a Squacco Heron and a Great Reed-Warbler in July; a small flock of Barred Warblers in September; an Aquatic Warbler, a Nutcracker, two Ruddy Sheld-Ducks, and a Porphyrio (but these latter had probably escaped) in October; a Glossy Ibis in November, and another in December.

I have copied all the notes in Mr. Jary's "Diary" about the Spoonbill, as that is a bird of special local interest, but have not thought it necessary to do the same with observations about Terns and other water-birds seen on Breydon Broad, as they can be obtained *in extenso* from Mr. H. P. Frederick, the Honorary Secretary of the Breydon Wild Birds Protection Society, whose balance-sheet, I am sorry to see, again shows a deficit. This useful Society, started by the late Sir Edward and Professor Newton, would collapse but for outside aid, in which case the Spoonbills would soon disappear.

The Weather.—The year's rainfall was unprecedented, owing to the great cloud-burst on Aug. 26th, which brought down from seven to eight inches of rain, and did enormous damage. For

the twelve months, two rain-gauges kept in the parish of Keswick made the rainfall respectively 34·08 and 34·73 in., and on the other side of Norwich it was more. In other respects the weather was not abnormal.

JANUARY.

4th.—W., 3. A very mild day. Thrushes singing, and Wood-Pigeons cooing. A Little Bustard† shot near Norwich by Mr. A. Mason, by whom it was exhibited before the Norwich Naturalists' Society. Another was shot in Kincardineshire on the 1st, and another in Devonshire on the 11th ('British Birds,' vi. p. 225); probably they all started from the same area, wherever it was. Although a species of southern distribution, the visits of the Little Bustard to England are generally in the winter.

6th.—An immature Black Guillemot at Blakeney (Sir T. Digby Pigott).

10th.—A Stone Curlew seen at East Ruston, and a Bearded Tit on Brunstead Common (M. C. Bird), and the day following Mr. F. H. Barclay flushed a Bittern at Hoveton, from a reed-bed, and saw a fine male Goosander.

12th.—Twenty-five Woodcocks obtained by H.R.H. the Prince of Wales at Castle Rising.

15th.—S.E., 3, at Yarmouth. On this day thousands of Lapwings were noted by General Upcher to be congregating on the extensive marshes of St. Olive's. These feathered barometers were perhaps from Scotland—at any rate, they knew what sort of weather was coming, and their foresight had made them the first to seek safety by going south in search of soft pastures, where worms were still to be found.

16th.—S.E., 5. All sorts of Ducks rushing through Yarmouth roadstead (Mr. Arthur Patterson). Mr. Ben Dye writes: "Strong south-easterly gale; numerous flocks of Wild Ducks, Brent Geese, Scoters, Knots, and Dunlins" passing.

17th.—E.S.E., 6. This was a very sharp day—what one knows only too well as a keen, biting, wind-frost—and was followed within twelve hours by snow. The wind at Yarmouth got up to force 6, which is equal to thirty-five miles an hour, while further north it rose still higher, amounting at Spurn Point to force 10, which is almost a hurricane. Wildfowl were everywhere on the move, particularly on or near the coast, and

an army of shore-gunners turned out to salute them. Mr. Dye, writing again from Yarmouth, says: "Gale continuing; Scaup, Sheld-Ducks, and Mallard going south"—there were wildfowl everywhere. Going out with some friends, we got three Teal and fifteen Mallard, and saw a great many more, as well as four Tufted Ducks,† which were too wild to be secured. On some of the Broads there were so many fowl that the water was literally black with them, I was told.

18th.—Mr. Patterson saw a flock of nearly seventy Brent Geese, and a few days afterwards Mr. Dye heard of eight of these birds being killed at one discharge. Examples sent to Mr. E. C. Saunders included what is most probably the Pale-breasted Brent (*Branta b. glaucogastra* (Brehm)). They must have been abundant at many other places, as later on Leadenhall Market was full of them, some with pale under parts, and others very dark.†

19th.—Goosanders reported at several places on the coast-line, as well as on some of our inland Broads; one which Mr. Roberts received from Bacton, had in it a small Pike.† Some fine old Golden-eyes have been shot, and at least ten adult Smews passed through the hands of Mr. E. C. Saunders and others.

20th.—*Little Auks*.—Following on this rush of wildfowl came an invasion of Little Auks, and at the same time some Slavonian and Great Crested Grebes; these latter were, I conclude, driven from inland waters to the sea. Perhaps the reason for the Little Auks being later comers than the Wild Ducks and Geese was that their progress would be more by swimming than by flying, also that they came from further north. The first intimation of their presence was at Cley, where several were to be seen from the beach on Jan. 20th (H. N. Pashley), the same day on which they were seen off Yorkshire. Examples, living and dead, were speedily picked up, not only there but at many other places near the sea. Others were found stranded on the shore, either dead or incapable, especially at Wells, Blakeney (Pashley), Cley, Salthouse, Cromer (H. Cole), Mundesley, Eccles (M. C. Bird), and Yarmouth (E. C. Saunders). No attempt was made to count them, but, including what were seen at sea, they must have exceeded two hundred and fifty; still, I hardly think they were as numerous as in 1895, when three Norwich birdstuffers set up

eighty-four. Mr. J. W. Smalls, of Wells, considers that sixty occurred at that place alone this year. One† dropped in my stable-yard at Northrepps, and, having found its way in by an open door, was discovered there next morning, but, though seeming to be uninjured, it did not live long. Mr. Patterson was told that some of the Little Auks actually dropped on fishing-boats, which is very unusual, I should say. A Little Auk,† which Mr. T. E. Gunn had alive, showed the white spot over the eye particularly well, and we noticed how prominently it stood out when the Auk was excited, but when quiescent it was almost lost. The somewhat inflated cheeks were also noted, and it appears that they can be used as a receptacle for food. The tongue is large and white, and the palate serrated, or, as Macgillivray better describes it, "covered with horny reversed papillæ." The glossy blackness of the back is a striking feature, but this quickly fades. No observations were made as to separation of the sexes this time (*cf.* Zool. 1896, p. 171, and 1900, p. 125).

21st.—According to 'The Angler's News,' the Pink-footed Geese feeding in the Holkam Marshes on Sunday (21st) were so numerous that one could not count them. "They resembled a flock of sheep, and it is no exaggeration to say that as many as six hundred were to be seen at one time. Amongst these was one bird of a creamy white." . . . (J. W. Smalls). This may have been a Snow Goose from Woburn, where they are bred by the Duchess of Bedford.

25th.—A Little Gull found dead in a reed-bed at Hoveton by Mr. Barclay.

28th.—A Great Skua found dead on the beach by Mr. H. Cole; also a Woodcock, a Curlew, a Velvet Scoter, a Mallard, a Herring-Gull, two Common Gulls, several Black-headed Gulls, two Razorbills, nine Guillemots, five Little Auks, three Oystercatchers, and a Pheasant. All this miscellaneous collection was lying on the shore in the short distance (five miles) between Cromer and Mundesley. The Great Skua, which is a rare Norfolk bird at any time, was in good condition, but several of the other birds were partially eaten, probably by starving Gulls. On this day there were 15° of frost.

29th.—A Bernicle Goose shot at Runton (H. Cole). Two Dabchicks beneath the Bishop's Bridge in Norwich (E. Gunn).

FEBRUARY.

2nd.—This was the coldest day of all, the thermometer being nearly down to zero, with very little wind. Eighteen Wild Geese flew over Northrepps Hill House (Burdett), and there were nearly a hundred frozen-out Waterhens on the Keswick River, besides two Water-Rails. Redwings had a hard time of it, and a Bittern was picked up dead. Other species which suffered were the Wren, Chaffinch, Bearded Tit, Kingfisher, and Coot (E. C. Saunders).

4th. — Mr. Cole, again continuing his researches among the *débris* at high-water mark, but in an opposite direction to his last walk, found twelve Little Auks on the beach between Cromer and Beeston, as well as three Razorbills, seven Guillemots, two young Puffins, one Great Black-backed Gull, and six Black-headed Gulls.

8th.—After this the weather improved, though still very cold. On the 15th a pair of Whooper Swans paid Keswick a visit, and seemed content with our small river (the Yare), until one of them allowed my nephew to get within range, and it now adorns the National Collection. I am not sure that I have heard of any Whooper Swans on our river since February, 1838, when my father nearly approached four at Earham (1838 was a great Swan year; cf. 'Guns and Shooting,' by P. Hawker, 1844, p. 274).

22nd.—The Rev. M. C. Bird observed two pairs of Mistle-Thrushes already nest-building, and on the 29th a Bittern was booming.

MARCH.

2nd.—With these signs of spring it was not surprising to hear of the Ringed Plovers having returned on the 2nd to Santon (W. G. Clarke), which is near Thetford.

29th.—Mr. W. G. Clarke flushed a Stone Curlew at Honingham, where he says a pair remained until the beginning of August, and, he thinks, bred; the next day one was seen at Icklingham by Mr. C. A. Hamond. Two or three pairs, I am informed by Mr. N. Tracey, breed at Roydon; I learn also from Mr. Tracey that a pair of Curlews (*N. arquata*) bred again near Lynn, and hatched off.

APRIL.

19th.—Sky-Lark's nest with three young.†

22nd.—The Tawny Owls again had young in the same pigeon-

locker as last year (Zool. 1912, p. 129), which is fixed on a pole about twenty feet high, but to-day one of the nestlings† was lying dead on the grass; a large pellet of rat's fur, which it had tried in vain to eject, had stuck in its mouth and apparently suffocated it. Tawny Owls do not leave pellets in the holes in which they nest, in this respect their habits being much more cleanly than the Barn-Owl's. Mr. Steele Elliott, in his excellent account of this species (Zool. 1912, p. 293), does not at all overrate the boldness of the Tawny Owl in defence of its young, of which I have had evidence more than once; in fact, to approach a nest at such a time is distinctly dangerous, and in France once cost a too venturesome boy an eye. This happened near Avranches, in Manche. I have found the Eagle-Owl to be very savage also in confinement when it has young.

24th.—Lesser Redpoll's nest with five eggs at Croxton (B. B. Riviere).

26th.—A White Stork seen at Hickling. I hope it escaped and passed on.

29th.—This afternoon I accompanied Mr. Robert Gurney to a place where a Bittern was believed to be. It was not audible until 5.45 p.m., and then only faintly, but during the next two hours it went on booming pretty loudly at intervals. Altogether we counted about ten booms, none of them lasting more than forty-five seconds. It is a sound which cannot be expressed in words, and a well-known writer is not far wrong in applying to it the epithet "awful." First there comes a long-drawn gasp, then another and another, each louder than the one before it, until the weird sound is like a regimental drum, and then in a moment it abruptly ceases. There are three consecutive booms, or five; I did not hear more. It is only the male which booms, and if the weather is windy and unsettled, he remains silent; the Broad-man says sunny weather is what the Bittern likes best, and then he will serenade his mate. I understand the female has also a cry, but it is not like the male's.

MAY.

2nd.—*Norfolk Spoonbills*.—Every year we have the presence of Spoonbills on Breydon Broad, which I imagine is the only place in England annually visited by them. Here, instead

of being shot as formerly, they are now protected by a paid watcher. Two appeared on May 2nd (the wind in the night being S., 3), one of them, according to our watcher Jary, a fine bird, the other smaller. Soon after this a pair, possibly the same, were seen by Mr. C. Borrer in the north of the county, and on the 6th Jary reported three at Breydon. On May 20th he saw another, which had found a mate on the 22nd, but they only stayed until the 27th. On June 5th three more came to Breydon, these being probably from Southwold, in Suffolk, where Mr. J. G. Tuck had seen them the day before, but they did not stay longer than the 8th. After an interval of five weeks there was another on the muds on July 13th, apparently a young bird of the year, and this had a companion on the 19th. Breydon Broad, however, was not sufficiently quiet for their taste, and both of them had gone on July 21st, but they thought better of it, and came back on the 23rd, only to depart once more on the 26th, after which Mr. Borrer heard that they were seen at Cley, but no more came to Breydon. Although the Spoonbill has been occasionally recorded in winter, it is essentially a summer migrant to the eastern counties. On looking back to previous "Reports" (Zool. 1904, pp. 206 *et seq.*), it will be seen that the earliest arrival of the Spoonbill on Breydon Broad has generally been in April. Since 1897 it has been noted eleven times in that month, as against three in May and one in March. Sir Thomas Browne, who wrote about 1663, regarded them as summer migrants coming to Norfolk in March, but no doubt they were commoner then; yet he only knew of them as breeding at the mouth of the Orwell, in Suffolk.

3rd.—Three Teals' nests, containing clutches of ten, four, and eight eggs (the last unfortunately trodden on by cattle), were found by Mr. B. B. Riviere on one of the Broads adjacent to the River Bure.

12th.—Two nests of the Gadwall, containing respectively nine and seven eggs, found by Mr. Riviere on the western side of the county. Two Reeves were also seen by Mr. Riviere and Mr. Meiklejohn at Fowlmere Lake, near Thetford, possibly revisiting a site where their predecessors had once bred.

21st.—An Orange-legged Hobby (?) seen on one of the Broads by Mr. E. Meade-Waldo. This species and the Common Hobby,

one of which was identified at Wootton on the 15th (N. Tracey), are now about equally rare in Norfolk, thanks to gamekeepers, who have entirely destroyed the small breeding stock of the latter bird.

28th.—An Osprey seen by Mr. F. H. Barclay at Morston, where it had been some time fishing the channel up to Cley, and often resting on the river-posts.

31st.—One day this month Mr. Pashley observed a fine Blue-throat perched on his garden-wall, which is nearly in the middle of the village, and he could hear another calling in the next garden. Their presence with us is not often detected in the close-time; unfortunately he omitted to note the exact date.

JUNE.

5th.—*Norfolk Terneries*.—Walked to Blakeney Point with three good naturalists who had not seen our largest settlement of Terns this year, on our way counting nineteen Sheld-Ducks, and finding the wings of a dead one. Since the publication of an account of this fine settlement (Zool. 1904, p. 216)—for it is not correct to speak of any permanent breeding-place as a colony—it has increased apace, and at the present time the watcher put on by Mr. Quintin Gurney estimates the nests at: Common Tern, 350; Lesser Tern, 100; Ringed Plover, 40; Sheld-Duck, 3 or 4; Oystercatcher, 1. We quickly noticed many Common Terns' nests, some containing three eggs, others only two, but not a single egg was hatched. There was frequently so much disparity amongst the eggs both in size and colour as to lead to the conclusion that different individuals make use of the same nest. Most of these so-called "nests" had a fabric of bents of sea-marram, but in some there was none at all. All of them were located in the open, none having sought the shade of the *Suaeda fructuosa*, which grows abundantly at Blakeney. From time immemorial one pair of Oystercatchers has bred, or tried to breed, here, but it is curious that not more do so, considering the extent of suitable ground. We had expected to find the eggs hatched, but they must have been a late clutch, for they were not, and my nephew found them still intact on June 15th. With regard to the smaller settlement of Terns at Wolterton, Mr. G. Cresswell, who has done his best for many years in protecting

them, informs the subscribers, in an interesting Report, of the arrival of both the Common and Lesser species on April 20th, and the finding of the first Lesser Tern's egg on May 12th. The number of nests of each species was in excess of 1911, namely, 73 Lesser Terns' nests as against 59 in 1911, 100 Common Terns' as against 73, and 66 Ringed Plovers' as against 49. There is another Ternery at Wells, which, thanks to Mr. Hamond, has been well guarded.

15th.—A Scops Owl, shot at Heacham. I learn from Mr. B. Lowerison, by whom its specific identity was established, that for a month previous its monotonous "kiu, kiu"—a sound to be often heard in the South of France—had been heard almost nightly in a grove near the river, an interval of about five seconds regularly intervening between each note. I am afraid this interesting visitor fell a victim to the irrepressible gamekeeper at last, unlike one which appeared at Sidestrand in April, 1892, which was fortunately protected. This makes six reliable occurrences for the county.

27th.—This morning Mr. Falcon was walking with his spaniel by the Bure, at Coltishall, when the dog ran into some herbage about fifty yards from the river, and brought out a nestling Common Sandpiper, still in the down, but large enough to run well when released. Going to the same spot in the afternoon with Mr. Falcon and another friend, we failed to find the young one again or its nest, but both the parents were there, and the female, evidently greatly agitated by our presence, perched repeatedly on trees near by, even on branches as high as twenty-five feet from the ground, uttering all the while a piping cry, which we took to be a note of warning to the young to keep where they were hidden. Although a few Common Sandpipers generally stay in Norfolk and Suffolk until June, and although they have been often suspected of breeding, this is only the second case in which we have obtained actual proof of their having done so, the first one having been in 1897 at Hickling (*cf.* Zool. 1898, p. 110).

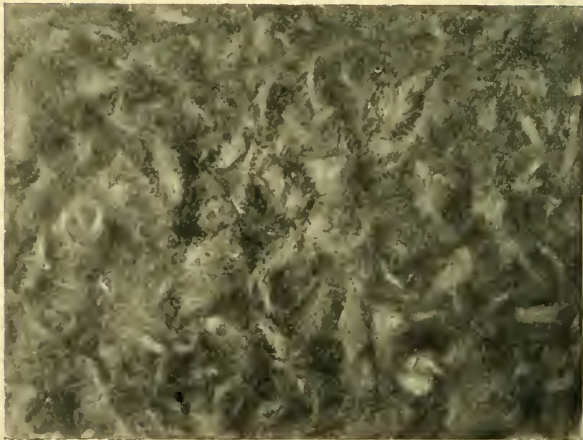
JULY.

5th.—According to an announcement in 'The Zoologist' (1912, p. 420), and 'British Birds' (p. 122), a Squacco Heron was shot at Horning, but I have not seen it; it is fifty years since this

species has been observed in Norfolk. The shooter, whoever he was, laid himself open to a fine, of which he was possibly not aware. The body was submitted to a well-known naturalist, who



Contents of a Barn-Owl's Stomach.



Fur of Voles and Shrews from Barn-Owl's Stomach.

states that the genital organs were not very large, from which he concluded that it was a non-breeding bird; but, in any case, it was not allowed the chance of finding a mate.

10th.—Invited to inspect four young Barn-Owls in a pigeon-loft no longer used by Pigeons. A few days afterwards (18th) Miss Buxton found lying on the ground under the entrance to the loft a young rat and a nearly full-grown Snipe†, minus its head. This must surely be very unusual—at least, such an incident as a Barn-Owl killing a Snipe has never come under my notice before. May I here introduce two suggestive photographs, taken in Yorkshire by another friend of the Barn-Owl, Mr. G. Parkin; one gives the contents of a Barn-Owl's stomach, *viz.* bones of mice and young rats, the other the conglomerate of fur from which they were extracted (p. 174). On May 21st, Mr. Riviere was shown a Barn-Owl's nest containing six eggs and a young one—a large clutch certainly, but I have twice found seven eggs at Keswick. The Barn-Owl generally lays more eggs than the Tawny Owl.

21st.—Mr. E. Campbell Taylor saw a large Reed-Warbler, which he is satisfied was *Acrocephalus turdoides*, about a mile from where one was seen by the Rev. M. C. Bird in 1906 (Zool. p. 132). It is possibly a regular visitor to our Broads in very small numbers, and, if so, no doubt breeds here, which would not be surprising, as it is pretty common at Amiens, in France, less than three hundred miles away.

AUGUST.

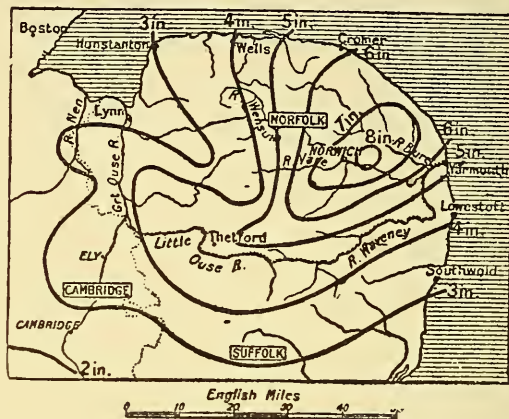
9th.—A Willow-Tit obtained near Beccles by Mr. C. B. Ticehurst ('British Birds,' 1912, p. 218). In the new 'Hand-list of British Birds' (1912) the Marsh-Titmouse is split up into three races, of which this form, there called the Northern Willow-Titmouse, is the palest.

21st.—A Bittern seen by Mr. Robert Gurney on a tussock of bent-down reeds, with a completely fledged young one standing by it, its beak pointing up to the sky in the protective way usually assumed by this species. Although he was within an oar's length of both of them, and could even touch the young one with his hand, it was too agile to be caught.

24th.—Much rain to-day and yesterday. At 6 p.m. six Swifts passed, going east.

26th.—E.N.E., 6. *Six hundred and seventy million tons of rain in one day.* Very heavy rain began at 4 a.m., and continued

falling all day, accompanied by an easterly gale. At 5.30 p.m. $6\frac{1}{2}$ in. had been registered in my garden. At Norwich $7\cdot34$ in. fell in fourteen consecutive hours (A. Preston). Enormous damage was done throughout Norfolk by this terrific downpour,



which, as the map shows, was especially heavy near Norwich, and between that town and Cromer. Many Pheasants were drowned, and a certain number of Partridges, but other species did not seem to suffer appreciably.

SEPTEMBER.

3rd.—N.W. to S.W., rain. As stated in 'British Birds' (p. 220), a Barred Warbler—a species of which 'The Zoologist' gave a good figure in 1909, by Mr. Arnold (Plate II.)—was shot at Cley, which, with the projecting promontory of Blakeney, now purchased by the National Trust, acts as a concentration area for many rare birds. Three more were seen there, and another was identified at Lowestoft by Mr. C. B. Ticehurst a few days before. Two also occurred in Yorkshire (*l. c.* p. 217), besides three in Shetland and two in the Isle of May ('Scottish Naturalist,' 1913, pp. 51, 67), and one in Ireland; so the British Isles were extensively visited by *Sylvia nisoria* in 1912. Even allowing for the great increase in observers, this species must surely be admitted to be more common than formerly.

10th.—The first appearance of Pink-footed Geese at Holkham, noted by Dr. Penrose.

14th.—An Arctic Tern on Breydon Broad (B. Dye).

OCTOBER.

5th.—W., 2. Two Ruddy Sheld-Ducks shot on Breydon Broad (E. Saunders), but these may have been escaped birds.

13th.—Green-backed Porphyriot at Barton Broad; this also may have been an escaped example. Black Redstart at Wells (S. H. Long).

23rd.—W., 2. About a hundred Redwings came in from the sea at Overstrand. Aquatic Warbler at Cley ('British Birds,' p. 220).

26th.—W., 1.—I learn from Mrs. Fowler that quite early in the morning an unmistakable Nutcracker was sitting on the roof of Gunton Hall, which is less than a mile from the sea. No attempt was made to shoot it, and it presently flew away, but in the afternoon was again seen being chased by a Goldfinch. This is in the same parish, and close to the spot where a Nutcracker was seen by Miss Fowler on Nov. 26th, 1907. Another occurred at Gorleston, which is close by, in October, 1864, and another at Somerleyton; so this neighbourhood has been favoured.

31st.—Six Snow-Geese, as I am informed by Mr. Pashley, were seen on the coast; these probably belonged to the Duchess of Bedford.

NOVEMBER.

1st.—A Glossy Ibis on Filby Broad, and another, on Dec. 2nd, near Burgh Castle (E. C. Saunders). The wind on Oct. 31st was N.W., 4, but I believe one, if not both, of the Ibises had been seen before that date.

3rd.—Mr. Patterson saw two Little Auks on the wing passing Yarmouth.

6th.—*Great Rush of Birds.*—At 7 a.m. the wind was N.E. at Great Yarmouth, and S.E. at Mundesley, but very light at both places. Whether the great rush of the autumn had been going on all day, or whether, indeed, it began on Nov. 5th, is not known, for it was only in part witnessed by two naturalists, Mr. B. B. Riviere and Mr. Sydney Long, who fortunately happened to be at Hunstanton, which is situated on the most rounded part of the Norfolk coast, and a favourable place for observation. From Mr. Riviere I learn the following particulars: From 6 p.m. on the evening of Nov. 6th, when the wind was veering to the south, but soft, until 11 p.m., when he and his friend retired to rest, great numbers of birds were following the coast-line at

Hunstanton, and the notes of Titlarks, Snow-Buntings, Fieldfares, Lapwings, Golden Plover recognized. The movement went on all night, for the notes of the birds were heard continually. Next morning (Nov. 7th) there was a S.W. wind, but too light to have any effect; though I had better continue the narrative of what Mr. Riviere and Mr. Long saw, in the former's words:—
 “ We were out at 7 a.m., and were met by really an extraordinary sight—a continuous stream of birds, all flying south past Hunstanton, following the coast-line, and flying over the beach, and some over the sea—that is to say, following down the east side



of the Wash. The birds were Hooded Crows, Rooks, Carrion-Crows (or else young Rooks, but, anyhow, feathered to the bill, with no bare skin around bill), Jackdaws, Lapwings, Fieldfares (in large numbers), Redwings (or possibly Song-Thrushes, but I think Redwings), Starlings (in enormous numbers), Sky-Larks, and hundreds of small Finches, the only ones which settled or came low enough to identify being Greenfinches, but I am sure there were Linnets, and I distinctly *heard* Chaffinches. We also heard Snow-Buntings. A good number of all these birds were flying at a great height, especially the Fieldfares, some of which were only just visible in the sky through Zeiss glasses, and I am certain there must have been more, quite beyond the field of

vision. Some of the small birds, which flew like Finches, were also at a great height. At nine o'clock we started walking up the coast north, with the birds coming towards us in undiminished numbers, and we reached the north coast, past Holme, and walked east nearly to Brancaster; the birds were then coming out of the east—that is to say, they were following the coast of Norfolk [see map]. The number of Starlings which must have gone by between 7 a.m. and midday is almost inconceivable, and I imagine they were passing all night as well." Mr. Riviere also saw two flocks of Wild Geese and eight Swans, probably Whoopers, as well as a flock of three hundred Twites resting on the ground. One curious feature in Mr. Riviere's narrative is that near Brancaster the birds were flying west, but when they reached Gore Point in Holme, where the coast bends, they preferred turning to the south to crossing the Wash, which is here only thirteen miles broad. As the morning wore on the passage of birds gradually slackened, and during the afternoon it was practically over. Meanwhile, a similar migration on a rather smaller scale, commencing on the 5th, was going on, on that day and the 6th, at Blakeney (R. Pinchin), Overstrand (W. Burdett), and Mundesley (Mack). Nor was this imposing array of birds confined to Norfolk, for in North Lincolnshire, Mr. Caton Haigh informs me, the movement was marked, as it was likewise in Heligoland (A. K. Schneider). But what is still more interesting is that it was registered by that acute observer, Professor J. Thienemann, at Rossitten, in the south of the Baltic, which is on about the same latitude as Edinburgh. Here the species passing, as I learn from Professor Thienemann, consisted of Hooded Crows, Jackdaws, Sparrow-Hawks, Buzzards, Fieldfares, Redwings, and Waxwings. It is exceedingly likely that among this host were some which reached Norfolk and Lincolnshire on Nov. 7th.

14th.—The Little Auk is a species which is much more powerless to resist the wind and waves than the Razorbill, although its wings are not much smaller in proportion to the body. We thought we had done with them for this year, but on the 14th three were detected by Mr. Ernest Gunn from Yarmouth Pier, where some had been seen a few days before by Mr. Patterson. About this time one was picked up on Sheringham golf-

links (Sir Digby Pigott), and several more at Cley and Salthouse, mostly alive (H. Pashley), while others turned up at Wells, and five† at least were sent to Norwich. I had one† from Breydon Broad, and have no doubt that the total movement was considerable. Large numbers were seen on the coast of Northumberland and some in Yorkshire ('British Birds,' vi. pp. 315, 345). The Little Auk has long since been separated generically from the Razorbill, and stands alone the only one of its genus—the genus *Alle*. It seems to be much commoner than it used to be.

DECEMBER.

I find but little in my notes that is worth recording for December, except the Ibis already mentioned. On the 5th Mr. Gerard Gurney flushed a good number of Short-eared Owls at Ringland, on the 17th Mr. Riviere watched a Glaucous Gull at Yarmouth Harbour-mouth, on the 20th there was a Rough-legged Buzzard at Sidestrand, and on the 22nd a Magpie at Brunstead, where Mr. Bird had never known one to be before.

VARIETIES OF PLUMAGE.

On Sept. 3rd a White Swallow† was picked up at Salthouse (C. Hamond), and the day following a pied Lapwing† was shot in the parish of Weybourne adjoining by Mr. Spurrell. On Oct. 21st Mrs. R. Clarke informs me that she received a "Sabine's Snipe" from Gaywood, near Lynn, which is well known now to be a melanic variety of the Common Snipe.

On Oct. 23rd Mr. T. E. Gunn received a splendid red Partridge† (*Perdix montana*) from Bylaugh, and on Nov. 22nd Mr. Roberts had another† from Foulsham, and Mr. Gunn had yet a third on Dec. 23rd. This bird weighed 15 oz., but Mr. Gunn has had Norfolk Partridges of the ordinary hue which weighed 19 oz. (*cf.* Zool. 1886, p. 480), so perhaps 15 oz. was not exceptional. From Mr. Quintin Gurney I learn that there are believed to be still two of this singular erythrism alive in Sparham, where I lately made an attempt to see them but without success. Including these, the red variety of the Partridge has been recorded twenty-seven times in Norfolk, but, according to Mr. Bolam's 'Birds of Northumberland' (1912, p. 476), it has been killed much oftener in that county. In Northumberland

also it seems that the first British examples of *P. montana* were recognized. Whether any of these red Partridges are the produce of birds imported by Carl Schaible and others from the Continent is uncertain, but seems probable, as they were met with abroad long before they were known in England. One thing which is curious about this erythrism is that more than two or three are never found in the same covey, either with us or abroad, nor is there any species in which the red pigment which goes by this name shows itself with such regularity, for in this Partridge it may be said to be of annual occurrence.

Some time in November a pure white Snipe†—white, that is, except for a shade of brown on the scapulars—was shot by a warrener on Salthouse Marsh, having probably recently come in from the sea. Mr. Pashley tells me that when in the flesh its legs were a lemon-yellow, and a pale, almost transparent, pink hue also suffusing both the eyes.

DESTRUCTION OF BIRDS AND BEASTS OF PREY.

In last year's Report reference was made to the destruction of birds of prey in Norway, and to the effect which it must infallibly have in reducing the number which migrate across the North Sea to England. Subsequently the late Professor Collett, whose loss all must deplore, was good enough to forward the official list of premiums paid by Government in 1910 for both beasts and birds of prey, that for 1911 being not yet published. One cannot but regret such a wholesale slaughter, which to a naturalist seems very unnecessary, and the wisdom of which is, to say the least of it, doubtful:—Bjorner (Bears), 26; Ulver (Wolves), 35; Gauper (Lynxes), 31; Jerver (Gluttons), 20; Røever (Foxes), 10,983; Maar (Martens), 1374; Orner (Otters), 1508; Lommer (Divers), 5072; Omer (Eagles), 739; Hubroer (Eagle-Owls), 1359; Falker (Falcons), 1768; Hønhøker (Goshawks), 4712; Spurvehøker (Sparrow-Hawks), 9431. The Common Buzzard and Snow-Owl, although not down on this list, were also made to suffer.

THE DIURNAL MIGRATIONS OF CERTAIN BIRDS
OBSERVED AT THE TUSKAR ROCK.

By Professor C. J. PATTEN, M.A., M.D., Sc.D.

INTRODUCTION.

WEIRDLY attractive and novel is the spectacle which presents itself to the student of ornithology as, in his silent night patrol, he watches from the dizzy heights of the lighthouse balcony the behaviour of bewildered migrants as they reel and topple under the mesmeric influence of the luminous beams. Equally attractive, and altogether more instructive in helping one to understand many features of migration which night largely occludes from view, is the study of diurnal movements of birds witnessed before and for some time after the first blush of dawn has dispersed the gloom of night from the rugged surf-lashed island-rock and its girdle of watery waste. Nay, more than this: in the study of diurnal migration one discovers the key to what probably would be, in a great measure, the natural mode of migration in the hours of darkness, if we imagine a complete absence of the numerous lanterns of lighthouses and lightships, whose brilliant beams betray the presence of wave-swept rocks, headlands, and shoals, beams which nightly stave off the imminent dangers to which our ships and lives are exposed, yet beams which entrap and lead to the destruction of numbers of feathered voyagers. A study of nocturnal migration, as the birds, allured by the treacherous dazzle of these resplendent beams, approach the lantern to sacrifice their lives by striking the glass, is a study of bird-migration in a highly distorted form; nor, indeed, is it credible that the multitudes of migrants, which, like glittering hosts, career wildly about in the rays, ever and anon striking the lantern, represent natural assemblies, even allowing that birds are more wont to exhibit gregarious propensities when flying in the dark. From what I have beheld when standing on the balcony, I would

liken the so-called "rushes" of migrants—as heedless of each other's safety and their own the birds dash through the rays of light in wild disorder—to the unwilling assemblage of a panic-stricken crowd trying to escape from the dangers of a threatened disaster. There is good reason for believing that the so-called "rushes" of birds are the outcome of many conjoined assemblies, mustered chiefly in the vicinity of the lantern, the rays of which under certain conditions of the atmosphere are rendered particularly dense and brilliant, and so detain the birds. And although the migrants pass on in time from lantern to lantern, having lost many of their companions *en route*, so retarded becomes their flight under the blinding luminosity that, in certain localities, especially where lanterns are numerous, they are led to combine, even though unwilling, into prodigious and at the same time highly artificial assemblies. Birds migrating in company by day—except when held up by a very dense fog—present no such features: even the aërial movements of *Limicoline* birds (in which systems of flocking on the wing are highly developed, and manifold aërial patterns are displayed) show that the strictest discipline all the while is maintained.

THE SYSTEMATIC STUDY OF DIURNAL MIGRATION.

In studying many problems of bird-migration, careful and systematically conducted observations of diurnal movements—movements not distorted, and in which the birds fraternise naturally—are of supreme importance, and it behoves me at the outset to indicate briefly how I came to give special attention to this part of my research. In the first place, I noticed that on several occasions, when examining nooks and crevices in the Rock for specimens, land-birds were making a passage overhead. This feature was especially noticeable during the early hours of the morning. But at first such observations on my part were rather casual, and usually were only made on occasions when I descended from the balcony at dawn, after having been at the lantern all night. Naturally I examined the Rock before turning into rest, in order to collect any dead, wounded, or exhausted specimens, which might have dropped from the lantern. But there was no occasion to attend

at the lantern every night during the whole period of darkness ; indeed, meteorological conditions were often such that it was inexpedient to do so. Attendance on occasions when no birds, or at the most very few, appeared in the rays and these at long intervals of time, was generally completed about 1 or 2 a.m., and my period of sleep was procured from about 3 to 7 a.m. Hence, I was oblivious of the features of diurnal migration which was going on during most of these hours. Not, however, altogether oblivious. For frequently the Lightkeeper, on early morning watch, would rouse me from my slumbers by telling me of a migration of birds across the Rock, and of those which alighted—sometimes strange ones—and which could be identified. Disinclined to rise so early and at first resentful that the brief span allotted for sleep should be broken into, I soon, however, learned that my best thanks were due to the Lightkeeper, for it was through his instrumentality that I identified many interesting specimens of birds as they tarried for a little on the Rock. I was deeply interested on those occasions when I once got out, not only because I collected specimens, but also because of the intensely important observations which I made. And so completely did the call of the Lightkeeper take possession of my mind that—fully expectant of his arrival—I often found myself awaking spontaneously as the first glimmer of grey dawn peeped through my window. Furthermore, I seemed to become all at once wide-awake, even though I may have lain down but two hours previously. And now, while not only thinking of what might be awaiting my advent on the Rock, but also listening to the actual chirp of well-known birds, there developed within me a glow of enthusiasm which culminated in an ardent desire to rise every morning at dawn for the remaining period of my second autumnal visit.

In the second place, for a different reason, I became anxious to make a systematic study of bird-migration by day, commencing at dawn. In the interval which elapsed between my second and third visit to the Tuskar Light-Station, Mr. Eagle Clarke's eagerly expected and most welcome work on migration was published, and I read with much interest how the author found that diurnal movements of certain birds, Swallows, Pipits, and Wagtails, formed a distinct and important feature as personally

witnessed from Eddystone Light-Station. I was therefore most anxious to compare his results with mine. I may say that in most respects our observations markedly coincided, but there was one very important difference to be made out, namely, that the direction of flight offered, in the main, a marked contrast. I shall return to this point presently. I commenced putting my projected scheme into operation on August 25th, 1912, and rose at dawn every succeeding morning until September 12th; nineteen occasions in all. It was my original intention to continue this early morning rising scheme until the completion of my time at this Light-Station, namely, September 30th, but pressure of work, added to renewed vigiliations at the lantern, seldom allowed me to retire before 3 a.m. However, on most mornings between September 12th and the end of the month, I managed to rise between 6 and 7 o'clock, thereby continuing to make several more important observations. With the exception of a short interruption, lasting about twenty minutes for breakfast, my personal observations, made during nineteen consecutive mornings beginning at dawn, always lasted fully five hours at a stretch; while when migration was particularly active and more prolonged, I increased the span of my watch some hours more.

DIURNAL MIGRATIONS OF WAGTAILS, PIPITS, AND SWALLOWS.

My primary intention was to make observations on Wagtails, Pipits, and Swallows, whose migratory movements appear to be chiefly performed in daylight. However, I gained an insight into some features of diurnal migrations of other species; and inasmuch as I found the majority of these also at the lantern at night, it was incumbent to consider most carefully the circumstances under which the birds appeared on the Rock; also to obtain all the objective evidence possible on this matter from a thorough post-mortem examination of the specimens collected. Passing over this point for the present, I shall now briefly describe the migrations of Wagtails, Pipits, and Swallows. Wagtails had been seen already passing the Rock a few mornings previous to the time when I started my early-rising scheme. But I was in time to make the first record of the migration by day of Meadow-Pipits. This species did not make its appear-

ance on the Rock until August 28th, and I did not detect the regular movement setting in until September 1st. The same may be said of Swallows. The regular migration did not start until August 30th. Prior to this, however, I had seen odd Swallows flitting past at uncertain intervals. From the point of view of obtaining rest it was fortunate that the migration of the above-mentioned birds set in during part of a bright lunar phase, on which nights the rays of the lantern were rendered too feeble to allure migrants, and so visiting the balcony for many hours was not the most profitable way of spending time. It also happened that, as the moon gradually waned and the dark phase was entered upon, very few birds appeared near the lantern, owing to the prevalence of wind and clear atmosphere. Indeed, it was not until the last lunar quarter was almost complete that migrants began to appear in any conspicuous numbers in the rays. This was on the night of September 11th, 1912, from which date, until the end of the month, I renewed my nocturnal watches at the lantern with much regularity, the weather conditions and lunar phases on the whole lending themselves to favourable results. To return to my observations on the migratory movements of Wagtails, Pipits, and Swallows. The daily time of their passage over the Rock was ushered in with marked regularity. Wagtails and Pipits appeared almost synchronously with the ascent of the sun over the horizon, though it was not exceptional to see the birds before sunrise. Swallows were more wont to arrive an hour or two later, but this event also exhibited variation in time within certain limits. At first I used to watch the birds from any point on the Rock. Thinking, however, that my presence might in any way interfere with the natural inclination of the direction or speed of their flight, I decided to keep ambushed in a crevice, where at the same time I could fairly well command a good view of the greater part of the Rock. I certainly found, as far as Wagtails and Pipits were concerned, that by adopting this form of strategy more birds descended and alighted than when I stood up and discarded concealment. Roughly speaking, about 5 per cent. of the total number observed tarried on the Rock. This percentage was taken in the aggregate; daily it varied markedly. Thus, on warm, calm days, as well as on

rough, windy days, more birds seemed to halt than when the weather was intermediate, and especially when it was uncertain in character.

In the first case, the birds, possessed perhaps of an instinctive knowledge that the weather appeared settled, took things relatively leisurely, and so were probably tempted to come down and endeavour to relieve their hunger, small flies, their natural food, being plentifully distributed in warm weather over the drift seaweed and other material. In the second case, the high wind no doubt acted as a deterrent factor in their flight. But I should point out that in reality very few birds appeared under such weather conditions, especially when persistent. Indeed, on several windy mornings no birds crossed the Rock at all. Having alighted, the behaviour of Wagtails and Pipits was fairly characteristic. Both were active and wary, the Wagtails, however, more so, and if I suddenly appeared from ambush the birds would immediately ascend and fly off. When, however, the wind was fresh they laid low, and could generally be approached quite closely. Only exceptionally, however, did I observe exhausted or listless Meadow-Pipits, and no Wagtails in this state. I cannot give at the present moment an estimate of the proportion of White and Pied Wagtails,* but, excluding the small number of Ray's Wagtails which I noted, I would say that these two species, taken together, formed two-thirds, and Grey Wagtails one-third, of the whole number observed. I first was under the impression that the Meadow-Pipit was the only species of its kind which affected these diurnal passages, but at the termination of my visit I collected a Rock-Pipit, which, with several others as well as with Meadow-Pipits, I actually saw descending and alighting as their companions winged their way onwards. The familiar note of the Meadow-Pipit largely predominated, but now and again I detected cries somewhat similar in character, but differing in pitch and accentuation. The similarity of the voice of Pipits

* While this paper has been passing through the Editor's hands, I have carefully examined thirteen Wagtails obtained on the Rock last autumn (1912). I find that eleven are white and two pied. My best thanks are due to Mr. Eagle Clarke for aiding me in the identification of the species, which in immature garb closely resemble one another.

generally renders it a difficult matter in arriving at any conclusions as to what species, rare to Ireland, may have been migrating in company with the common species on some of these diurnal flights. The evidence already given, regarding the circumstances under which I collected the two Tree-Pipits,* leaves little doubt in my mind that these two birds alighted directly on the Rock in daylight, having abandoned their companions as the latter passed by in the vicinity. On this point I shall have something more to say presently. The speed at which both Wagtails and Pipits flew was about twenty miles an hour. I made my calculations, which I claim to be only of approximate value, by measuring one of the major axes of the Rock, an axis which at the same time corresponded to a favourite path pursued by the birds overhead. Then, with a stop-watch, I noted in seconds the time taken by the birds in traversing this axis. I took a vast number of these time-observations, and found that in favourable weather, with light wind, the speed of flight altered but little. The average height at which Meadow-Pipits flew was about seventy feet or two-thirds the height of the lighthouse tower. Wagtails flew higher, passing, as a rule, well over the lighthouse dome; and the average elevation was about one hundred and twenty feet. However, the altitude of flight was subject to considerable variation.

As in the case of Meadow-Pipits, the chirp of Wagtails was dominant and oft repeated, thereby affording me much aid in distinguishing the different species flying past.

Swallows, in making a diurnal passage, swept by the Rock with rapid twisting flight. They did not seem to heed my presence, and often flew close over my head. Now and again a bird or two would forsake its companions and take up a circuitous route round the Rock for the greater part of the day, all the while hawking for insects. Only very exceptionally would a bird alight; when it did it was usually for the purpose of seeking shelter in a large cavern-like crevice. Very different was the case when Swallows, affecting a nocturnal journey, were held up at the lantern in thick weather. These birds, possessed of a marvellous faculty for not striking, wearied

* *Vide* "Discovery of the Tree-Pipit on the Tuskar Rock, Co. Wexford," 'Irish Naturalist,' vol. xxi. November, 1912, pp. 209-213.

themselves out by flying round and round the light for many hours. At length, when day broke, they either settled down on the balcony rails, or descended to the Rock, fatigued to such a degree as to suffer one to capture them almost with the hand.*

The average height from the ground at which Swallows, on diurnal migration, passed by was about forty feet; but their gyratory and undulatory movements through the air subjected the altitude almost to an unlimited degree of variation. The speed of flight was certainly up to one hundred miles an hour.

NATURAL AND EXCEPTIONAL FRATERNITIES.

I now pass on to consider two important features in connection with the above-mentioned diurnal migrants: one, the extent to which the birds tend naturally to fraternize; the other, the factors which seem to be responsible for the formation of larger communities than are usually seen. In regard to the first feature, I may say that were one to make merely a few casual observations on a small party of passing migrants, and because these birds were not immediately followed by others, the watch was discontinued, or, at all events, carried out in a disconnected way, then the fundamental feature of diurnal migration here would be lost sight of. That is to say, its more or less continuous or chain-like character, which becomes evident only when a lengthened watch was kept up, would not be observable. For in this chain are links of various sizes and shapes, and here and there gaps exist where the links are broken. Even when an intermission of fifteen minutes or so takes place and no birds are seen, and allowing that more than one link is severed, yet the chain-like character, as the migrants stream past, singly or in small parties, for perhaps *six hours on end*, is still quite evident. Pipits formed a more continuous chain than did Wagtails, but it is not my intention in this paper to enter into details on the migrations of these or any other birds, which are being dealt with respectively in separate articles. Suffice it to say that, grouping Wagtails, Pipits, and Swallows together,

* I did actually manage to capture a few Swallows in my hand, as the birds were perched on the balcony railings at dawn. When liberated some returned to alight almost in the same spot; others descended to the Rock.

these birds passed the Rock most often in small parties; less typical links in the chain being formed by solitary travellers. By making careful and protracted observations with the aid of a pair of strong prism binoculars, I was able to see that the migrants were often spread out on either side; and, no doubt, beyond the range where I could descry their presence, they, as part of the stream, were heading in the same direction. Hence it might be more appropriate to designate this streaming mass of migrants as moving in a broad procession, loosely and unevenly marshalled. Call it what one will, there remains the important fact that vast numbers of birds—all heading in the one direction, all moving in an orderly fashion, and all exhibiting the same steady and uniform speed of flight, so that one bird was seldom seen overtaking its companion—were performing a natural and quite undisturbed migration, a migration which went on for many consecutive days during a given time of the year, only interrupted spasmodically by haze, which held the voyagers up, or by storm which drove them back to alight on the shore or on rock-islands, *en route*. And without particularizing in regard to species, I have little doubt that when undisturbed by adverse weather, whether it be haze or storm, and when not allured by the beacon's blaze, the nocturnal peregrinations of birds follow the same lines as I have just detailed in the case of migrants travelling by day. If, for a moment, we suppose this not to be the case, but rather that the multitudinous assemblies or so-called "rushes" are, by a kind of avian volition, drawn up as the journey is being started, or shortly afterwards, then we should expect visitations of these "rushes" (at all events of the widely distributed and abundant species) more regularly and frequently at our lighthouse lanterns, and not necessarily in only a special phase of the weather. If birds normally migrated in dense throngs at night, their passage in great numbers through the more distant part of the rays of the lantern in clear weather (when they would not be allured to the glass) would at all events be noticeable. But such is not what one sees. Indeed, it is only by watching from the balcony with unremitting attention that one can gather evidence of the analogous features between the migratory flights of birds by night and by day. On a calm night, with a clear and dry atmosphere, so that the rays

of the lantern are rendered feeble, I have beheld only single birds and small parties flitting across the rays in somewhat regular succession, and passing on without showing any signs of being enchanted by the light. This feature may be noted for many hours at a stretch, and as evidence that the birds were not being held up, I observed that there was no augmentation in numbers, or confusion, or even hesitation in the flight. At first, when my main interests were centred in studying the phenomenon of "striking," the behaviour of migrants on such clear nights greatly disappointed me; but when I became thoroughly familiar with the processional migrations performed by daylight, this analogous feature, detected at night, became highly interesting. There is another noteworthy feature in connection with the natural night-flights, namely, that the birds show a decided preference for travelling with members of their own kind. Of course, closely connected species and birds about the one size probably fraternize more readily than when such relations are wider apart.* By day one sees analogous fraternities. Pipits and Wagtails, birds of close affinities and endowed with much the same velocity and power of flight, appeared about the same time after dawn and travelled in company, probably to the end of their journey. Swallows (sociable and peacefully disposed to other small birds, though brave and aggressive in their pursuit of the Hawk or other piratical member of the bird-tribe), with affinities remote from those of Wagtails and Pipits, and with power and velocity of wing differing in a marked degree, appeared later in the morning, but, soon overtaking their companions, accompanied them for only part of the journey.

In regard to larger communities of diurnal migrants than usual, one main factor seems to be responsible for their formation, namely, any obstacle which can hold up the advancing body of birds adequately and for a sufficient time to allow the rear-guard (here represented by a procession of an indefinite length,

* I could not imagine Goldcrests and Corn-Crakes, or Manx Shearwaters and Sedge-Warblers, choosing each other's company when travelling, and yet I have seen such, and other equally peculiar couplet combinations at the lantern on hazy nights, when every sort of migrant runs the gauntlet of being "held up."

so to speak) to press forward until a vast assembly thus constituted becomes congested, and in endeavouring to move apace, confusion arises in the ranks. Several of these obstacles are natural forces, *e. g.*, fog, dense haze accompanied by drizzling rain, and a strong head-wind with driving rain, especially when setting in suddenly after a calm. It is obvious that fog or haze would act as an obstacle with much greater force in the hours of darkness, because, as far as the generality of land-birds is concerned (and these birds in the main concern us here), the evidence goes to show that they have no great aptitude for finding their way in the dark. Hence, while they manage to move along on clear nights much assisted by moon- and star-light, as well as by the fact that when out at sea they encounter no natural barriers, the argument remains that they possess but little useful vision at night. What instinctive sense of direction at the same time they may be gifted with is a most difficult question, and one which I do not propose to deal with at present. But we do know of the velocity and marvellous endurance of wing power that a bird possesses, and in allowing the fullest amount of credit for such faculties, we are certainly in a position to argue that, even if birds wander from the direct route leading to their ultimate destination, it matters but little, for they will arrive home in due season. But, as we have just seen, nocturnal migrants in thick weather are rendered very helpless. And in this helpless and hapless state the voyagers, in their attempts to move aimlessly along, now behold the beams shining from the lighthouse. Allured by their dazzle, and desirous to quit the enveloping gloom, the migrants close up nearer and nearer to the rays until they find themselves within the doors of what they little know is veritably a glittering avian death-trap.

But by day also, while there is no flash from the lighthouse to cause further confusion, nevertheless the fog itself becomes, though in a less degree than at night, a very serious deterrent factor to the migrants, whose speed, regularity, altitude, and direction of flight are soon thrown out of gear. Such features may be observed when a thick fog suddenly lowers over a vast tract of slob-land tenanted at the time by great flocks of shore birds. That their vision has no penetrating power in such a state of

the atmosphere is proved by the way the birds will allow an intruder to approach extremely close, and *vice versa* in the way that they will suddenly loom up out of the fog and brush just over one's head. The flight at the same time is full of disorder, and the loud and oft-repeated cries indicate lack of contentment, the birds rushing hither and thither as the throng swells. And there can be little doubt that diurnal migrants, as they undertake protracted journeys, exhibit under similar atmospheric adversities such-like features.

Rain, when persistent, and especially fine drizzling rain which accompanies haze, has no doubt a retarding effect on the flight of birds; still, it is wonderful how land-birds, whose feathers soon become soaked with wet, keep on the wing. From the lighthouse balcony I have observed birds in rain flying round and round the lantern practically all night long. Indeed, here we have further evidence giving support to the view that endurance of flight depends not so much upon the possession of long pinions,* as upon the structural adaptability for flight of the whole machinery of the fore-limb. A bird must add enormously to its weight when its feathers get wet; in fact, no material varies more in weight than a feather perfectly dry and one even only slightly moistened. Hence there must be a tremendous reserve force of muscular wing-power to overcome the resistance offered under such altered condition of plumage. And this reserve force must be all the more powerful when we remember that migrants frequently do not encounter rain until late on in the night, when already they may have been observed to have expended a considerable amount of energy of wing-power during earlier hours of darkness.

In regard to the deterring influence of a strong head-wind in cases where it suddenly springs up accompanied by showers of driving rain—in short, a “sudden squall”—I have had occasion to observe how Pipits, heading against the gale, suddenly dropped down to the Rock. Sometimes a whole

* *Vide* paper on “Wrens on Migration observed at the Tuskar Rock,” ‘Irish Naturalist,’ vol. xxi., July, 1912, pp. 127–129; also paper on “The Dartford Warbler in Ireland,” ‘Irish Times,’ December 26th, 1912, pp. 5 and 6.

party of about a dozen would descend, but it was more usual for about two-thirds of the party to break their journey in this way.

When the migration was active and the stream almost continuous, not many minutes elapsed before the Rock accommodated half a hundred birds, and as the wind and rain abated and the migrants rose and resumed their journey, they, as they circumvented the lantern (an interesting sight in daylight), appeared to form quite a good-sized flock, which, if appearing at night, might have been designated as a small "rush" of Pipits. Here again we see that the so-called "rush" was really an assemblage temporarily held up by temporary stress of weather. But in regard to nocturnal migrants, there is this difference to note—that, if overtaken by a "squall," the birds, instead of swooping down to the Rock, would, in all probability, on approaching the lantern, endeavour to obtain shelter to leeward, but becoming confused by the glare of the rays flashing across them, would sooner or later be carried to windward, and then of a sudden crash in against the glass. This "incidental strike" is very characteristic in rough weather, especially when birds have been trying to forge their way in a head-wind. As mentioned elsewhere,* they are usually hurled against the glass, and clouds of feathers are seen issuing from their backs or breasts. With a rebound they leave the glass immediately, and, borne away by the wind lifeless or fatally wounded, drop on the Rock or into its surrounding waters.

Before leaving this part of the subject, I may say that there is good reason for believing that birds of prey, when on migration (especially when near the land or an island whence they can bear off their quarry), may cause disorder and even hold up several parties of small birds on diurnal migration. During my last visit to the Tuskar Light-Station I saw many Merlin Falcons, some passing, others alighting on the Rock, and when they were about I have seen Pipits wildly excited; on one occasion one of these little birds suddenly descended and alighted close beside me panic-stricken. Almost immediately I perceived

* *Vide* "Grasshopper-Warblers on Migration observed at the Tuskar Lighthouse," 'Irish Naturalist,' vol. xxi., August, 1912, p. 140; also *vide* "The Dartford Warbler in Ireland," 'Irish Times,' Dec. 26th, 1912, p. 5.

a Merlin flying towards the Rock with a Pipit in its talons.* Likewise we should expect that Owls, harassing small birds at night, would so confuse them as to render them in the vicinity of the lantern more liable to rush in and strike the glass. I have seen a flock of Terns brush by the lantern in the dusk of the evening when pursued by a couple of Skuas, and if the latter put their piratical methods of seeking food into action during the hours of darkness, there may be forthcoming a cause of the sudden approach of numbers of Terns, which I have seen precipitating themselves against the glass, as though they were taking the lantern by storm.

* The Merlin alighted and commenced plucking before I disturbed it. Hence I recognized his quarry by examining some of its feathers.

(To be continued.)

NOTES AND QUERIES.

A V E S.

The Nuptial "Play" or "Display" of the Yellowhammer and Pied Wagtail.—Never having met with any description of the behaviour during courtship of the males of either of these birds, I have thought that the following notes might be acceptable to some of the readers of 'The Zoologist':—On May 22nd, 1908, at Farnham, Suffolk, I noticed a pair of Yellowhammers in the middle of the road. The male was moving along the ground close to his mate, and was holding up his wings high above his back, as a Redshank often does for a short time after alighting. This year (1913), on April 27th, I saw a pair of Pied Wagtails on a bare plot of ground, and only a few yards off. The male kept approaching and moving partly round the female, bowing to her repeatedly, much after the manner of a cock Pigeon or Dove (the Barbary or Laughing Dove in particular), but the action was performed in a rather more jerky manner, and was somewhat lacking in that courtly grace with which the male Dove makes his obeisance, the head being held to the ground for scarcely an instant, but raised at once in readiness for the next bow. The performance was repeated very rapidly, the little bird each time drawing himself up to his full height, and so making himself look very long and slim. The downward movement was made with such energy as to bring to mind the actions of a Nuthatch hammering at a nut.—G. T. ROPE.

NOTICES OF NEW BOOKS.

Heredity. By J. ARTHUR THOMSON, M.A., &c. John Murray.
(Second Edition.)

THE problem of heredity is not confined to the sciences of botany and zoology, and cannot be separated from a human factor of the highest importance with which most men are conversant. Hath not the evolutionary potter power over the clay? and is the iniquity of the father visited upon the children unto the third and fourth generation? The question of the hereditary transmission of ideas and experience is approached in different methods by the biologist and psychologist, while are not ideas and experience in most cases acquired characters?

This book, the second edition of which now appears, has already gained a consensus of opinion as being the best and most complete publication on the subject. It refers to all the best work and investigations that have been done or made at home and abroad, and is *biological* in treatment and purview. The reader is soon familiar with the steady progress of Mendelism in evolutionary conceptions, and, as Professor Thomson clearly states:—"Now, there is no need to hamper the Evolution Theory by restricting selection to minute variations. We know that sports, mutations, or discontinuous variations are frequent, and that they are remarkably stable in their hereditary transmission. We know also that many domestic races have, as a matter of fact, arisen by sudden mutation." This view strengthens the value of the Darwinian theory by restricting its operations, and disposes of a superfluous value sometimes enunciated as "the all-sufficiency of natural selection." Many inheritances are of doubtful value, many are more than valueless. In human psychology we see the baser qualities more frequently transmitted, and in human biology dangerous tendencies an unwelcome inheritance; genius a "sport" scarcely transmitted beyond the second generation.

Prof. Thomson's volume is brought in this edition thoroughly up to date, and it will puzzle the reader to find any responsible

worker on the subject ignored, nor will he fail to find a candid examination of views other than his own. The chapter on telegony is an excellent example of judicious criticism combined with an unbiassed statement of the facts used in support of that theory.

The Dictionary of Entomology. By N. K. JARDINE, F.E.S.
West, Newman & Co.

A GLANCE at this volume will almost surprise an average entomologist by the number of terms used in his science. Mr. Jardine seems to have successfully grappled with the derivation of these words, and his book will doubtless find its place on most entomological bookshelves. As the author requests to be informed of any omissions, "in order to render future issues more complete," we do not hesitate to point out a few items that may help to serve that purpose.

In the definition of the word "Hemiptera," that Order is stated to comprise insects possessing, among other characters, upper wings which are "partly coriaceous and partly membranous." This will not apply to some members of its suborder "Homoptera." The term "Hemiptera" is by many students considered to be preoccupied by "Rhynchota," and the latter word should therefore find a place in the catalogue. So also should "Odonata" (Dragonflies), while the term "mimicry" has been so much pressed and laboured in entomology that it should at least be recognized in the Dictionary. The best previous lexicon on this subject, and the first of its kind, is found in Burmeister's 'Manual of Entomology,' of which an English translation by Shuckard appeared in 1836, and this may well be added to the "Authorities Consulted." We expect Mr. Jardine's wish for a knowledge of "omissions" has been gratified by other writers, and that he will thus in a future edition be able to make this really good and useful book an even better and more comprehensive one.

EDITORIAL GLEANINGS.

At a recent meeting of the Zoological Society of London, Dr. S. F. Harmer, F.R.S., F.Z.S., read a paper on "The Polyzoa of Waterworks." He gave some account of the serious trouble which had been caused by the occurrence of a rich and varied fauna in the pipes of certain foreign waterworks, notably at Hamburg and Rotterdam. As was first shown by Kraepelin, the Polyzoa play a prominent part in the activity of the pipe-fauna, by feeding on Diatoms and other microscopic organisms, and serving in their turn as the food of other animals which prey on one another. The nutritive matter rendered available by the presence of enormous numbers of Polyzoa is thus in large measure responsible for the existence of other constituents of the fauna, which may include even fishes, such as the Eel and the Stickleback. The organic material supplied by the disintegration of the Polyzoa and other animals is believed to be important for the nutrition of Iron-Bacteria, which are well known to cause the most serious trouble in waterworks.

He then gave some account of five cases, which had recently come under his own observation, of the occurrence of Polyzoa in English waterworks in sufficient numbers to give rise to very serious inconvenience. In one or two of these cases the advice given by Kraepelin, in his paper on the Hamburg pipe-fauna, was being followed, by the introduction of a system of filtration, the principal object of which is to remove the microscopic organisms on which the Polyzoa, and ultimately the whole assemblage of animals in the pipes, depend for their nutriment.

The Polyzoa found in the five systems considered were referred to four species, and some account was given of the synonymy and distinguishing features of these. One of the species found was *Paludicella articulata*, Ehrb., and the specimens were remarkable for the profusion with which hibernacula or winter-buds were being produced. The examination of the hibernacula resulted in the discovery of some evidence with regard to the mode of development of these structures—a subject on which no observations appear to have been hitherto published. The evidence recorded may have some

bearing on the question whether there is any homology between the hibernacula of *Paludicella* and the statoblasts of Phylactolæmata.

THE Norfolk and Norwich Naturalists' Society, at its Annual Meeting this week, elected Miss A. M. Geldart as President for the coming year. "Miss Geldart is, we believe, the first woman to hold that office. A scientific society knows nothing of differences of rank or of sex amongst its members, but only of efficiency and of those qualities of mind that make for efficiency in the work of the Society. We hear a good deal nowadays of what is woman's sphere and what is man's sphere in industry, in politics, and so on; but in science and art and literature there is no question of separate spheres, but only of human attainments; and we welcome the election of the first woman President of the Society on her proved merits as a naturalist."—'Eastern Daily Press,' May 1st, 1913.

MR. F. H. SIKES, F.L.S., of Burnham Abbey, Burnham, Buckinghamshire, has presented his collection of British Shells to the Natural History Museum, South Kensington. This collection, says the 'Times,' is very rich in authentically named varieties, a fact which will cause it to be greatly valued by British collectors. It also contains a large proportion of the species and varieties enumerated in J. W. Taylor's monograph of the land and freshwater mollusca of the British Islands.

The 'Pall Mall Gazette,' in commenting on this national gift, remarks:—"When the shells are in place, a few afternoons spent in studying the cases will be worth months of poring over text-books, and ought to teach thousands of people how to add to the attractions of a seaside holiday by searching intelligently for the delicate treasures of our shores."

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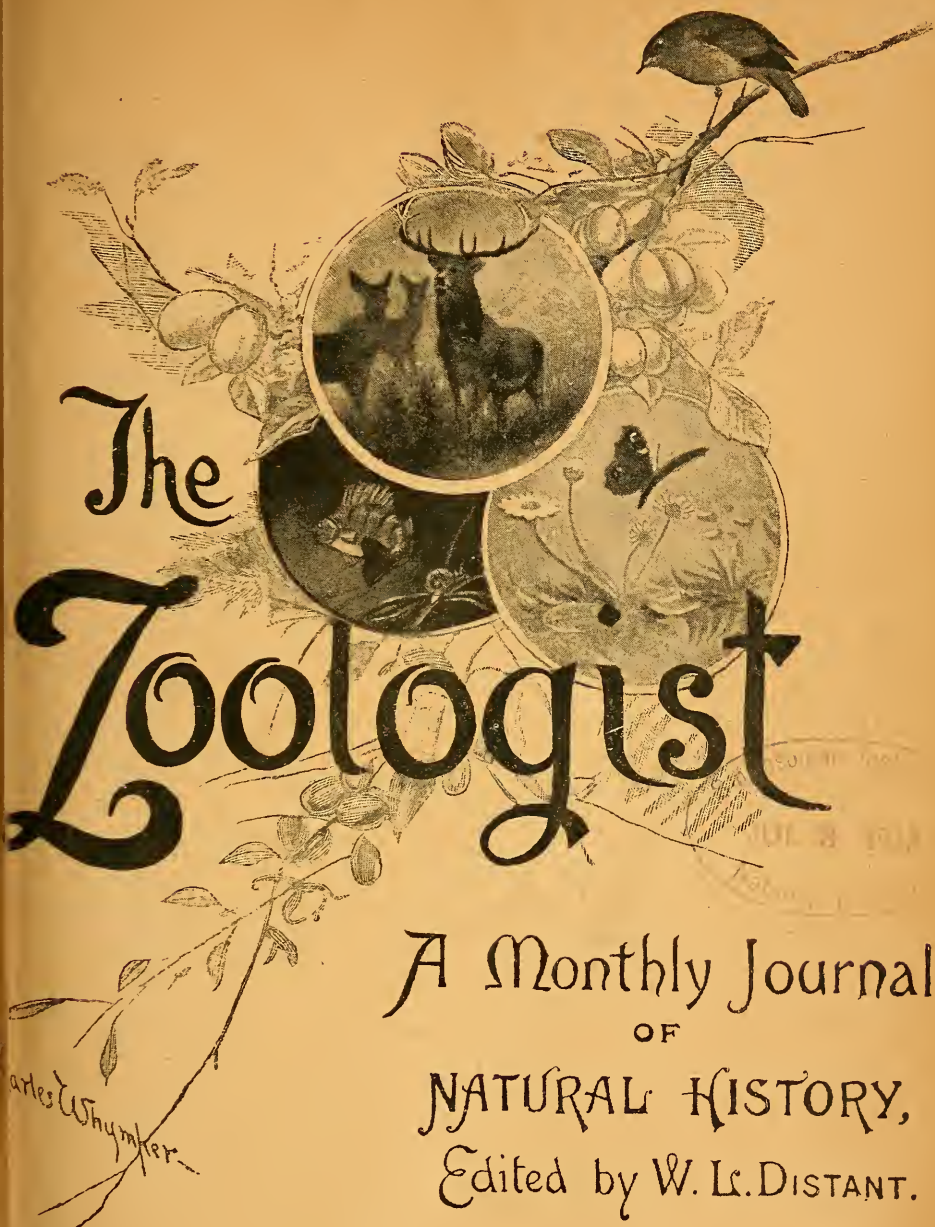
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FIG. 1.—On the truck platform ready to be taken round to the factory. Note the "genital sheath." A few of the large barnacles are also shown.



FIG. 2.—A better idea of the Whale on the truck platform, ready to be taken round the Bluff to the factory. This picture shows the rigid lips of the "genital sheath," and conveys an idea of the length of the "flippers" (man standing on one).

THE ZOOLOGIST

No. 864.—June 15th, 1913.

WITH THE WHALERS AT DURBAN, AND A FEW
NOTES ON THE ANATOMY OF THE HUMP-
BACK WHALE (*MEGAPTERA BÖOPS*).*

BY THOMAS B. GOODALL, F.R.C.V.S., F.L.S.

(PLATE I.)

THERE is some difficulty in getting out in the whaling boats; neither the captain nor the crew care to be troubled with strangers, and for many reasons, the first being that no one but a very good sailor could stand the rough-and-tumble of these small boats on a rough sea without being unwell. When they are after a Whale none of them has time to look after a sick person, while, as the steamers have only the flimsiest of bulwarks, anything might happen to one in the throes of *mal-de-mer*; so they do not care to take the risk. Again, a too inquisitive person is apt to be getting in the way at a critical time in the shooting or securing the Whale.

I was fortunate in having made the friendship of a gentleman who held a large number of shares in one of the whaling companies. With the usual urbanity of the colonist (and really I received nothing but kindness from all during my long stay in South Africa), he was not satisfied to give me only a note of introduction, but went down himself and gave me a personal introduction to the captain of the 'Urnau,' and also to the manager of the factory, and I was thus not only welcomed on the steamer, but every facility was given me to see the cutting up of the Whales, and with the able assistance of Mr. Imeson, Jun.,

* This species has been previously referred to in these pages (1909, p. 54) as *Megaptera longimana*.

Zool. 4th ser. vol. XVII., June, 1913.

the manager's son, and Mr. Scott, the secretary, I was enabled to make some notes on the anatomy of these strange mammals.

The boats—small steamers of from 80 to 100 tons—go out before daylight, and, as it was impossible to obtain sleeping accommodation on them, I put up for a few nights at a small hotel, 'The Public House Trust,' on the bluff, close to the shipping and whaling stations, in order to avoid the waste of time in going to and from the town, and thus I was amongst the Whales from sunrise to dark. After the first day, when I exchanged with the captain and mate my luncheon of sandwiches and cake for a plain sailor's meal of boiled pork and pea-soup, I was made quite one of them, for by these signs they were satisfied that I was not likely to give them trouble, at any rate with sea-sickness.

I was aboard before the crew was well awake, and had a cup of coffee with the skipper as we slipped away from our moorings at nooi-dag;* then up on the bridge to look out for Whales. No words can describe the glory of the rising sun in these regions; it is sublimely grand. As it had been blowing hard the day before, there was a big "swell" on and a rough sea, and we were making similar weather to what the little 'Telegraph' used to do in the winter time from Poole to Swanage in the old days.

There are, I believe, nine of these steamers belonging to the two companies, and as they steam out of the harbour, between the bluff and the breakwater, they spread out fan-fashioned, and everyone is at once on the *qui vive* for the Whales, for they come quite close into the shore.

We soon sighted a pair of Whales (the skipper told me that they generally go in pairs), and gave chase. We got within range and fired, but owing to the tossing of the boat, the muzzle of the gun was too much elevated, and the harpoon passed over them; their sense of hearing must be fairly good, for they immediately dived, coming right under the boat, making their way astern, and eventually dodged us. I had no idea before how crafty these huge creatures can be; this is no doubt engendered by the constant harrying they get from the whalers. Two or three others also slipped away from us in the same way, but at last we got on the tracks of a single Whale, which kept

* A Dutch colonial word to be roughly translated as the hour before dawn, when there is seen the first red streak in the eastern horizon.

us on the chase for an hour, but which we at last secured. We saw him "blow," and, noting the line he was making, we got on his wake and followed it. I timed his longest "sounding" (the time he was under the water) as eight minutes, and then he would come to the surface and take from four to eight short "soundings." As we pressed on his wake, he kept almost close under the surface, so that the man in the "crow's nest" could see him and direct the helmsman, and every move of the Whale being thus followed, we at last came up to him, just as he was forced to come to the surface for his "blow," and the harpoon was driven well home.

In these chases the great thing to avoid was not over-running the Whale when he takes his deep "soundings," or he will start off in an opposite direction; so we often brought up and waited rather than risk the alternative.

The harpoons and the harpoon-guns are very clever contrivances. The harpoon itself is a heavy instrument, as much as two men can lift, the shaft having a long groove in it, in which runs a wire grummit, to which the rope from the ship is attached. When the harpoon is in the gun the grummit hangs down in front of the muzzle, so that when it is fired the grummit slides down the groove to the base of the shaft, which is made to just fit the barrel of the gun, and on which the charge of powder exerts its force. The harpoon has a four-sided arrow-head, about 8 in. long and 3 in. in diameter at its base. This is made of a cast metal, and has in it a small charge of dynamite, which is timed to explode three seconds after the harpoon is fired from the gun. This cast-metal head is screwed on to the harpoon proper, and of course goes to pieces with the explosion in the Whale's body, and a new one is screwed on after each shot.

I might mention here that skilled blacksmiths are constantly employed at the factories in straightening out and repairing the harpoons as they are dug out of the Whales' bodies, and they are sometimes twisted about to a greater degree than would be thought possible. A gauge is kept at the factory of the same size as the gun-barrel, and each repaired harpoon is passed through it.

Behind the screwed-on head, and on the harpoon proper, are four flanges working on hinges, which are tied back to the shaft with rope-yarn. After the harpoon has entered the

body, as the first strain comes on the rope, the yarn breaks, the flanges open out, and give a very sure and strong hold on the Whale, the rope paying out with the harpoon. The gun itself is very strong and heavy, and works on an easy swivel on a small platform in the extreme bows of the boat; it can be turned about to fire not only ahead but on either side of the boat. The captain always takes charge of the gun.

The stricken Whale first plunges, and then, coming to the surface, violently thrashes the water with his powerful flukes. I have seen one turn over and over and over till he got turn after turn of the rope round his body, then he gives two or three violent grunts, almost like roars, whistling as the expirations become feebler, followed by a violent quiver or "flurry," and all is over. The carcase is now hauled in to the ship, and a chain is passed round the body where it is thinnest, just in front of the "flukes," which are cut off to facilitate towing, and then we steam away to the whaling station or factory, where we leave the carcase, and at once go out to sea again (Plate I. fig. 1). One boat will sometimes capture three or four Whales in a day.

There are powerful steam-windlasses at the station, for the steamer leaves the Whale in the water at the foot of a slanting platform, up which the body is dragged, tail first, by the windlass. A wide and large railway-truck platform runs in on rails to the exact level of the top of the slanting platform, on which the body is dragged by the help of the steam-windlass, pulleys, and wire ropes and chains. The engine is attached to the truck, and it is taken by a short railway round the head of the bluff to the cutting up and boiling works, which are out on the open sea-beach. Here the cutting up and boiling is always going on—an interesting process!

Nearly all the Europeans employed both on the boats and at the factories are Norwegians, though there are also Englishmen, and Scottish engineers, of course. The captains and crews of the boats are paid a "living" wage, but they get a bonus for every Whale captured. There are about one hundred Kafirs employed in each factory for cutting up the Whales, and twenty-five at work at a time to each Whale. They have day and night shifts, and it is an interesting sight to see them working, with their scant clothing consisting of nothing

but a waist-cloth; but they appear to revel in the blood and grease.

When I called at the factory just before sailing for home at the beginning of November, I was told that the Union Company had taken about 460 Whales in the season, and the South African about 490, of which my boat, the 'Urnau,' had accounted for 130, and headed the list of all boats for the season.

NOTES TAKEN AT THE WHALING FACTORY, DURBAN,
AUGUST 31st, 1911.

FEMALE HUMPBACK WHALE (*Megaptera böops*), 60 ft. long.—Standing by the side of this Whale as she lay on her abdomen, I should say the top of the back was about 9 ft. from the ground.

The upper part of the body is uniformly black, the under surface is white, marbled with black streaks and blotches; this is also the colour of the large plicæ under the throat and lower jaw; the upper part of the "flippers" is also black, the under part white.

Note.—The model of the *Megaptera* in the Natural History Museum, South Kensington, is much too dark on its under surface; it should be, as stated above, white, marbled with black streaks and blotches. This was the colour of all the Humpbacks I saw at Durban.

The "flippers" are 12 ft. long, sometimes more, and 3 ft. across at their widest part; there is a row of tubercles on their anterior margins, which are rounded, the posterior margins being thin. The tubercles give the anterior margins a serrated appearance (Plate I. fig. 2).

These tubercles are found also round the anterior margin of the lower jaw, and rows of them on the face and upper jaw; I cut into some of them, and found they were merely composed of "blubber" and skin.

Every Whale caught is infested with barnacles; they are numerous round the jaws, on the flippers, and always round the genital sheath. Some of these barnacles (*Balanus coronula*) are as much as an inch and a half in diameter, and they are embedded in the skin. There were several large wounds in the skin of this Whale, some on the upper part and sides of the body,

which, I was told, were due to the rubbing off of old barnacles which had been embedded in the skin at these spots.

There are twelve large plicæ on either side of the under surface of the lower jaw; they extend backwards to within four feet of the genital sheath, and in young Whales they terminate in a central spiral. Their function seems to be to allow great expansion of the skin, both in the act of swallowing and in respiration.

The large transverse processes of the vertebræ extend practically, after the region of the neck, from end to end of the body, in the median line between the summit of the back and the floor of the abdomen. All the vital parts are below this line, and are never exposed above the surface of the water in "blowing." Though I never saw it myself, it is said that these Whales will sometimes leap right out of the water in play. All the upper part of the body—that is, all above the transverse processes—is made up of the huge dorsal, lumbar, and caudal muscles, and is not directly vital if struck with the harpoon. If this were borne in mind, and the harpoon was always fired sufficiently low, a struck Whale would never require a second harpoon.

Palate and Baleen-plates.—I cannot quite reconcile my notes and observations with the description of the relationship of these parts and structures to one another found in most text-books, as in Flower & Lydekker's 'Mammals Living and Extinct.' I will describe the parts separately.

The palate proper is about eighteen inches wide. Just inside the inner edges of the baleen plates, or "finners" as they are called by the whalers, there is, first, on either side, a raised longitudinal rounded ridge, formed by a thick fold of mucous membrane, which apparently can be raised and depressed; inside these folds, which are, presumably, the analogues of the gums, there is, on either side, a deep fissure separating the gums from the palate proper. The folds or gums mentioned above extend back for about half the length of the mouth, and the palate proper, depressed between the gums at its anterior part, gradually takes the form of a rounded ridge, two feet high from the bases of the "finners," behind the lips or gums, and the ridge is about six inches wide on its summit.

Note.—The ridges of mucous membrane inside the mouth are in the position of the gums, but they are mobile, and they

may be a huge inverted upper lip, but whatever part of the anatomy of these strange mammals they represent, they separate the bases of the "finners" and the "finners" themselves from the palate proper.

Baleen-plates or "Finnners."—As stated above, these appear to me to be quite distinct from the palate, and seem to correspond rather to the papillæ found on the inner surfaces of the cheeks of many animals, notably the ruminants, than to be processes from the buccal membrane of the palate, for, if my description of the palate is correct, they are outside the gums and inside the cheeks; or, if the ridge of mucous membrane is an inverted lip, they are really modified hairs of a veritable moustache on an inverted upper lip. These "finners" hang down inside the cheeks; they are sharp and smooth on their outer-edges, and the inner-edges are frayed out into coarse brown hairs in this particular species of Whale (in the Right Whale they are as fine as silk); they are broad at their bases, eight inches across in the centre of the series. They grow from a matrix of dense fibro-elastic material, and, except at the anterior part, the finners are half an inch apart at their bases. They are quite close together at the anterior part of the series, where they take the form of hairs, five inches long; behind these hairs are very small or rudimentary plates, which gradually increase in length to the centre of the series, where they are from four to five feet long. They commence to shorten abruptly from about two feet from the posterior margin of the mouth, and with the shortening they begin to converge, and towards the throat they are continued across the palate as a patch of veritable hairs on either side; these patches of hair are separated from each other centrally by a smooth surface only three inches across at the extreme posterior part of the mouth. Where the plates begin to shorten they become, as it were, broken up into four or five pieces instead of the one plate, and these give way later to the hairs; at this part of the series there are several rudimentary or the commencement of the growth of new plates in evidence. There are from seven hundred to eight hundred "finners" on either side, and their frayed edges, forming the hairs all along their inner edges, extend from the pointed tips to their bases. The Whale's mouth has the

appearance of being full of coarse brown hairs! The "finners" are black.

The tongue is black in colour, very soft, and looks not unlike a huge bagful of soft spongy tissue. After the head had been separated from the body, from its posterior part, I could just pass my fist through the gullet to the mouth.

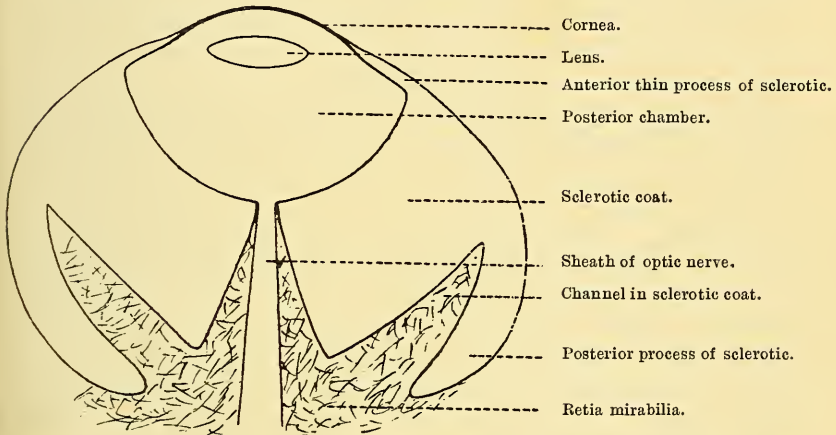
I have stated before that there are several large tubercles on the face; these are here placed on longitudinal ridges. One of these ridges is centrally situated, and the anterior nares are behind this ridge, where there is a central depression, and the two openings, each about a foot long and elliptical, and going out posteriorly from the centre at an angle of 45° , is surrounded by roughened skin, probably sensitive; on either side are a pair of lips.

I have had the opportunity of seeing a wounded Whale "blow" at quite close quarters, not more than twenty feet away, and this occurs: in the act of expiration these "lips" are erected on either side, and then directly after the inspiration they fall over the openings, and thus effectually close them.

The true skin is about a quarter of an inch thick; it is very elastic and springy, like indiarubber. It appears to be composed of columnar rods or tubes, which are arranged vertically from the body outwards (probably, in life, oil exudes from the blubber through these tubes, thus keeping the skin perpetually coated with oil). It is very firmly adherent to the blubber by connective tissue, and it is covered by a thin layer of epidermis, which readily peels off in large flakes after a short exposure of the body to the air. When a piece of skin has been soaked for a couple of days in cold water, the pigment is extracted, and the water becomes dark, almost black in colour.

There are distinct flabby eyelids six or eight inches long; there is a rete mirabile inside the lids, and also at the posterior part of the eyeball. These retia mirabilia are found at all parts of the Whale's body; they even surround the intestine, and are no doubt concerned in the purification of the blood in the long respiratory acts. The eyeball is four inches across by two and a half inches deep; the cornea is one inch and a half across by one inch and one-eighth in the perpendicular measurement. The lens is only three-quarters of an inch across by half an inch

deep from front to back. The sclerotic coat, in section, is thin at its anterior margin, then it suddenly thickens to over an inch through, and at its posterior part each side folds in to form the passage for the optic nerve, which is small, leaving an open space at the posterior part of the eyeball, filled in by a venous plexus, or rete mirabile; besides this there is a distinct channel in the thick sclerotic, and circumscribing the eye, also filled in with a venous plexus. What a superb specialization all this is to resist the pressure of sea-water, especially when the animal is going at speed in deep water! The posterior chamber of the eye is two inches across, and not more than two ounces capacity



Section of the eye of Humpback Whale (*Megaptera böops*), to show the great thickness of sclerotic coat; the space at its posterior part and the channels in it filled with retia mirabilia.

The only evidence of an ear in the outer part of the body is a small longitudinal slit, half an inch long and about sixteen inches behind and below the eye; but when one cuts into this, what a revelation! It is found that the external auditory meatus passes through a dense mass of yellow fibro cartilage, a foot or so in thickness, from side to side, which seems to indicate that the Whale's ancestors may have had external pinnæ, but that, like the hind limbs, they were found to be in the way; so they have become tucked away under the skin!

The notes of the internal organs following were only made in a perfunctory manner, as the body was being torn and hacked and

cut to pieces by the Kafirs—everyone in a hurry—and another Whale on the stage waiting to be cut up, and the stage itself on which the cutting up was in progress was inches deep in dirt, grease, and blood.

The kidney is composed of several hundreds of separate small glands, each of which is about the size of a walnut; these are all contained in a common outer membrane; the whole conglomerate organ is more than three feet long. There was a bunch of about a dozen soft nematode worms in the loose connective tissue of the kidney; each worm was about a foot in length. I had put these on one side for preservation, but in the confusion and grease and blood they were unfortunately lost.

The contents of the stomach consisted of a dark brown substance, of the consistency of thick paint. I could not discriminate any form or shape of any particular organism. In one part of the stomach there was a distinct line of demarcation between the cuticular and the villous portions; on the latter were several raised nodules.

The liver was an immense organ, and though all authorities say the Whale has no gall-bladder, I believe there was one—at any rate, as far as I could make out in the very rough tearing up of the carcase, there was a large bladder adherent to the liver, and in the position of the gall-bladder, of three or four gallons capacity, and containing about this quantity of a dark brown fluid. The contents of the small intestine were semi-fluid, and reddish brown in colour.

The external generative organs are greatly developed; the penis of one Whale I saw measured six feet, but I was told by the manager that they were sometimes quite eight feet long. What I have termed the “genital sheath” is the external opening seen in both male and female of the generative organs; it is longitudinal, and bounded on either side by a rigid lip; it is quite four or five feet long, and is situated on the abdomen, opposite the dorsal fin, about one-third the length of the body from the tail or “flukes.” When the male is brought ashore the penis is almost always hanging pendulous from the sheath.

The mammæ of the female are in a depression on either side of the genital sheath. Our captain told me that last season he

had taken a cow-whale in the act of parturition, and that the young Whale taken from her, *i. e.* the Whale at birth, measured sixteen feet and weighed two tons. The weight of a Whale is computed at a foot to the ton; a sixty-foot Whale would weigh sixty tons.

A Whale gives, on an average, forty-four barrels of oil; each barrel contains about three hundred and seventy-six pounds. Last season's results:—

Humpbacks: Oil, 2254 tons 12 cwt. 21 lb.; meat, 1696 tons 9 cwt. 22 lb.; bone, 262 tons 8 cwt. 25 lb.; “finners,” 47,699 lb.

Blue Whales: “Finners,” 1174 lb.

Two Right Whales: “Finners,” 1470 lb.

NOMENCLATURE.

I have found it a very interesting study to look up the meaning of the terms used in the naming of the Whales.

The order Cetacea, from the Greek κῆτος, any “sea monster” or “huge fish.”

Suborder Mystacoceti, from μύσταξ, “the upper lip” or “moustache.” This is significant, if my deductions are correct, and whoever was primarily responsible for the name had probably come to the same conclusion as myself regarding this part of the Whale. The Mystacoceti signifies simply the Moustached Whales or sea-monsters.

Suborder Odontoceti; the meaning, of course, is simple and well known—ὀδούς or ὀδών, ὀδόντος, “a tooth.” The toothed sea-monsters.

Family *Physiteridæ*, from φῦσα, “a pair of bellows,” or φυσάω, “to blow or spurt out”; and τέρας, τέρεα, a “prodigy” or “monster.” A prodigy of a sea-monster that spurts out (water?).

Family *Balænidæ*, from the Latin word “balæna,” signifying simply a Whale. This becomes a trifle mystifying when we speak of a family of the Cetacea as *the* “Whales,” when the whole order is so understood.

[An eye, a large piece of skin, a large shred of epidermis, and a “finner” are being sent to the Natural History Museum, South Kensington.]

THE DIURNAL MIGRATIONS OF CERTAIN BIRDS
OBSERVED AT THE TUSKAR ROCK.

BY Professor C. J. PATTEN, M.A., M.D., Sc.D.

(Concluded from p. 195.)

DIRECTION OF FLIGHT.

COMING now to consider the direction of flight, I have already incidentally mentioned that it differed from that observed by Mr. Eagle Clarke at the Eddystone Lighthouse during the autumn migration of 1901. Here again I do not propose going into details, as I shall have occasion in separate papers to refer to the movements of individual species of diurnal migrants. Suffice it to say that, in September and during the first week in October, 1911, the direction of flight of Pipits, Wagtails, and Swallows seen at Tuskar Light-Station was, with very few exceptions, landwards, and lay between west and north. Indeed, north-west was the most usual course. In regard to Swallows, these observations are in accordance with those made during the same autumn by Mr. Delap at Rosslare Harbour, six and a half miles north-west of Tuskar Light-Station.* Mr. Witherby, on the other hand, found that the direction of flight of Swallows was in this locality mainly southward. In his case observations were made chiefly a few miles north, but also on a few occasions south, of Rosslare Harbour. Swallows were, however, observed by Mr. Witherby going north on September 13th, 14th, 17th, and until 10 a.m. on the 18th; after that hour and until 3 p.m. they passed southward. From September 18th to October 13th the flight in the case of all observations recorded was southward. On September 11th the same ornithologist also observed Swallows flying southward.

Last autumn the direction of flight, not only of Swallows, but also of Pipits and Wagtails, at the Tuskar Light-Station

* Mr. Delap, moreover, made similar observations during many previous years. *Vide* 'Irish Naturalist,' vol. xxi., April, 1912, pp. 65-71.

differed in that during the latter end of September (1912) it was east to south-east, *i. e.* seawards. Whether we are to correlate this alteration in the direction of flight with an alteration in the direction of the wind is, with the present insufficient data to go upon, difficult to say. However, it is well to mention that, previous to September 19th (1912), the prevalent winds came from points between north and west, and the direction of flight of Swallows, Pipits, and Wagtails from the first date that I recorded their diurnal migrations up to September 19th was mainly north-west.

On the other hand, the direction of the wind from September 19th to the end of the month was between east and south-east, and generally it blew fairly strong. Hence it may be that when the wind settles down to blow from a certain point, veering but little for many days, the migrants may elect to fly against it, *i. e.* to head the wind as they proceed on the way. This view is strengthened by the fact that Pipits and Wagtails also reversed their course *pari passu* with Swallows. It would take us rather far afield in this paper to deal with the question as to whether the landwardly-directed flight of Pipits and Wagtails signified, in the strict sense of its meaning, an immigration to Ireland. This point I shall pass over until I write on these birds separately on some future occasion.

But a few remarks may here be dealt with conveniently on the interpretation of the direction of flight in Swallows, birds whose movements in autumn, no matter what be their direction, signify a token of their departure from our shores. Neglecting the question of the direction of the wind, which should (unless the force was of very considerable magnitude) exercise little or no influence on the course pursued by this species, possessed as it is of remarkable wing-power, quick glancing flight, and marvellous adroitness in twisting and turning in the air, it is quite possible and not improbable that the land-going birds which I observed at the Tuskar Light-Station, emigrated from, or at all events passed along, the coast of Wales from some points along the shores of the extensive region of Cardigan Bay. Owing to the strongly directed south-west curve of the coast of this bay extending down to Pembrokeshire, which curve tends to lessen considerably the mileage of water between that part of

Wales and the facing part of Ireland (*i. e.* where the Tuskar Rock and adjacent coast of Co. Wexford are situated), it is quite likely that these Swallows when making out to sea in the initial phase of emigration, *en route* for the main track leading to their southern destination, overshot the mark, as it were, *i. e.* drifted westward out of their course, and then, owing to their powerful speed of flight and great keenness of eyesight, only very few minutes elapsed before they espied the outline of the Irish coast, to which they steered. Not that they had any ultimate object in immigrating to Ireland, but that they were attracted to steer landwards simply to pick up a landmark *en route* as they pursued their lengthened peregrinations. Practically all the birds I observed passing the Tuskar Light-Station were immature. Hence their passage across the comparatively narrow part of St. George's Channel may simply represent a matter of feeling their way. That immature birds are more prone than adults to leave the track which takes them by the most direct route to their ultimate destination is in part explained by the greater number of the former appearing during migration at unexpected sites.

Owing to the remarkable degree of development of the sense of vision in birds, especially their keen perception for form of objects,* a sense developed altogether out of proportion to all the others, it seems that one aid which birds receive in seeking out their destination is the faculty they possess of picking up, and recognizing the form of, certain landmarks, such as mountain-ranges, great riversheds, coastlands, or portions of coastlands with pronounced features, and, for aught we know, great cities spread out beneath may serve as guides to the aerial travellers. Young birds, unless they meet with adults, which no doubt they do at all events for part of their journey, would, in the initial phases of their migrations, have to find out their landmarks, and no doubt several of these would be out of the track and might afterwards be discarded. To say simply that birds work out their migration-routes by instinct is in a large measure merely begging the question, and certainly this concep-

* Illustrative of this visual sense, I may point out that a tame Kestrel which I had for eight years failed to recognize me, and seemed scared if I wore a hat different to that which she was accustomed to see.

tion of the matter lends no new aid to the personal observer working out the problems of flight-lines in birds. But if we take into consideration the wonderful speed, and, what is more important, the wonderful endurance of flight in birds, then a lack of knowledge among immature birds in regard to the shortest route to their destination, manifestly matters but little. To my mind the passage of Swallows across St. George's Channel and thence north along part of the Irish coast (or, indeed, for that matter, round the whole of the Irish coast), *en route* for the African Continent, as compared with the shortest possible course, is a matter of very small moment.

Viewing the question of the migration-route of Swallows in a technical rather than a general light, I think it worth while laying emphasis on the fact that the initial period of emigration as observed in 1901, at the Eddystone Lighthouse by Mr. Eagle Clarke, *viz.* September 24th, corresponded very closely with the date when I first saw Swallows in September, 1912, *flying south to south-east past Tuskar Rock, i. e. from the shore.* Furthermore, the birds pursuing a southward course, as observed by Mr. Witherby in September, 1911, appeared to do so at a later date than those which he noticed flying northwards, if we except one date, *viz.* September 11th; and, as just mentioned, I observed the same feature in September, 1912. Moreover, the time in September when Mr. Witherby and I noticed Swallows altering their course from north to south, though observed in different years, is fairly synchronous. The south-bound birds observed by Mr. Witherby in September and early October, 1911, evidently did not pass the Tuskar Light-Station, for all the birds seen by the light-keepers and myself at that time directed their flight in the main to the north-west, sometimes, however, going due north or west. And it seems that these birds headed in the same direction past where Mr. Witherby was residing (Rosslare strand), for they were seen by Mr. Delap pursuing this route all along from Rosslare Harbour to Wexford. The ground on which these two observers worked overlapped considerably, which at first makes it difficult to reconcile their opposing observations, but when we bear in mind the significant fact that on many occasions when Mr. Delap saw birds flying north Mr. Witherby made no observations, and *vice versa* when Mr. Witherby saw

Swallows flying south Mr. Delap saw none, it looks as though the birds flying in opposite directions were in a large measure independent of each other. That is to say, the north-bound birds did not turn at once close by, and represent the south-bound birds. Rather, two phases of migration were probably going on at the same time, *i. e.* an emigratory phase of south-bound birds, and a pseudo-immigratory phase (not strictly immigratory, as pointed out) of north-bound birds. And, as already shown, only one of these migratory phases was witnessed at the Tuskar Light-Station in September–October, 1911, *viz.* the pseudo-immigratory phase. The last point strengthens the hypothesis that two independent movements were taking place, which in point of time were seen to overlap. The apparent immigratory flight of Swallows in autumn, witnessed from a rock-island six miles off the mainland, was a remarkably interesting sight. In order to obtain further data to help us to explain its meaning, I should like here to be permitted to make an appeal to ornithologists who are afforded opportunities of investigating this matter at other points of the Irish coast to make public their own personal observations.

So much, then, for the essential features of diurnal movements of Wagtails, Pipits, and Swallows, which, while also migrating at night (having been taken at the lantern according to evidence obtained from other light stations), I did not observe strike or even come in contact with the lantern at the Tuskar Light-Station. However, I *have* seen Swallows in the rays of the Tuskar lantern, and have seen both this species and Sand-Martins approaching very closely to the glass in thick weather. But heretofore I have not seen Pipits (at all events sufficiently near to identify them as such) within the zone of the lantern's rays, and only on very few occasions did I see birds which I suspected might be Ray's Wagtails, but on no occasion the larger Wagtails. Therefore, when one meets with Pipits or Wagtails in the daytime on the Rock, and does not happen to have seen them alight, the evidence is cogent that these birds reached the Rock directly, that is to say, they had not been flying round and round the lantern during the previous hours of darkness. Furthermore, their lively and restless demeanour, as they run hither and thither in search of food, does not give one the idea that they had fatigued themselves

by performing lengthened and disordered movements in the dazzle of the rays during the night. In short, then, the three species under consideration perform their migrations in the vicinity of the Tuskar Light Station almost entirely by day, and the Rock, not the lighthouse balcony, is the observatory whence we behold their movements.

NOCTURNAL MIGRANTS OBSERVED ON THE ROCK AT DAWN.

In the opening pages of this paper I stated that, while my primary intention was to study the migratory movements of the three above-mentioned species, I also proposed, in regard to several other species, to touch upon some aspects of diurnal migration into which I had gained an insight during my hours of watch on the Rock. Here, however, I have practically no occasion to deal with *Direction* or other characters of flight, as before detailed, because the birds which I now wish to consider seldom flew across the Rock. On the contrary, they almost always flew straight in and alighted, and remained for a variable time, until they left either of their own accord, or because they were scared by human presence or aught else. But as the majority of these species also figured prominently at the lantern, it seems most incumbent to consider very carefully the circumstances under which they appeared on the Rock, when endeavouring to discriminate between genuine diurnal migrants and such nocturnal migrants as may have descended at dawn from the lantern, round which they had been flying during the previous hours of darkness.

Birds descended from the lantern to the Rock by: (a) being killed outright, (b) becoming stunned by striking the lantern head on, or stupefied from being hurled against the lantern by the wind. Such birds might sustain further injuries as they drop unconscious to the Rock, as fracture of a limb, usually a wing; (c) breaking or dislocating their shoulder by coming in contact with some projecting object, as the pillar of the balcony-rails, the hand-rings of the window-panes, &c.; (d) becoming exhausted or even fatigued from flying round and round the lantern all night in a wildly excited fashion as the brilliancy of the beams of light produced a derangement of vision, at all events, temporarily or physiologically.

It is not an easy matter to distinguish between a stunned bird which had recovered consciousness and a fatigued bird. When seen at break of day both appear listless, very tame, and move about with their feathers puffed out. A bird with a broken wing at once attracts attention as it tumbles and flutters over the inequalities of the rugged rock-surface. When pursued it generally disappears by crouching in a crevice, where it will remain until dislodged by a stick or even the hand. When a post-mortem examination is made on the body of the stunned bird there is, as a rule, some cerebral or cranial lesion;* in fatigued birds there is usually no indication of damage of the head due to contact with the glass. Objective evidence such as this, even though not obtained till after death, is valuable. In regard to the occurrence on the Rock at dawn of tame and listless migrants, the evidence that they descended to the Rock at the close of a nocturnal migration becomes all the more convincing if the same species were seen at the lantern or in the rays prior to daybreak. This is a particularly important point to note in the case of birds which very seldom alight on the Rock in daylight unless associated with a nocturnal passage. I may mention three common species—the Song-Thrush, Goldcrest, Corn-Crake—which figured prominently at the lantern, and whose occasional appearance on the Rock at dawn invariably followed their advent at the lantern.

Few birds that had been hurdled against the lantern-glass by the wind were observed alive on the Rock; most of them fluttered or were carried into the sea. On September 19th, 1912, however, I examined a Song-Thrush which Mr. Power captured alive on the Rock at 7.30 a.m. The wind during the previous night blew with the force of a fresh breeze. This bird had lost a considerable number of feathers from the lower region of the abdomen and right flank. Elsewhere the plumage was good, nor was there any sign of moult. It may be well to state that, as many birds are found migrating during an active moult, it is necessary, when a specimen is captured on the Rock in daytime, to arrange carefully any feathers which may have been ruffled, and at the same time to note whether many feathers are missing,

* Birds which strike very hard often show in addition lesions of the orbit, eyeball, and spinal cord.

making a very careful discrimination between loss of feathers due to moult, and loss of feathers from a circumscribed spot due to the bird striking incidentally against the glass.* I have collected *dead* specimens, of various species, in which the loss of feathers bore evidence that the birds met their fate by being blown forcibly against the lantern.

So much, then, for the behaviour of nocturnal migrants which descended from the lantern at dawn and tarried on the Rock, and so much for the methods adopted in seeking to obtain objective evidence in regard to the circumstances under which such migrants appeared on the Rock.

DIURNAL MIGRATIONS OF CHAFFINCHES, GREENFINCHES, AND GREY LINNETS.

Concerning birds which may have arrived directly on the Rock in daylight irrespective of the presence of the Lighthouse, it is best to examine the question from the following points of view: (a) the demeanour of the bird itself; (b) the time of day when the bird was seen; (c) the condition of the weather not only on the day of the bird's arrival, but also during the preceding and succeeding nights; (d) the presence of the bird on the Rock associated with the presence or absence of migrants of its own species at the lantern during the immediate preceding or succeeding hours of darkness; (e) the evidence obtained from an examination of the dead body. It will be seen that in some cases there is very little difficulty in settling the question at issue; in other cases it is well not to be too positive. Of species which obviously migrate by day as well as by night, I first refer to the Chaffinch. This was a bird which I observed and obtained far more frequently by day than by night; I did not see one tame or listless bird—all were bright, lively, and rather wild. Chaffinches arrived at various hours in the day, and owing to the fact that on alighting they invariably uttered their shrill alarm-note, which I could usually hear when in my room, it was not difficult to set down the hour of their arrival. I seldom saw this bird at first dawn as one would have expected, had it been at the lantern the night before. In support of the view that

* *Vide* article on "The Dartford Warbler in Ireland," 'Irish Times,' Dec. 26th, 1912, pp. 5 and 6.

Chaffinches travel largely by daylight, I may say that I actually saw several descend and alight on the Rock. The prevailing weather had little effect: in markedly rough weather, however, they often were absent; they appeared on the Rock at times when no Chaffinches were seen for days before and after near the lantern. Post-mortem examination showed that in the case of vigorous birds collected in broad daylight (mostly three or four hours after dawn), the bodies were well-nourished, and the gizzards contained some foodstuffs. The same was found to be the case in specimens which were collected when striking the lantern, and in specimens found in a dying state in the early morning following a migration night. The latter no doubt had injured themselves at the lantern; indeed, objective as well as circumstantial evidence showed such to be the case. But I have also obtained a few dead specimens on the Rock in very poor condition. These were evidently birds which remained on the Rock from stress of weather. Being largely granivorous in their diet, they soon succumbed, as the form of food obtainable on the Rock, *i. e.* insects, minute crustaceans, and molluscs, was little partaken of, either because it was not readily discovered, or was too foreign to the bird's taste. Further particulars, especially in regard to the question of immigration and emigration, will be given subsequently on the migration of this bird separately. The features of migrations of Greenfinches and Grey Linnets, migrations largely effected in daylight, are markedly similar to those of Chaffinches. But I saw considerably less of the former two species, and made no records of these birds striking the lantern. However, a tame and listless Grey Linnet was captured by Mr. Glanville on the Rock on the morning of April 22nd, 1912, and the occurrence of this bird cannot be dissociated from the occurrence of great numbers of several species—probably including Grey Linnets—at the lantern during the previous hours of darkness. In passing, I may mention that I have seen in broad daylight also a Yellow Bunting and a Snow-Bunting (each on a separate occasion) suddenly, as they were passing at a considerable height, swoop down and alight on the Rock. I thus was enabled to ensure their identification. It was self-evident that the birds were effecting a diurnal migration. Other species, whose diurnal

migrations are on the whole fairly obvious, may be dealt with more expediently on separate occasions.

DIURNAL MIGRATIONS OF WHEATEARS, WILLOW-WARBLEDERS,
CHIFFCHAFFS, AND SPOTTED FLYCATCHERS.

It may be well, however, to consider now the diurnal movements of a few well-known species, movements not so easily detected. I shall confine my remarks to four species: Wheatears, Willow-Warblers, Chiffchaffs, and Spotted Flycatchers. The diurnal movements of others, mainly of less frequent occurrence, will, I hope, be considered subsequently. No bird figured more prominently on the Tuskar Rock, as well as at the lantern, than the Wheatear. This was especially so in the fall of the year. And while more of these birds assembled together on a given occasion round the lantern—naturally owing to the lure with which they were presented—nevertheless the percentage of observations made and specimens picked up on the Rock in daylight was very considerable. I shall, however, avoid now setting forth actual statistics; such will receive their proper place when dealing exclusively with the migration of the Wheatear.

Unlike the preceding species just dealt with, neither the Wheatear nor the three following birds now under consideration appeared to adopt the custom when passing of descending abruptly from a considerable height to alight on the Rock. That they may migrate for a considerable distance at a fair height above the surface of the sea is a question which I am not prepared to consider in this paper. It would appear, however, that, on sighting the Rock and wishing to alight, they descend rather obliquely, and fly in over the waves until they reach their perch. On a few occasions I have actually witnessed the arrival of Wheatears, Willow-Warblers, and Chiffchaffs (not, however, Spotted Flycatchers) along the outlying reefs. But owing to the small size of these birds and the difficulty of "picking them up" as they flew along over the ever-moving surface of the sea, I was unable to say at what distance off they made the descent. In by far the greater number of instances these birds had already arrived unknown to me. Owing, however, to their extreme

restlessness as they repeatedly flew from one end of the Rock to the other, they hardly could, for any length of time after their arrival, have escaped my notice as I patrolled the Rock. Handicapped, then, by a lack of positive knowledge in regard to their advent on the Rock, it becomes necessary to apply more rigidly still the tests which were applied in the case of the Chaffinch and other birds whose migrations by day appeared more obvious. In demeanour all four species showed great activity. Wheatears naturally appeared more at home on the Rock than did the Warblers and Flycatchers. The contrast in the behaviour of these particular Willow-Warblers and Chiffchaffs appearing at various hours in the day and of those observed at dawn, thoroughly tired out after flying round the lantern for many hours before daylight broke, was very noticeable. Flycatchers were decidedly active, but I could not contrast their individual demeanour, as I did not see a single listless or even tame bird. But I picked up a few dead specimens on the Rock, which, as post-mortem examination revealed, had struck the lantern the previous night. However, owing to the very different hours at which Flycatchers appeared on the Rock, I have little doubt that they were not laggards which originally had descended from the lantern at dawn. In all four species I obtained evidence that their advent on the Rock was not necessarily associated with the presence of birds round the lantern on corresponding nights. Nor did post-mortem examination reveal any evidence that the specimens collected had in any way collided with the lantern. They were all in good condition. It is well to mention that, owing to the similarity of the Tuskar Rock to their *natural habitat*, Wheatears frequently remained on for several days, apart from being held up in rough weather. These genuine laggards were mostly immature birds. Lack of fresh water and much limitation in the amount and choice of diet soon told on these birds, which daily grew less active. In four to six days they became so listless as to be almost indistinguishable in their demeanour from fatigued birds observed at dawn which had descended from the lantern. By counting the number of these laggards daily, and noting their dissociation with any nocturnal migrants, I was able to keep the study of the two phases of migration apart. Except Flycatchers, of which only

solitary examples were observed at a time, each of the other three species appeared for the most part in small parties. The whole four species were not recorded as occurring on the same day, one or two being more usual. In any case, individuals of the same kind showed a marked tendency to keep together, as we have seen, not only in the case of other diurnal but also of nocturnal migrants, when the latter are effecting natural night-flights in clear weather.

DIURNAL MIGRATION OF THE TURTLE-DOVE.

Before leaving the subject, I may refer to a Turtle-Dove which I observed on the Rock just about sunrise on Aug. 26th, 1912. The bird stood quite still, and in the bad light and heavy rain I was not sure as to what species it belonged. On securing it, and finding it to be a Turtle-Dove, I *at once* examined the crop and gizzard, both of which contained wheat. Now, as the crop was well packed, and most of the grains of corn had not undergone any softening, the presumptive evidence is strong that this bird fed at dawn probably not far from where I captured it. In other words, it probably emigrated from the South of Ireland. At all events, it could hardly have been winging its way during the hours of preceding darkness, having made its last feed the evening before. Here, then, is a case of a bird which, though I did not make direct observation of its actual arrival by daylight on the Rock, or of its demeanour, and so on, yet analysis made on the contents of its crop point to the fact that it appeared on the Rock as a diurnal migrant, and owing to the heavy rain prevailing at the time, or perhaps scared by the sight of a hawk, this Dove was tempted to alight and seek refuge.

CONCLUSION.

In conclusion, I wish to draw special attention to a supremely important fact, namely, that a comprehensive study of bird-migration, as it occurs in daylight, might be made at the Tuskar Rock, *apart from its being a light-station at all*. By day the presence of the Lighthouse is a non-entity to passing birds; by night, under certain meteorological conditions, it is verily a huge decoy. Were it possible to secure adequate shelter in all

weathers on any marine rock island lying in the migration route, I venture to say that the ornithologist who elected to take up his abode at such a site could see much of what I have already put forward in this paper. But such shelter is not obtainable—at all events on rugged wave-swept rocks—in other than in the dwelling apartments of lighthouses. Indeed, were it not for the most kind sanction of the Commissioners of Irish Lights whereby I have been enabled to become housed securely against the ravages of wave and storm, I never could have culled the knowledge which I now have put forward in this paper on a special phase of bird migration. Were one to study only the phenomena of birds assembling and making contact with the lantern at night, then a vast amount of most instructive information would never come to hand. I would also lay emphasis on the fact that the topographical aspect of the Rock itself demands the closest study. Thus its relative height above the sea-level may have a more or less direct influence in inducing passing migrants to break their journey and alight; while the question as to what water and food can be obtained would exercise a varying influence on the length of stay which a bird might make; these and several other points, which can only be studied when residing on the Rock, affect the whole question of the features of diurnal migration in a marked degree. Such important facts, however, could hardly be expected to enter the minds of ornithologists who, while writing on the subject of bird-migration at light-stations, had not thoroughly familiarised themselves with the special topography of each station. This fact is brought home very clearly in Mr. Moffat's note entitled "The Tree-Pipit as an Irish Bird."* Here, in entering a caveat against my suggestion that the two Tree-Pipits which I recently obtained at the Tuskar Rock might be Irish emigrants, he draws analogies between the occurrences of several species *rare to Ireland obtained on autumnal migration only* (as recorded by Mr. Barrington)† and the occurrence of the two Tree-Pipits above mentioned which I obtained. He considers all as autumnal stragglers, and all killed at light-stations, as though always attracted by the light, adding that the tendency to come to the lights in autumn and

* *Vide* 'Irish Naturalist,' vol. xxi. December, 1912, pp. 246-247.

† *Vide* 'Migrations of Birds at Irish Light Stations,' pp. 11, 72, 181.

not in spring is extremely significant. Such analogies can hardly be established in the absence of a full and personal knowledge in regard to the exact circumstances under which the birds were obtained ; even endowed with this knowledge, it might be still a difficult matter to decide as to whether analogy existed in every case. My Tree-Pipits, though obtained on a rock on which a lighthouse happens to be erected, did not in all likelihood approach the lantern, but arrived in full daylight, when no luminous beams were shining to allure them. I have already given strong evidence in favour of adopting this view in the body of this paper. Here I may strengthen the evidence still further by stating that on the day when the first Tree-Pipit was collected, there were exceedingly few birds seen in the vicinity of the lantern during the previous hours of darkness, and when the second Pipit was collected no birds at all appeared at the lantern the night preceding, the weather being altogether unsuitable for alluring migrants. Hence for this and other reasons already mentioned, these Tree-Pipits could hardly have descended from the lantern at dawn and, as fatigued birds, remained on the Rock for several hours until I collected them. Besides, we must keep clearly before us the important fact that visits of Pipits of any species to the Tuskar lantern are very exceptional, whereas Meadow-Pipits in great numbers, and Rock-Pipits in lesser numbers, not only pass by but also frequently alight on the Tuskar Rock during their diurnal movements. I believe that the Tree-Pipits here under consideration were, after venturing to set out in the early hours of the morning, held up almost at once by the high winds which prevailed on each occasion, and so they took advantage of alighting on the Tuskar Rock which lay in their route. The tendency for *Pipits as a class* to alight in greater numbers proportionately in rough weather has been already pointed out.

Incidentally referring to the Reed-Warblers which I collected, Mr. Moffat considers these birds, together with two of the same species previously recorded by Mr. Barrington, and several other species besides, as *autumnal stragglers*. Of the circumstances in connection with the capture of Mr. Barrington's specimens I have few details ; we are told that they were killed at light-stations in autumn, and of the total numbers of each

species mentioned that never more than a solitary example was obtained on the same date from the same light-station; indeed, for the most part it seems that the birds of the same kind were obtained in different years at different localities. I note particularly that such was the case in regard to the capture of Mr. Barrington's Reed-Warblers. The occurrence in regard to my specimen, however, does not present analogous features, for, in the first place, two specimens were secured at the same time and at the same site; and this is not all, for I observed three more. Hence, technically, Mr. Moffat is mistaken when he states that my two specimens, added to those two obtained for Mr. Barrington, make four autumnal *occurrences*. He might either say that the bird has occurred three times, twice as solitary individuals, each on different dates and each at different localities, the third time five examples being seen together at the same locality and synchronously, two of which were collected; or he might say that, in addition to Mr. Barrington's two separate occurrences, five birds, two of which were collected, were seen together at the same time and at the same place, making *seven* occurrences. Bearing in mind that I saw the party of Reed-Warblers at 10.30 a.m., and had only come out on the Rock to look for birds an hour or so before, it is quite likely that still more individuals of this species were present earlier, and had passed on. At all events, the evidence afforded by the presence of five birds—perhaps parents and young—does not necessarily point to the species being a straggler. Furthermore, I am not at all sure that I did not see a few Reed-Warblers again this year on the same Rock. About this matter, however, I hope to have more to say another time.

It is perhaps straining a point to state that the capture of Mr. Barrington's specimens and mine ran parallel, for in the case of the former the birds were killed *striking the lantern at night*, and in the latter case they were *collected on the Rock in broad daylight*. Now, as I saw no birds of any kind in the rays of the lantern during the hours of darkness which preceded the capture of my specimens, and as the whole five Reed-Warblers showed no signs of having been to the lantern, it seems quite likely that they were coursing along by daylight at no great distance from the land of their departure when they encountered

the Tuskar Rock. There, owing to inclement weather (a rough wind and steady downpour of rain prevailing at the time), they broke their journey, and so afforded me the chance of observing them. A highly important piece of evidence, showing that they were not fatigued, and were moreover shy, is the way in which the three, which I did not collect, immediately they missed their companions hurriedly left the Rock, *even in heavy rain*, and speeded along over the waves. Were they fatigued, not only my presence but even the terrible rending noise produced by the fog-explosive then in action would not have driven them off the Rock, unless they differed markedly in their habits from many other species of Warblers which I have a score of times seen stand such menace.

Of course, one cannot say definitely where these Reed-Warblers came from before reaching the Rock: I cannot, however, believe from their demeanour when living, and from their bodily condition as examined after death, that they, in a protracted journey, had been carried out of their course by the wind. At the time and indeed for many hours before their appearance the wind, blowing with the force of a moderate breeze, came from the *south-west*, and so could hardly carry the birds across from the shores of Great Britain. After all, these birds may have emigrated from Ireland, for, until the vast watersheds and abundant reed-grown ponds, rivers, and lakes have been systematically searched by ardent and patient field ornithologists, it is wholly unjustifiable to conclude that Reed-Warblers absent themselves from Ireland during the breeding season. Many of the great luxuriously grown reed-beds, such as those of the River Shannon, offer a special inducement to Reed-Warblers for breeding purposes, and it would well repay ornithologists resident in Ireland to investigate this matter personally. I cannot but believe that Ireland catches the western fringe of the migratory routes of more birds than we think. In comparatively recent years a substantial addition has been added to the list of birds, which for the most part breeding in greater numbers in the sister Isle also breed in Ireland. We have also considerably increased our knowledge in regard to the wider distribution of several species which, not remaining to breed, pass through the country on migration. At all events, much more *personal field*

work must be carried out before we can afford to relegate several species which have only occurred on autumnal migration within a few miles of the mainland of Ireland to the position of stragglers; at the same time, full details must be collected of the site and circumstances under which every specimen has been recorded. Nor can we neglect to study carefully the individual distribution in Great Britain and elsewhere of such migratory species. It seems to me a somewhat *a priori* argument, without sufficient evidence, to advance that species occurring as regular summer visitants to England, but only as autumnal visitors on migration to Ireland (and this only as far as we have ascertained by evidence afforded in the capture of birds at lighthouses), are mere stragglers, no matter what may be their difference in range of distribution and in numbers in the quarters where they breed.

NOTES AND QUERIES.

A V E S.

Nuptial Display of the Pied Wagtail and Yellowhammer.—With respect to the nuptial display of the Pied Wagtail (*ante*, p. 196), I have the following record, which adds one or two points to the description by Mr. G. T. Rope:—"The cock kept moving about a yard off the hen, in front of her, bowing his head repeatedly; then approaching, he spread his tail, deflecting it, and displaying to the full the striking contrast between the deep black and the white. With his wings spread, his body pressed upon the ground, inclined to one side, and all tense, he dragged himself slowly towards the hen." The act of coition followed. Mr. E. Selous has summarised, in the 'British Bird Book'—in which the above note also appears—observations on the display of the Yellowhammer by Ussher and Warren and by Boraston:—"As for the male Yellowhammer, he, too, will raise the feathers of his crest or rather scalp, and, with wings drooped upon the ground, parade about the female. . . . The white border feathers of the tail . . . are by the sudden spreading out of the latter . . . frequently flashed into view." The holding up of the wings, mentioned by Mr. Rope, is a new addition.—F. B. KIRKMAN (Letchworth, Herts).

Nuptial Display of the Pied Wagtail.—Some years ago I had the good luck to observe this habit in the Pied Wagtail, but I am unable to lay my hand on my notes. However, my observations agreed with those of Mr. G. T. Rope (*ante*, p. 196), but in addition the cock bird spread out his wings and his tail much after the depicted manner of the Argus Pheasant, and the striking black and white plumage of the wings, tail, and back appeared to merge in one regular pattern with the head in the centre. It was certainly a wonderful and beautiful sight.—JOHN R. B. MASEFIELD (Rosehill, Cheadle, Staffs.).

The Sense of Beauty in Birds.—Mr. G. T. Rope's remarks on the nuptial displays of the Yellowhammer and Pied Wagtail (*ante*, p. 196) caused me to turn up a few notes of mine on the Yellow Wagtail. The behaviour of this species provides a little puzzle for those who hold the view that birds respond to the same æsthetic impulses as

those influencing *Homo sapiens*. To my mind the male Yellow Wagtail is a remarkably beautiful bird, both from the purity of its colour and because of the unusual grace of its outlines; in the Grey Wagtail, it will be remembered, although the yellow is more delicate—shall we say primrose as compared with the daffodil of *M. raii*?—the disproportionately long tail quite destroys the balance of the design of form.

When parading before the female, either on the ground or hovering just above her head, the male Yellow Wagtail puffs out his plumage until the feathers are on end and the colour lost, and the beautiful outlines entirely vanished. Now, if we agree that to human eyes the Yellow Wagtail is beautiful, we are bound to admit that when he wishes to attract the attention of the female he makes himself *un*-beautiful. The bird in an ordinary frame of mind is totally different in outward appearance to the same individual when under the influence of sex. We cannot have two standards of beauty here: one must be handsomer than the other; and I can explain my preference by describing the fine yellow of the sleek-plumaged bird and the harmonious design of its outlines. Under the empire of love he makes himself ugly, according to my standard. The way out is simple—we can refuse to accept these popular views on animal aesthetics until at least one example has been definitely proved.

The case of the Bullfinch can be described here, for I think it must be new to ornithological literature. The song of the male, I might explain for those who have not heard it, is a peculiar spluttering whisper that is inaudible at more than a very few feet; indeed, only by the rarest of chances do we hear the full song in the fields, so low are some of its details. The males collect in small parties in early spring, and sing in concert.

Many birds (Sandpiper, Golden Plover, &c.) string their call-notes together in the form of a loud warbling song, but most birds appear to keep the two voices separate. In the Thrush, for example, the song is far louder than the call, and this is a useful fact for those who see a challenge or a signal in bird song. In the Bullfinch, as I have found by many experiments, the call-note is at the very least four times as loud as the song. If the bird desires to call the females, or to drown the voices of its rivals, why does it not use a repetition of its ringing "hoop"? So far as we can see, the uttering of the call-note needs little physical effort; yet the *singing* bird is trembling with what certainly appears to be suppressed muscular effort. Dr. Stolzman and Dr. A. R. Wallace long ago held song to be nothing

but the ebullition of superfluous energy, and I continue to feel that this should be carried still further, and believe that song, and such phenomena as ornamental plumes (*not* bright colours) and vernal flights or dances, have no connection other than an indirect one with sexual affairs. At least, this theory fits in with my own observations, which is far more than I can say for the old theories that song is primarily a phenomenon of sex.—FREDK. J. STUBBS.

Syrnium aluco in Suffolk.—The Tawny Owls returned to our church-tower this year for the seventh year in succession. Their game-bag, however, was not so varied as that of last year (*cf.* Zool. 1912, p. 228), as I found no rats or moles in the nest—in fact, nothing beyond a few small rabbits, some field-mice, and many feathers of small birds. Three eggs were laid, one of which by some means got broken in the nest, and, from the different size of the two owlets, they were probably hatched from the first and third eggs laid. Most troublesome and adventurous owlets they were, for one Sunday morning there was much excitement in the churchyard just before service, as both had fluttered down from the nest, and were found under the tower. One boy suggested he should go for a cage, but a worthy woman took them in charge, declaring that no one should touch the Owls, and I put them back, making the exit rather less easy. A little later they got out again, and the larger bird could not be found; the smaller one was on the ground under the tower, drenched to the skin by heavy rain, and looking a most pitiful little object. The parents had evidently not neglected it, for close by were the remains of a young thrush and a dead toad, the latter not touched. I put it back again, and visited the nest next day, quite expecting to find it dead, but it was dry, clean, and perfectly well. It remained for about a fortnight, and disappeared once more—this time, like the historic dove of the Ark, it was not seen again. Certainly the erratic behaviour of this pair of youngsters fully justified a remark lately made to me: "It seems a wonder that any Owls get off at all," for when they get out of the nest young Tawny Owls are completely at the mercy of anyone who finds them.—JULIAN G. TUCK (Tostock Rectory, Bury St. Edmunds).

Greenland Falcon (*Falco candicans*) in Co. Mayo.—I have just heard from my friend Captain Kirkwood, of Bartragh House, that on Sunday, May 4th, as he was sitting in a sheltered nook of the sand-hills, a lovely Greenland Falcon passed within ten yards over his head, and fled on to the marsh where the Lapwings nest, among which he caused great commotion, but, not having succeeded in

securing a bird, he returned and fled to the lower end of the island, probably in search of young rabbits. He says this bird was much whiter than the one shot by Miss Kirkwood on the island on March 2nd.* Bartragh Island is a safe refuge for rare birds; a narrow range of sandhills, with about thirty or forty acres of good loamy soil on the eastern end, upon which the house and offices are built, and, as no poachers are allowed to visit the island, it is a perfectly safe refuge for any birds coming from the north. — ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

Rufous Variety of the Partridge (*Perdix montana*).—Mr. G. H. Gurney, in his interesting "Ornithological Report for Norfolk, 1912," says: "One thing which is curious about this erythrism is that more than two or three are *never* found in one covey" (*ante*, p. 181). I can supply the exception to this statement, but I much doubt if it proves the rule! In September, 1900, three birds were shot at Pyrehill, near Stone, Staffordshire, *out of a covey of five, all of this dark rufous variety*. The remaining two birds paired the next spring, but one was killed by flying against telegraph-wires. These facts I recorded at the time in a short paper which will be found in vol. xxxvi. p. 49, of the 'Transactions' of the North Staffordshire Field Club. A dozen birds at least of this red variety have been reported for this county.—JOHN R. B. MASEFIELD (Rosehill, Cheadle, Staffordshire).

Black-throated Diver (*Colymbus arcticus*) in Co. Mayo. — On Sunday, May 11th, a Black-throated Diver in summer plumage was seen by Captain Kirkwood in the narrow channel between Bartragh and the island of Bannros; the bird swam in towards where he was sitting, and having his glass he had a good close view, and was able to distinguish the *black* throat and *white* markings on the back. This species is very rare in Killala Bay and the estuary, and not since April 20th, 1851, when my brother observed a Black-throated Diver in summer plumage in the same channel where this bird was seen by Captain Kirkwood, has one either in winter or summer plumage (although every winter I was wildfowl shooting in the estuary) ever come under my notice; and when out in my shooting-punt I always kept a good look-out for any strangers; indeed, it was one of the great enjoyments of wildfowl shooting—the *expectation* of some rare visitor turning up in the course of the day.—ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

* Cf. *ante*, p. 155.

AMPHIBIA.

Destruction of Toads.—I was very interested in the communication of the Rev. H. Marmaduke Langdale on the subject of Rats eating Toads, which appeared in 'The Zoologist' (*ante*, p. 159). Whilst out quietly prospecting for snakes in some swampy ground at Welsh St. Donats, Glamorganshire, I observed the rushes swaying about, indicating a disturbance at their base. On remaining quiet for a few moments I saw a fawn-coloured Rat (*Mus decumanus*), about one-third grown, which appeared to be jumping about upon a lump of peaty earth. Approaching within six feet I saw the apparently inanimate peat rise and walk; it was a full-grown toad. Taking out my watch, I waited to see what was going on. The rat ran round the toad several times, and, coming up behind it on the left side, began biting into it slightly to the left of the backbone. Placing its fore paws on the toad, it reached forward to the neck, and, taking the skin in its incisors, tore it back, strip after strip, leaving these shreds hanging about the abdominal region; having cleared the ground, so to speak, of the noxious derm, the rat continued eating. Several times the toad had walked or clambered forward a few inches; the rat, with its fore paws on its living meat, hopped along with it. Six minutes had elapsed since I took out my watch, and thinking it best to end this gruesome feeding, I (now only four feet away) brought down the bamboo I was carrying, aiming at the rat; however, the latter leapt adroitly aside and fled. I dispatched the toad, which was alive and showed no concern at the hole in its back. Incidentally, during the previous part of the proceedings, a shrew—looked more like a water-shrew than the common species—was running around the chief actors and up the stems of aquatic plants, apparently agitated or interested in what was happening. This took place in the afternoon of May 13th. On Feb. 8th I put up a Magpie within a stone's throw of the same spot. This rascal was busy disembowelling a very large toad. On reaching the latter I found a hole in its side large enough to insert a thumb for an inch or slightly more; the viscera of the amphibian was lying in the sunshine by its side. The toad blinked and squatted down, seemingly indifferent or stupefied; I cannot say which. Just before spawning takes place I have found scores of female toads disembowelled lying near the water's edge. I have often observed the Carrion-Crows pecking about, though every endeavour to approach near enough to see at what they peck has been thwarted by the wily birds. The keeper states definitely, though on what grounds I know not, that the crows open up the toads to get at the spawn.

Toads are very plentiful in the Welsh St. Donats district, whilst frogs are comparatively scarce; thus the grass-snakes are often compelled to eat toads through scarcity of their favourite food. In captivity also *T. natrix* makes no trouble over eating small or half-grown toads, though if given the choice the frog is selected. The greatest destroyers of toad-life, however, are the fires which are started every spring to burn the old bracken; hundreds of charred remains of poor *Bufo* are to be found scattered about after one of these conflagrations.—ARTHUR LOVERIDGE (Kiltiernan, Llandaff).

CRUSTACEA.

The Maximum Weight of the Edible Crab (?).—This question has been recently raised in these pages by myself (1912, p. 272), and by Mr. A. H. Patterson (*ante*, p. 77). My friend Mr. John Callenso, of Penzance, has taken considerable trouble in procuring me authentic information on this matter, and has just forwarded me a copy of 'The Cornish Evening Tidings' for May 29th last, containing a report of a meeting of the Cornwall Sea Fisheries Committee, held at Truro on the previous day. At this meeting Mr. P. P. Williams stated that one of the fishermen in his district recently caught a Crab weighing 13 lb. 3 oz.—W. L. DISTANT.

Immense Swarms of *Euthesto compressa* on the Shore at Redcar.—On Friday morning last (May 23rd) I went on to the sands, the tide being low, and noticed that from high-tide mark to the water's edge the shore was littered with these little creatures, evidently left by the ebb; in some places the sands had the appearance of there having been a slight fall of snow, which had partly melted and formed a kind of slush. I recognized that they were all *Euthesto compressa*, and that there was an unusually large number of them. The next day I went again on to the shore, and then found that there had been a most extraordinary influx of the crustaceans on the previous tide; the shore was practically covered with them, and at high-water mark they were in such quantities that they resembled small snowdrifts several inches in depth, and so conspicuous as to be easily noticeable at a distance of over a quarter of a mile. All the little pools on the beach and on the rocks were swarming with them, and they were generally swimming on their sides (this is the first time I have seen them swimming). Those in the drifts and on the wet places of the sands were all alive. On either side of Redcar—to Saltburn on the east and Teemouth on the west—a similar state of the shore prevailed. I am informed that one of the fishermen raked

together heaps of the crustaceans, and took them in barrow-loads to put on his garden for manure. I have seen small visitations at irregular intervals for several years past; in 1892 there were a good many, and again in 1907, but never before have they occurred in such swarms as on the present occasion. To-day, which is a week since they first appeared, I could point out greyish patches on the sands where accumulations had been formed, the remains now being merely the skins or cases. These visitations invariably occur in spring, with north or north-east winds, but last week the wind had been westerly for several days before the 23rd. I think the theory regarding these occurrences is that the ocean currents setting in from the Arctic seas southward in spring carry these little creatures to our waters, and so they are drifted in and come under observation if suitable conditions prevail. I understand that *E. compressa* is considered to be rather uncommon; it has been reported from the Norwegian coast, and from further northward, so that the present visitation is unusually interesting.—THOS. H. NELSON (Seafield, Redcar).

P.S.—Since writing the above I had some conversation with a friend, who tells me he was bathing, on May 23rd, at the east side of Redcar, and the sea was swarming with *E. compressa*. He said he could scoop up hundreds in his doubled hands, and his bathing costume was covered with them when he came ashore. Bathing was rendered quite unpleasant owing to the millions of these little creatures. I am reminded that in 1892 Canon Norman named some crustaceans for me, amongst them *E. compressa*, the first specimens known in British waters (see 'Naturalist,' 1892, pp. 144 and 175-6; also 'Birds of Yorkshire,' vol. ii. p. 692).—THOS. H. NELSON.

[Dr. W. T. Calman, who has seen some of these specimens, also refers to Norman (Ann. Mag. Nat. Hist. (7), v. p. 132 (1900), and Petch and Norman, 'Naturalist,' 1904, pp. 158-159.—ED.]

ANNELIDA.

Dutrochet's Land Leech in Surrey.—Since the previous record of this species in Surrey (Zool. 1911, p. 155), there is now evidence that *Trocheta subviridis* is far from uncommon in this county. In April last my gardener brought me three examples which he had found in the clay subsoil near my garden. I forwarded them on to Mr. W. A. Harding, who identified them as the above species.—W. L. DISTANT.

ZOOLOGICAL NOTES FROM MENTONE, 1912.

ON Oct. 31st I had given to me a female Blackcap, and on Nov. 5th a female Golden-crested Wren, both of which had been obtained in the Valley of the Borigo. Blackcaps have been plentiful in the gardens during the past winter, and are evidently sedentary in part, but some may migrate to higher ground in summer; they frequently uttered their call-note, which resembles the sound produced by striking two stones together. This note is sometimes repeated very often and very loudly, and then becomes, I suppose, a note of alarm or warning. I had one in my hands, with the under mandible partly and the feet wholly horn-coloured; I judged these to be marks of immaturity. There was a bare reddish ring round the eyes. On Dec. 17th I flushed a small bird on the Chemin de l'Annonciade, which appeared to be wholly black, but as it had a red tail, I have little doubt that it was a Black Redstart. Four days later I saw one of the Yellow-breasted Wagtails in the garden; I believe this was the Grey Wagtail (*Motacilla melanope*). The breast was very pale yellowish, the throat black, bounded by a narrow whitish line; the black of the throat was not quite pure. A male Golden-crested Wren, given to me on Dec. 23rd, had the crest a bright orange-red, with only a few minute yellow feathers visible. I received a Willow-Warbler on the same day, so that bird is also apparently resident all the year.

On March 8th I noted that almost all the Gulls had coal-black (not brown) heads and black bills and feet. Some had wholly white tails; the tails of others were white tipped with black. There were a few the wings of which were streaked with white and ashen. Further observation is necessary before one can pronounce an opinion on the species. Two large gulls seen with the smaller ones on Feb. 2nd were, I believe, Lesser Black-backed Gulls.

About July 7th or 8th, as I was sitting by the Bévéra, near Sospel, I became suddenly aware that a large snake was in front of me, close to the side of the stream, whither, I suppose, it had come to drink. It saw me, and appeared undecided how to act, turning its slender and graceful head anxiously from side to side. I moved slightly, and it turned sharply round and slid under cover in the twinkling of an eye. I never saw Tasmanian snakes glide so rapidly. The upper surface was conspicuously marked with black (or perhaps very dark green) and yellow. The species was *Zamenis viridiflavus*, Wagl. In June, near Sospel, and near Moulinet, I saw on several occasions a bright green Lizard, minutely dotted with black, about

nine or ten inches long. It was one of the numerous varieties of *Lacerta viridis*—"supra flavo-virens, punctis atris creberrimis variegata" (Schreiber, 'Herpetologia Europæa,' p. 442). When surprised they invariably betook themselves to a hole in a bank. I once saw a small Gecko, probably *Hemidactylus verruculatus*, in the street here.

When I was in Lisbon, in April of this year (1913), I visited the aquarium at Algés, and there saw several examples of *Tropidonotus viperinus* in a glass tank, and wholly under water, with the exception of their heads. The Portuguese name on the label was *Cobra d'agua* (Water Snake). This interested me, because a friend at Mentone had told me that he had seen a snake in a pond (or stream) there wholly under water, and had jerked it out of the water with a stick. The Green Lizard which I saw in Portugal was a totally distinct variety from that which I saw in the Alpes-Maritimes. It was of a pale sage-green hue, and had irregularly shaped black spots.

I regret to say that the butterfly which I saw at Mentone on Aug. 24th last (as mentioned in 'The Zoologist' (1912, p. 430)) was not *Vanessa antiopa*, as I thought at first, but the much rarer *Charaxes jasius*. At the date of writing (Nov. 28th, 1912), a few Red Admirals may still be seen, and occasionally a Locust in a semi-torpid condition. Last winter (1911-12) a Locust maintained its position on a slender peach branch during the greater part of the winter. On Nov. 26th, 1912, I found a spider beneath a large stone on the Chemin des Castagnins. It proved to be the rare male *Cteniza moggridgei*, Cambr., the female of which constructs a trap-door nest. On the 20th of the same month I had taken a green Orthopterous insect (*Conocephaloides nitidulus*, Scop.); on the 22nd, *Cebrio gigas*, Fabr.; on the 27th I caught a Locust (*Acridium ægyptium*, L.). On Dec. 1st I saw a Mole-Cricket (*Curtilla gryllotalpa*, L.) crawling along a hard garden-path. The Mentonese call it "ortolan" (gardener), and say that it makes holes in potatoes. On the 27th of that month I saw the last butterfly of the season—a Red Admiral. The day was bright and warm, and the insect remained on the ground with fully expanded wings for some minutes, as if to absorb every ray of sunshine.

On the evening of Jan. 25th of the present year I perceived at the side of the garden path three minute and faint specks of light which proceeded from a female *Lampyris*. The creature was absolutely wingless, and bore some resemblance to a woodlouse, but did not roll into a ball, but crawled about on short legs. The upper surface was flat and projected beyond the under surface. When placed on its back it righted itself by means of a steady twist of the whole body.

This is the only female *Lampyris* I have seen here, although near Lausanne I have seen several, but probably of a different species, as their light was more conspicuous and slightly greenish. The Humming-bird Hawk-Moth was first seen on Feb. 3rd, a small white butterfly on Feb. 7th, and the Brimstone Butterfly on March 14th.—
J. R. McClymont (Maison Roche, Avenue Carnot, Mentone, France).

O B I T U A R Y.

LORD AVEBURY.

LORD AVEBURY, perhaps better remembered as the once Sir John Lubbock, passed away on May 28th last at his seaside residence, Kingsgate Castle, near Margate. He was born in London on April 30th, 1834, and after three years at Eton entered his father's bank at the age of fifteen, being at the time of his death head of the firm of Robarts, Lubbock & Co., and will be remembered as an acknowledged authority in finance, a well-known politician, an anthropologist principally from the archæological and social standpoint, and a naturalist in restricted and special groups of animal life. Lord Avebury belonged to the Victorian era, and was a man of varied taste and busy life; his business training and courteous manner, apart from his scientific knowledge, made him an excellent president, and his official positions in the scientific arena showed that these qualities were not unrecognized.

It is, however, with his zoological services that we are now interested, especially those relating to anthropology. In this field he contributed to the knowledge of the student in books that could be read with interest by a large class of general readers. His 'Pre-historic Times' (1865), and 'The Origin of Civilization and the Primitive Condition of Man' (1870), of which there was subsequently more than one edition, were excellent examples of arguments based on available information, much of which has now been supplemented, and some qualified, by subsequent investigators. Their effect in introducing anthropological conclusions to the educated public in the early days of the science of man in this country was more than considerable.

In entomology he wrote 'The Origin and Metamorphosis of Insects' (1873), 'British Wild Flowers considered in Relation to

Insects' (1875), 'Ants, Bees, and Wasps' (1882), and especially with reference to the last subject rightfully and at once obtained the verdict of being an original, patient, and reliable observer. To the ordinary reader he will be remembered as opening the discussion—now some years ago—on the "Hundred Best Books," and by the industrial toilers as the introducer of two welcome and beneficial Acts of Parliament—the Bank Holiday (1871) and the Shop Hours Acts (1886 and 1904).

NOTICES OF NEW BOOKS.

Problems of Life and Reproduction. By MARCUS HARTOG, M.A., D.Sc., &c. John Murray.

MANY readers will wish that Dr. Hartog had not been prevented from following his original aim in this publication, which, he tells us, was to produce "A general treatise on Reproduction, suited to the layman interested in biological questions, and without any technical preparation for their study." He has, however, been compelled to alter his plan, and has reissued a collection of essays previously published at different times and in various journals, but these have been in some cases remodelled, and all have been brought up to date.

Of these, the two that will probably be read with most avidity are "The Transmission of Acquired Characters," and "The Biological Writings of Samuel Butler." The first is combative to the views of Weismann and the "Neo-Darwinians," and is in a sense frankly "Neo-Lamarckian." It is very vigorously written, and will well repay the attention of representatives of either school of thought. Dr. Hartog fully admits that judges on this question differ. "From Alfred Russel Wallace, Ray Lankester, Thiselton Dyer, and Archdall Reid, we turn to Charles Darwin, George Romanes, Sydney Vines, Francis Darwin, K. Goebel, Wilhelm Roux, Oscar Hertwig, Yves Delage," and he claims that if a verdict has to be pronounced at this moment it must be "in favour of Lamarckian transmission as a factor in variation and evolution." We think, however, that no *twelve*

unbiased and competent scientific jurymen could be found who would unanimously agree on a verdict at all. The question is still an open one, but Lamarck has been unduly depreciated, and will certainly come again to his proper recognition.

A scientific appreciation of the biological writings of Samuel Butler is somewhat of a snare. That versatile and clever writer almost put himself out of court by the extreme candour of his criticism and the freedom of his assertions, but nevertheless his books are still very much alive, and Dr. Hartog has given a very fair and judicial introduction to them.

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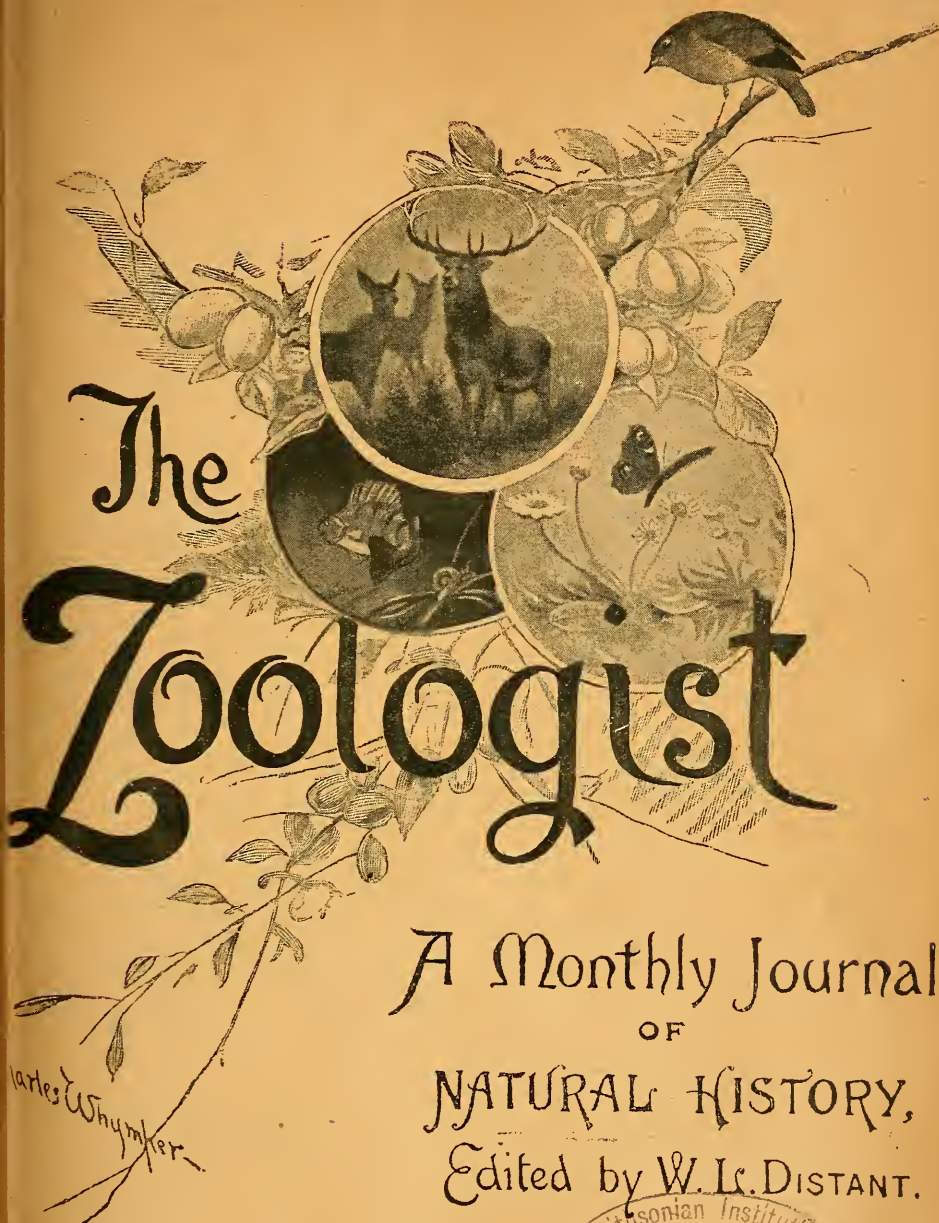
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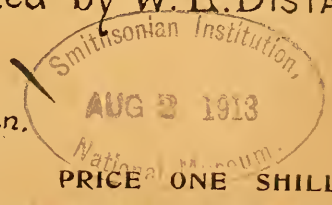
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THE ZOOLOGIST

No. 865.—July 15th, 1913.

THE VELOCITIES OF MIGRATORY BIRDS.

BY F. J. STUBBS.

MR. GURNEY'S remarks on the flight of migratory birds (*Zool.* 1913, p. 165) prompts me to offer a word or two on the subject. Since the writing of my paper on "The Use of Wind by Migrating Birds" ('Manchester Memoirs,' vol. 53, no. 15), I have seldom failed to take advantage of any circumstance bearing on the question that offered itself to my notice; direct or controlled experiments on normal birds are almost past hoping for, and the most we can do is to make the best of chance opportunities of field observation. A word of warning is necessary in connection with the statistics of Pigeon-flying; the bird is a *non-migrant*, and its sedentary habit is a factor that leads it to cover long distances. I am well aware that the figures derived from homing races are very valuable, but nevertheless one ought never to forget that the Domestic Pigeon is not by nature a long-distance flier. I was once told by a well-known Lancashire "mapper" (the official who fixes the parallel routes in Pigeon races) that a Starling thrown up with the Pigeons in a race from Worcester reached its home in Lancashire, one hundred miles away, far ahead of the first of its larger rivals. I forget the times, and I can only give the word of my informant.

For a great number of years the study of migration has been inconvenienced by the existence of one or two curious superstitions that maintain their hold in spite of attacks. One in particular is the belief that migrants prefer to travel in the teeth of the wind. I have been unable to learn exactly how and

when this view became established. Herr Gätke has been blamed, but I think without cause. Long before the publication of his well-known work the "head wind" theory was commonly mentioned in British writings, and although nobody pretended to have reasoned observations in its support, and all were ignorant of any natural law that would have made it credible, it continued to flourish. Gätke (believing, of course, that birds did regularly migrate head to wind, and anxious to suggest a reason) said that they did so in order "to escape the disagreeable experience of having the wind blowing obliquely through their plumage from behind" ('Heligoland,' &c., p. 27). Many present-day writers on flight and migration have repeated this curious explanation, so comical to the mind of the physicist; and probably the majority of professed ornithologists, if not going so far as Gätke, still believe that a flying bird falls to earth in a "tail wind."

Few tasks can be more thankless than that of attacking a superstition of science, for it is in human nature that "what did not come in by the door of Reason, will not be driven out of that door." Apparently, the "Head Wind Theory" was not based originally on actual observations; I think, however, that its birth was in a misinterpretation of a single common phenomenon. For example, when a bird crosses the North Sea, under adverse conditions, it comes to earth as soon as it sights land. Now, bird migration is visible, as a rule, only when it ceases to act, and most of our observations are based upon birds that have for some reason or other *ceased to migrate*, either temporarily or permanently. No one would pretend to think that every migrant crossing the North Sea comes to earth the moment it sights land; only the weaklings, or those destined for that particular locality, become visible to the terrestrial observer, and the main bodies pass overhead in their courses to Cornwall, Wales, or Ireland—to name these destinations at random.

A head wind, as I shall soon show, is an adverse condition, and birds encountering it are glad to drop to earth, and in this way come to the knowledge of the observer on the coast. Thus the collector or the wildfowler is led quite properly to view a head wind as the one bringing most migrants, and the next step is to believe that birds actually *prefer* such a wind.

The fact that a head wind *stops* migration, and that they are seeing *retarded* birds, seems to have eluded the understanding of Gätke and others.

The "feather-ruffling" aspect is also based on the misinterpretation of a common observation. Such birds as Lapwings, in rough weather, constantly stand head to wind. If they happen to turn, their feathers are ruffled. A not too robust philosophy has led many people to say that exactly the same thing happens if the bird is flying, and no longer on the ground. The equally absurd if less inexcusable belief that *a flying bird, if it is to maintain its altitude, must move at a greater velocity than the wind if flying in the same direction* is based on the fact that a cyclist, for example, riding at twelve miles an hour in the teeth of a wind of the same velocity, rushes through the air at the speed of twenty-four miles an hour. Riding in the opposite direction, of course, he is in effect in a calm.

A bird must maintain a certain speed to keep itself in the air—let us say twelve miles an hour. The idea is that flying tail to wind (velocity twelve miles per hour) it finds itself in a calm, and "the air ceases to support it; it falls to the ground." The theory is a good example of its kind—unsupported by observations, and directly opposed to four or five well-known natural laws; it is, of course, merely a logical outcome of the superstition of head winds. The actual "facts" have not been observed, but evolved in the mind of the writer, in agreement with his theory. There is no such thing as wind, as we know it, to the flying bird. It is travelling in a medium that happens to be moving bodily over the surface of the earth. The man feels the same medium rushing past him.

The point is: Can a bird fly tail to wind, or head to wind? What observations are available? On many occasions I have seen birds *unable to travel head to wind*, and I have also seen birds *moving at great speed tail to wind*. On March 6th, 1909, a blizzard of unusual severity raged over the greater part of England. I happened to be at that time on the Lincolnshire coast, and, notwithstanding an unparalleled state of bodily discomfort, I contrived to carry out some experiments on the birds. The wind, at the sea-level, was blowing, so far as I could estimate it without instruments, at not less than fifty miles per hour.

Great numbers of birds were sheltering in the hollow ditches, and when I struck one of these the inmates were forced to take wing. A single example will suffice here.

Walking up wind to a ditch, I came upon a small party of Hooded Crows, and on my approach these tried to fly away from me, in the teeth of the blizzard. Flying at what was obviously their full speed, they made no headway whatever, and, indeed, even moved very slowly towards me; had I been free from the wind myself, I could easily have touched one of them with my walking-stick, and thus they hung for a second or so in the air before me. Finding their efforts useless in that direction, the birds promptly turned tail, and swept past me down wind. I turned also, and saw them rise high in the air to clear a group of tall trees a quarter of a mile inland.

Let us assume for the moment that the wind was exactly fifty miles per hour, or, as an alternative, that the speed of the Crow is fifty miles per hour. Flying head to wind, as we have seen, their velocity *in relation to the earth* was $50 - 50 = 0$ miles per hour, but in the opposite direction it must have been $50 + 50 = 100$ miles per hour over the surface of the earth. Since then I have made many similar observations (but never under such terrible conditions!). No longer ago than May 12th last, sitting in the shelter of a rock at the summit of one of the Peak hills, I saw a Titlark flying head to wind, and moving tail foremost past my shelter at an estimated speed of two miles an hour. Assuming that its usual velocity was 30, the wind must have been 32, and when the bird turned (as it did do) its net speed between points on the earth's surface was $30 + 32 = 62$ miles per hour. If we use these figures in conjunction with the "Head Wind Theory" of migration, we shall see that such a bird as a Titlark could not cross the North Sea in less than 150 hours, unless the so-called "favouring" wind kept below 28 miles per hour; but if we drop this theory and admit that a bird actually can fly tail to wind, we shall see that with a 30-mile breeze a Titlark could cross the North Sea in five hours. I cannot say that I quite follow Mr. W. Eagle Clarke in his interesting and epochal work, 'Studies in Bird Migration.' As I understand his remarks, he does not now insist on the acceptance of his "head wind" views described in the Report of the British Asso-

ciation (Liverpool, 1896, pp. 451-477), but expresses a belief that winds have little or no influence on migration (i. p. 178). Possibly some day we shall have an account of the observations and the deductions on which this remarkable opinion is based, but in the absence of these details, I am inclined to urge that every single mile in the velocity of the wind has its influence on the speed and the routes of the migrants that happen to be on the wing at that time. It is perhaps my own obtuseness, but I confess I do not quite follow Mr. Clarke's "matured opinions." I was greatly disappointed to find this important matter of winds almost entirely overlooked in the book, and the question left much as it was twenty years ago, with the exception of an opinion—that winds have no influence—which is unfortunately in direct disagreement with the results of the experiments now to be described. I may be pardoned for pointing out that these results support the conclusions given in my paper, which was published in the spring of 1909, before the genesis of the successful aeroplane.

It was my good fortune to be present in the House of Commons on March 19th last, when the Secretary of State for War delivered his notable speech on Aviation in the Army. This speech was widely published, but no part of it reached the ornithological literature of the day, although certainly it came within the province of the student of birds. Two items worth notice are accounts of experiments that can be made most useful in the present discussion. One day, when the wind was blowing at 57 miles per hour, an officer rose in his aeroplane in the teeth of the wind, and after 16 minutes' flying had covered a distance of no more than 400 yards, at a net velocity in relation to the earth of less than a mile an hour. On another occasion, with "a wind of great violence," a second officer flew to and from a point 21 miles away. "Head to wind," the journey occupied $1\frac{1}{4}$ hours, at a velocity of 17 miles per hour; and "tail to wind," the distance was covered in 3 minutes 56 seconds, a velocity of 115 miles per hour. Is any supporter of the "Head Wind" theory ready to claim one law for the bird and another for the machine? If not, the "Head Wind" theory must be abandoned.

In my "Wind and Migratory Birds" paper, I discuss the influence of cyclones on migration. It occurred to me that this

matter might be worked out theoretically, and I arranged a sort of time-table, giving the speeds of a stream of birds an hour apart, crossing a series of concentric eddies moving at known velocities in a given direction. The actual courses, as worked out for me by Mr. H. G. Taylor, M.Sc., A.M.I.C.E., prove conclusively that a "migration route," either for a species or for a general tide of birds, is a physical impossibility. Mr. T. A. Coward, in his tiny yet most valuable book, 'The Migration of Birds,' has figured a route modified from one of Mr. Taylor's charts, and I hope soon to see the publication of a set of these significant diagrams, with the data on which they are based.

Perhaps those who do not readily understand how a flying bird *cannot possibly* have its feathers ruffled by the wind—and I admit that the reasoning is not so simple as some would have us believe—may be contented with the account of a simple experiment that can be repeated as often as desired. In places where Gulls are in the habit of being fed it is easy to persuade any individual bird to move in a circle. Choose a bird and toss it a fragment of fish; then, as the same individual flies past again throw it another; in a short time it will make its circles as small as possible, in order to lessen the intervals between the morsels of food (in the Black-headed Gull the minimum circle is about thirty to thirty-five feet in still weather). On a windy day watch the plumage carefully, especially during that part of its course when the bird is tail to wind—*there will be no ruffling* in any way. Observe, however, that as the Gull is about to alight, when flight has ceased and the force of gravity acts as a sort of connection with the earth, the feathers *are* often ruffled, although the bird is in the air.

It should now be clear that birds cannot cover long distances against a wind; that they can, and regularly do, fly with the wind, and this without any ruffling of plumage, and without loss of lifting power; and I would go further, and express my belief that the migrations of birds are aided to a very great extent by the movements of the atmosphere. Every field ornithologist must be familiar with the intelligent manner in which birds habitually make use of local currents or eddies of air or water, either in play or when about their more serious affairs: a Swan using its wings as sails; Gulls utilizing the upward current

above a cliff to save wing power; or—a comical instance—Sparrows sheltering from wind or rain in the narrow, dry, vertical area a yard or so from the corner of an ivied lee wall, while intellectual mankind below is getting wet through!

If we examine a diagram of the atmospheric currents of the earth, we see that there are regular tides between the Equator and the Poles. A migrant must of necessity either fly *with* or *against* these currents—we can ignore “beam winds” for the present—on its annual journeys. To travel head to wind is, as we see, wasteful and even dangerous, and from what we know of the habits of birds in relation to winds and short flights, we are led to expect that they are intelligent enough to take advantage of air currents for long flights. A critic of my earlier paper was led to view the migrant as “boarding” the rim of a cyclone as one might board a moving roadway, and dropping off when that part of the atmosphere came above its destination, or as near that spot as possible. This was rather a flippant way of interpreting my views, but after all I cannot see any very great objection to it, except that certain people are justly suspicious of scientific views that are not couched in some form of scientific argot.

Migrants certainly possess the sense of direction to a high degree, and this aspect of the study is a most important one. I would draw attention to an unusually interesting paper by Dr. C. Viguier on “Le Sens de l’Orientation et ses organes chez les Animaux et chez l’Homme,” in the ‘Revue Philosophique’ of 1882 (xiv. pp. 1–36). So far as I know, this piece of work, even to-day and to a greater extent thirty years ago of prime interest to the ornithologist, has not been even mentioned in any British book or paper. Yet, on the other hand, Gätke’s work received a flattering welcome, although his book contained a number of palpable errors. Many of these were combated by Mr. F. B. Whitlock and others, but the personality of the man and the ornithological richness of his island have ensured him a wide circle of sympathetic readers for his fascinating book.*

The experiments made with flying machines demonstrate that winds directly influence the speed of aeroplanes moving in

* All cautious students of Gätke’s book should read also Whitlock’s ‘Migration of Birds; a Consideration of Herr Gätke’s Views’ (1897, 8vo).

them—a head wind retards, a tail wind accelerates, beam winds carry the machines out of their courses. These results agree in every way with all the observations I have made on wild birds, and are quite in keeping with all known natural laws. On the other hand, they are in violent opposition to the popular “Head Wind” theory of modern ornithologists, with its weird by-products of “feather-ruffling,” and so forth: and I hold that this latter theory was erroneous in the first place, and has never during its existence received any support from checked and tested observations.

Perhaps I might offer the following as a help to those who do not care to treat the problem theoretically. One day I saw, during a “balloon race,” two balloons at an altitude of 2000 ft., travelling tandem, about half a mile apart. There was a good wind, and the vessels were drifting across the surface of the earth at about 60 miles per hour. The aeronauts, of course, were unconscious of this wind; the balloons, with their ropes and hanging flags, were as rigid as though carved from metal; and there was the usual strange experience of standing in a strong wind and seeing the yellow mist of the falling ballast in a perfectly vertical column. The air around and between these two balloons was certainly as calm as that of a vault. Now, let us try and imagine a strong pigeon being released from the *second* balloon, and flying in a straight line to the *first*, with a velocity of 60 miles an hour. In 30 seconds it would have covered the journey; but, at the same time, the two balloons, and the medium supporting them, would have travelled over half a mile of the earth’s surface. The speed of the bird, to the terrestrial observer, would be therefore one mile in 30 seconds, or 120 miles per hour. If we now imagine the bird returning to the second balloon, it would complete its half mile of vigorous flight and still remain *precisely over the same spot on the earth*. According to the “head wind” ornithologists, it ought to be moving at an enhanced speed across the earth under these circumstances. Let us hope the theory has a champion ready to come forward with calculation or observation explaining just how it is achieved.

STRAY NOTES ON THE BIRDS OF TRINIDAD AND TOBAGO, BRITISH WEST INDIES.

BY COLLINGWOOD INGRAM.

Haleland Park, near Port of Spain, Trinidad, December 20th, 1912.—The Yellow-breasted “Qu'est-ce-qu'il dit” (*Pitangus sulphuratus trinitatus*) is certain to be the first bird to obtrude itself upon the visitor's notice. Not only on account of its abundance—for it is even common within the precincts of the city—but because it has a habit of constantly screeching out its name in a harsh, unmusical voice. Were it not for these frantic vociferations, this Tyrant would be an attractive bird, for it has many quaint ways that point to its being endowed with more than the ordinary run of avine intelligence. At this season it is usually to be seen in closely consorting pairs, and I have no doubt that fear of separation accounts for much of this disagreeable noisiness.

When I was in Port of Spain seven years ago, the “Johnny Crow”—a black and unsightly Vulture (*Catharista atrata*)—was common everywhere, and was so familiar that it is hardly an exaggeration to say that one almost stumbled over the birds in the streets of the town. Since then they have fallen on evil days. The Trinidadians do not question their utility as scavengers, but charge them with carrying their unsavoury viands on to the roofs of the houses, whence morsels are occasionally dropped into the fresh-water cisterns. This is hardly in accordance with their ideas of hygiene, so the edict went forth that the birds should be destroyed. “Johnny Crow” has consequently been obliged to withdraw from the town, but he may yet be seen in goodly numbers round the slaughter-house and on the “dumping” ground beyond the harbour. In the township of Le Brea, however, he is as tame as ever, and still shares the garbage of the streets with the gaunt pigs and lean pariah dogs, scarcely deigning to move out of the way of the passing negro.

December 23rd.—For several days I have been speculating as to the owner of a peculiarly sad voice that I have heard calling from the wooded hillsides. It is a very striking sound—a clear,

mellow pipe, followed, after a distinct pause, by a single, or sometimes a dual, note in a much lower key. To attempt to trace its author amidst the tropical vegetation seemed a well-nigh hopeless task, as, indeed, it would have been had I not bethought myself of the simple device of calling the bird to *me*. I found it was not difficult to give a plausible imitation of the whistle. Keeping quite still—oblivious of the mosquitoes and the vicious little sandflies!—I repeatedly answered the call, and patiently awaited developments. Very soon the fluty notes of the stranger could be heard approaching nearer and still nearer, until the sound became unbelievably close—in fact, in the very bush that protected me. I could even hear the gentle rustle of a dried leaf as the newcomer stirred, almost under my feet, and the next instant a small brown bird strode, with a jerky flick of its uplifted tail, into full view, not an arm's length from where I was crouching. In every detail it was a miniature Rail—it had the same stooping, hesitating gait, the same spasmodic flick of the tail; yet I knew it to be a very different species—one of the Ant-Thrushes; in fact, the “Coq-bois” (*Formicarius analis saturatus*).

As though in duty bound, and apparently without a semblance of pleasure, the bird frequently stayed its peregrinations to raise its head and utter this loud, joyless challenge. It would then proceed on its way, taking a few long strides over the ground, only to stop again either to search among the dried leaves for its insect food, or to reiterate its doleful notes. A strictly terrestrial species, the “Coq-bois” appears to be one of the few birds that habitually affect the gloomy under-world of the forest, the majority preferring the well-lighted upper branches of the bushes and trees.

Another member of the same family (*Formicariidæ*), likewise possessing a characteristic voice, is the “Pintade” (*Thamnophilus doliatus*). This is a curious looking fellow with a black-and-white barred livery, while his wife, usually in close attendance, is very differently dressed in tawny brown. He is not uncommon, and is found inhabiting the dense thickets of wild vines and other growths, whence he keeps in touch with his mate by a rattling chortle—a curiously “thick” sound uttered in a quickly descending scale.

Trinidad, December 24th.—This morning I was astir long before the break of day, joining a party of Creole deer-hunters on an excursion to a neighbouring valley. When I left my house at three the full moon was just sinking behind the hills to the northwards, and the light from it seemed to plate the burnished foliage of the Tropics with an extraordinary wealth of silver. The air was delightfully fresh and charged with the pungent smell of growing things. A heavy dew lay upon everything, soaking our clothes as we forced our way along the overgrown pathways. The noisy din of insects—so aggressively loud when one retires to bed—had almost ceased, but one still heard the occasional cry of some unknown night bird, and the more familiar muffled “poop-poop-poop” of the “Petite Chouette” (*Glaucidium phalaenoides*). This pigmy Owl, scarce larger than a Sparrow, is very common in Trinidad, where I have both seen and heard it in broad daylight. It is exceedingly sprightly in all its movements, and has a peculiar habit of violently jerking its tail. Its note, repeated ten or twelve times in succession, although soft, is nevertheless loud and resonant, and on account of its monotony soon becomes wearisome.

With the first paling of dawn a babel of bird voices fell upon my ear, and this speedily increased in volume until the forest glades were filled with a clamour of strange and unfamiliar sounds. A naturalist fresh from northern latitudes is sure to be impressed by the infinite variety of these notes. It is not so much that each bird possesses a large vocabulary (the reverse is probably the case), but that the island is remarkably rich in species, most of these being represented by a comparatively even (and often small) number of individuals. Compared with European birds, the notes of these tropical species are generally harsh and squeally, a sustained musical song being almost unknown in this country.

One of the first birds to make itself heard was the “Caille,” a species of Tinamou (*Crypturus soui*).^{*} It produces a shrill, sibilant sound—a rather mournful, high-pitched note, suggesting to the mind the quivering, silvery neigh of some fabulous creature rather than the cry of a bird. With ventriloquistic power, a few individuals repeatedly answering one another will scatter

^{*} *Crypturus pileatus*, auct.

this sound over a valley in a truly bewildering manner, giving one the impression that the bird is really commoner than is actually the case. Pre-eminently a ground bird, the "Caille" will only take to its wings under compunction. Once forced to fly, however, it rises with a surprising bluster and whirr of wings, and I can vouch for it, that as it swings sharply through the cocoa trees it is an amazingly difficult bird to hit!

Then one distinguished the plaintive cat-like "me-er" of the "Grive" (*Turdus gymnophthalma*), and again, from down among the black shadows of a deep dell, the bold notes of the "Coucou" (*Thamnophilus major*). Suddenly a great chattering sound attracted my attention, and on looking up I espied a squealing bevy of Parrakeets (*Urochroma cingulata*) flying hurriedly southwards. This flock, or one similar to it, passes over Haleland Park regularly every morning and evening on their way to and from their feeding grounds. The birds always seem to travel high, and in a fairly compact body of twenty or thirty individuals, and all the time they maintain a constant outcry of chattering notes.

These are a few of the avine voices I have already learnt to distinguish, but as the sun rises, and the "High Woods"* fill with the sound of awakening bird-life, I realize that the vast majority still remain unknown to me, but if I have time I shall hope to make their acquaintance later on!

Trinidad, December 27th.—Stirred by the many and wondrous tales of the Tarpon—or "Grand Ecaille," as they call him here—this afternoon I went out trolling in the Gulf of Paria. Beyond a sudden and violent tug, for all I knew the waters might have been fishless! But the outing was nevertheless entertaining, and I saw much to keep me interested. Overhead there were always a number of Frigate or Man-o'-War Birds (*Fregata aquila*) to be seen. At one time I counted as many as seventeen together, soaring in wide circles above the Five Islands. The majority of them were young birds, as was denoted by their white throats, but I also observed a fair sprinkling of adults. If, at first, one is inclined to admire the clear-cut outline of this strange species, one soon appreciates that in reality it is a somewhat unwieldy creature, for, like a yacht under too heavy an expanse of canvas, it often seems to find a difficulty in manœuvring

* "High Woods" is the local term for the virgin forest.

neatly ; at any rate, it does not appear to fly with that ease and grace one is accustomed to associate with a really well-proportioned bird. I noticed one drop out of the skies to gather something from the sea ; bending sharply its immensely long wings, it fell in a kind of spiral, turning round several times in the descent. Several immature brown-plumaged Boobies (*Sula leucogastra*) were continually plying to and fro across the Gulf. The other day I heard of one seizing a large spoon-bait that was being used for Tarpon, but the bird dropped it when only a few feet from the water, and was uninjured by the hooks.

The stately Pelican (*Pelecanus fuscus*) was also present in considerable numbers. In apparent contradiction to their habits and structure, they are very fond of sitting with stolid mien on the frailest of branches, usually overhanging some beetling cliff. It is curious how, for no ostensible reason, they use one or two trees only for this purpose, and never favour any others along the same portion of the coast.

I noticed several "Rainbats," as the little Swifts (*Chætura cinierventris lawrencei*) are called, flying in and out of a low-mouthed cave. Hoping to find signs of their nests, I landed and waded in, but the vault of the cavern was lost in obscurity, and I could make nothing of them. As I entered three or four birds dashed out, brushing close past my face. In the cool hours of the mornings and evenings flocks of these Swifts, together with the commoner *C. spinicauda*, may be noted hawking for insects above some of the mountain valleys, but they disappear entirely during the heat of the day.

The dusky Hawk (*Urabitinga anthracina*) appears to be not uncommon along the cliffs, and is often seen resting on a prominent branch in the shade. He is a fine-looking bird, with a bright yellow bill and a well-marked white band across the middle of the tail, which is very conspicuous during flight. I fancy he must prey on the Iguana, for many of these reptiles may be seen basking on the uppermost branches of the cliff-growing trees. Some largish Martins (*Progne chalybea*) were also benefiting by the cool air of these precipices, but one sees many more under the high bluffs by Macaripe Bay, where I believe they nest in the crevices of the rocks. They likewise settle on the clinging vegetation, and should a Black Hawk trespass on

their domain they make repeated but, of course, wholly ineffective onslaughts upon the intruder.

An Osprey (*P. haliaëtus carolinensis*) was also noticed skirting the coast, but he was evidently a wanderer, for he soon disappeared towards the shadowy outline of the Venezuelan mountains.

Tobago, January 2nd, 1913.—A long, sweeping beach fringed with a belt of coconut palms, and ending in a small headland supporting a few dilapidated shanties, is all that now remains of Plymouth and its harbour—the former capital of the once prosperous sugar island of Tobago. But when we steamed into Courland Bay about two o'clock this afternoon, I had no eyes for these details, being fascinated by the vast numbers of Pelicans that were to be seen—a seemingly interminable line of birds, almost all of whom were busily engaged in fishing. As a matter of fact, they were strung out for a mile or more along the coast, keeping about thirty or forty feet from the shore, where, it is to be presumed, the shoals of fish were cruising. A few were resting—riding buoyantly on the water—but the majority were on the wing, either flying back to the far end of the bay, or fishing systematically up-wind in a kind of endless procession. As they proceeded leisurely against the soft “trade” breeze, the birds could be seen peering downwards, carefully scrutinizing the water. Suddenly one—often two or three together—would close its wings, turn over, and hurl itself, Gannet-fashion, at its prey. Judging by the frequency of these plunges, the bay must have been literally teeming with fish, for sometimes as many as ten or a dozen splashes could be seen instantaneously, and within quite a small compass. All this, of course, was very interesting, but the remarkable feature of the whole scene was the manner in which some Gulls (*Larus atricilla*) were worrying and robbing the complacent Pelicans of their booty. At points where these were diving oftenest, the Gulls could be noted swimming idly about in twos and threes, awaiting their opportunity. It was evident from the way they always seemed to anticipate the splash that they were watching the movements of the larger birds very closely. Thus before the Pelican had time to come to the surface the Gulls had almost invariably reached the spot, and were already hovering overhead.

Three or four would usually waylay the one bird. Dropping with noisy cries on to the water these would surround their victim, and impudently try and snatch the newly caught fish from its huge bill, which, however, the Pelican wisely kept three parts submerged until the prize was successfully swallowed. On many occasions I noticed that the Gulls actually *settled on the Pelican's back*, from which coign of vantage they could easily reach the tucked-in bill by stretching their heads out and past the other bird's neck. In this way the wretched Pelican would be completely encircled by its tormentors, and the slightest "slip" no doubt meant the loss of its meal. But although I watched this amusing performance repeated scores of times, I cannot honestly say that these avine pickpockets (or would *pick-pouches* be a more appropriate term?) appeared to be often successful. On the other hand, numbers of Gulls were sitting on the beach, preening their feathers with all the self-satisfied airs of well-fed birds, and there is no doubt in my mind that these, at any rate, had succeeded in stealing a meal.

At this season Gulls appear to be rare round the coasts of Trinidad and Tobago, and beyond a few individuals seen in the Gulf of Paria, the above are the only birds I have yet observed. This is not surprising when one remembers the volcanic origin of the Antilles and the almost tideless waters that surround them. This dearth of suitable feeding grounds is no doubt responsible for the evolution of this piratical habit, though it must be confessed it does not appear to be confined to the *Larus atricilla* visiting the West Indies, for Lord Warwick tells me he has seen them behave in precisely the same manner off Charlotte Harbour, Florida. I have observed a somewhat analogous habit among our own Black-headed Gulls (*L. ridibundus*) in East Scotland. These Gulls, somewhat closely allied to the American species, will often associate with the autumn and winter flocks of Green Plover, with the sole idea of allowing these birds to cater for them. Segregated individuals may be seen standing here and there in the midst of these flocks, waiting patiently until the nearest Plover discovers a worm. This is the Gull's opportunity: he promptly falls upon the rightful owner, and, if lucky, succeeds in driving it away before it has time to devour the wriggling and reluctant annelid.

SOME PHENOMENA OF SPECIES HYBRIDIZATION AMONG PHEASANTS.

BY GEO. P. MUDGE, A.R.C.Sc.Lond., F.Z.S.,

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A SUMMARY of certain results obtained by crossing Silver and Swinhoe Pheasants may be of interest as suggesting further lines of research.

An examination of the skins of hybrids obtained by crossing the two species (*Euplocamus nyctemerus* × *E. swinhoii*) shows that the analysis of the results is extremely difficult, and the interpretation of the features of the hybrid plumage is not without possible pitfalls. A pattern may be exhibited in the hybrids which looks like a somewhat similar pattern in one or other of the two sexes of the parent species. But whether it represents the specific pattern, or is a hybrid character simulating it, or whether it is a sort of dislocated mosaic with some of the unit-characters of the pattern of one sex of one parental species dominant, while other features of the pattern are dominant unit-characters from the other sex of the same species, or from either of the two sexes of the other parental species, is a problem which will require answering for each special feature, by continued experiment. It follows from considerations of this kind that unless the alternative feather patterns and colours with which the investigator is concerned are very strongly marked and divergent, and each represents a single unit-character, or a combination of unit-characters gametically coupled together, great caution is necessary in making definite or positive statements even of the most seemingly apparent results. So that any conclusions which I may have reached, by an examination of these skins of Pheasant hybrids, should be regarded merely as tentative and provisional, and of value only as indicating the nature of the further problems which these preliminary experiments in

hybridization have opened out. They will serve to suggest the lines along which further research may be most advantageously continued.

In making the examination of the skins, I confined my attention to three restricted areas of the plumage of the male, leaving the female plumage for subsequent examination. These areas are: (1) The Interscapular Feathers; (2) The Primaries and Secondaries of the Wings; (3) The two Central Rectrices (one right, one left) of the tail.

The chief effects of the various crosses appear to be as follows:—

(1) THE INTERSCAPULAR PLUMAGE.—The first hybrid generation derived from Silver ♀ × Swinhoe ♂ does not give uniform results. I purpose dealing with the interesting details of the polymorphism of the F_1 generation in a subsequent and detailed paper. But one of the most interesting features of this generation is that it appears to manifest a translocation of a plumage character not only from the female sex of one of the parental species to the opposite sex of the hybrid, but from one body region of the female of the species to another body region of the opposite sex of the hybrid. The transmission of the female plumage of one region to the same region in the male of the same race or sub-breed of the same species is a well-known phenomenon. But as far as I know, the result I have just described is new. It is, however, necessary to say that the hybrid character is not *identical* with the species character with which it is compared, and that there is an alternative interpretation; but I am afraid I have not space to enter here into details. The features of this generation also suggest that not only does the male of a species transmit some of the secondary sexual characters of the female of his species, but that the female of a species may transmit those of the male.*

The second hybrid generation (F_1 hybrid ♂ × Silver species ♀) is not uniform. The same sort of translocation as that described in F_1 also appears in this generation. There is also a reduction in the number of pencillings characteristic of the parental species (*E. nycthemerus*, ♂).

* In this particular case the male of one parental species was concerned, while the female was of the other parental species.

The F_2 generation (F_1 *inter se*) reproduces some F_1 hybrid features, together with clear evidence of segregation of unit-characters. This, however, cannot be discussed in the absence of a detailed statement of results.

(2) THE CENTRAL RECTRICES.—With regard to the two central rectrices of the hybrids, the first hybrid generation and second hybrid generation (F_1 *inter se*) are both polymorphic, and in both generations the most interesting results can be expressed by saying that three transpositions of colour or pattern, or both, have occurred :—

- (a) From the hen of one species to the cock of the hybrids.
- (b) From the lateral rectrices of the same species to the central rectrices of the hybrids.
- (c) The orientation of pattern has been reversed in the course of this transposition, and there has also been a mutual reversal of adjacent colour areas.

(3) THE PRIMARIES AND SECONDARIES.—In the F_1 generation polymorphism is shown, and there is some indication that one of the colours characteristic of the Swinhoe hen has been transposed to the opposite sex in the hybrid. In the F_2 generation (F_1 *inter se*) the chief feature is the manifestation of a complete segregation of the Swinhoe cock character in one of the birds. In another bird a new character not seen in F_1 appears. In a sense it represents a somatic mosaic of the modified pattern of both parental cock species. The other members re-manifest the hybrid polymorphism shown in the F_1 generation.

For the examination of the skins upon which these results are based, I am indebted to the kindness of Mrs. Haig Thomas, who in 1907, at my suggestion, commenced the breeding experiments which are here described, as well as others which yet remain to be dealt with. The object I had in view in suggesting these experiments was to ascertain how far Mendelian principles held true, if true at all, in the transmission of characters among the hybrid descendants of crossed species, as distinct from those of varieties. I may add that there is evidence of Mendelian segregation, but its nature is such that the fuller discussion of it can only profitably be undertaken when the paper with the details of results is published.

NOTES FROM THE MILLPORT MARINE BIOLOGICAL STATION.

BY RICHARD ELMHIRST, F.L.S.

IN 'Materials for the Study of Variation' (1894), Professor Bateson has brought together many instances of variations or abnormalities of Echinoderms. Since the publication of the above, numerous other instances have occurred, and at the Millport Station we have specimens as follows :—

MERISTIC VARIATION IN ASTEROIDS.

Astropecten irregularis.—One specimen with the third ray divided.

Porania pulvillus.—Two specimens, both symmetrical, with only four rays. One of these (fig. 2) was obtained in June, 1912, and lived in captivity for nine months.

Stichaster rosea.—One specimen with the third ray divided almost from the disc.

Cribella oculata.—One specimen with the fourth ray divided (Robertson collection).

Solaster papposus.—One specimen with the eleventh ray (out of thirteen) divided, and another (fig. 3) with the fourth and seventh rays (out of thirteen) divided. Number of rays varies from ten to fifteen.

Solaster endeca.—One specimen with only six rays (fig. 4) (Robertson collection). Number of rays is usually eight to thirteen.

Asterias rubens.—One specimen (unfortunately lost) with six rays, and another with seven rays (fig. 1).

Asterias glacialis.—One specimen with six and another with seven rays (Robertson collection). A third had a small arm at right angles to a ray, as in the *Cribella oculata* mentioned by Bateson, *loc. cit.* p. 440. This specimen has been handed over to Dr. J. F. Gemmill for further investigation.

OPHIUROIDS.

Ophiocoma nigra.—Three specimens with six rays each. Such varieties are not uncommon (*vide* Bateson, *loc. cit.* p. 447).

In numbering the rays of Asteroids it is proper to regard the madrepora as being "between radii I and II, the former being on its dextral and the latter on its sinistral side, while the succeeding members of the series, *viz.* III, IV, V, &c., follow on the sinistral side of II." (Gemmill, Proc. Roy. Phys. Soc. Edinb. vol. 18, p. 181, 1911.)



Fig. 1, *A. rubens*; 2, *P. pulvillus*; 3, *S. papposus*; 4, *S. endeca*.

This system has the further advantage of giving the developmental order of sequence of the rays. Following this system, we find that the anus is placed in interradius v/i in five-rayed forms, or v/vi in many-rayed forms. On examining the seven-rayed *A. rubens* and the six-rayed *S. endeca*, the anus was found in both cases in interradius v/vi. This means that the variation in the *Asterias* is towards the *Solaster* type, and the variation in the *Solaster*, by omission of the latest developed rays, is a throw-back towards the older Asteroid type.

DEFORMATION IN *ECHINUS ESCULENTUS*.

I have found a specimen in which the third ambulacrum is constricted above the equator of the test or shell, so that the fourteenth pair of radial plates (counting from the aboral end) only bear two large spine tubercles, whereas the fourteenth pair in the other ambulacra have four tubercles. The total width of the third ambulacrum at the constriction is 1 cm., and that of the normal rays at the same level 1.5 cm.; the adjoining inter-ambulacral plates are enlarged, so that in profile the test shows only a very slight flattening in the abnormal ray. At present I cannot hazard an explanation of this interesting variation.

DISTRIBUTION OF BRITISH ANNELIDS.

BY THE REV. HILDERIC FRIEND, F.L.S., F.R.M.S.

(Continued from p. 154.)

SCOTTISH RECORDS.

WITH the exception of one or two records in Dr. Johnston's 'Catalogue of British Worms,' published in 1865, nothing appears to have been done among the Earthworms of Scotland till I took up the subject upwards of twenty years ago. My own researches have been ably supplemented by the labours of Mr. Wm. Evans, F.R.S.E., of Edinburgh, who published, in 1910, an account of the 'Oligochæta (Earthworms and their Allies) of the Forth Area.' The following notes will incorporate all the records which have up till the present been made by myself and others, so far as they have come under my observation, the list being limited as heretofore to the larger forms known as *Lumbricidæ* :—

1. ABERDEEN.—Prof. James W. H. Trail sent me a consignment of Earthworms on Nov. 3rd, 1909, collected in his garden in Old Aberdeen. Out of forty-four specimens which were in a fit condition for identification, I found six specimens of (1) *Lumbricus terrestris*, L., six of (2) *L. rubellus*, Hoffm., and eight of (3) *L. castaneus*, Savigny. There were four specimens of (4) *Allolobophora longa*, Ude, ten of (5) *A. caliginosa* forma *turgida*, four of (6) *A. chlorotica*, four of (7) *Dendrobæna subrubicunda*, and two of (8) *Eisenia rosea*. A total of eight species.

2. AYRSHIRE.—In July, 1892, I received a letter from Mr. M. Young, of Paisley, saying that he proposed visiting the Girvan District, and hoped to send me some gleanings. As they have not yet arrived, I fear the postal authorities have not done their duty! There are no records known to me for Banff.

3. BERWICK-ON-TWEED is mentioned in Johnston's 'Catalogue,' and four species are recorded, viz.: (1) *Lumbricus terrestris*, (2) *L. festivus*, (3) *L. minor* (= *castaneus* probably), and (4) the Brandling, *Allolobophora* (= *Eisenia*) *fætida*, Sav.

4. CLACKMANNAN has (1) *A. caliginosa* to its credit, with (2) *Bimastus constrictus*. (See Evans's paper on Forth Area.)

5. DUMFRIES.—To the 'International Journal of Microscopy and Natural Science,' 3rd series (1891), i. 163, *seq.*, I contributed an article on the Earthworms of Scotland, in which, after giving such information as was then available on the general subject, I subjoined an account of the species collected in Dumfries by myself in 1890 and later. "It is curious to observe that the very first worm which I added to the list (*Allolobophora celtica*, Rosa) is exceedingly rare, or, to put it more accurately, has seldom come under observation. I discovered this interesting species in the spring of 1890, when on a flying visit to Langholm and Burnfoot, the home of the Malcolms, in Dumfriesshire. Some two miles north of Langholm, where the road diverges to the left, there is a streamlet of a very unpretentious character. Under the stones on its northern bank I found three specimens of a worm I had not observed previously, which proved on examination to be the one I have mentioned." It now bears the name of (1) *Dendrobæna mammalis*, Sav. Some time after I revisited the spot one Saturday afternoon, failed to find any more specimens, and wandered so far in my search that I lost the last train for Carlisle, and had a most lively experience as a result. In February, 1891, between Annan and the Solway, I found half a dozen specimens of (2) *A. chlorotica* in a brackish pool. Half of them were dead, having apparently been drowned by an exceptionally high tide. The same species was found to the north of the town, while (3) *Lumbricus castaneus*, Sav., was plentiful in the meadows. Near the station the Longworm (4) *A. longa*, Ude, was taken, while (5) *Allurus tetrædrus* was found sparingly near the river a little above Annan. The only other species known in 1891 for this county was (6) *A. turgida*, and about this there is an element of doubt.

6. EDINBURGH.—The list for Edinburgh and district is very large in comparison with that for any other county, thanks to the efforts of Mr. Evans. *Lumbricus festivus* seems as yet to have been found only once on the mainland, but it has once reached me from the Isle of May, so that, if we include this island under Edinburgh, we find all the four species of *Lumbricus* here. These are (1) *L. castaneus*, (2) *L. rubellus*, (3) *L. festivus*,

and (4) *L. terrestris*. The following species of *Allolobophora* and allies are also well authenticated: (5) *A. longa*, Ude, (6) *A. chlorotica*, Sav., (7) *A. caliginosa*, (8) *Eisenia fætida*, Sav., and (9) *E. rosea*, Sav., (10) *Dendrobæna mammalis*, (11) *D. subrubicunda*, and (12) *D. arborea*; also (13) *Bimastus eiseni*, and (14) *B. constrictus*, with (15) *Allurus tetrædrus*, and (16) *Helodrilus oculatus*, Hoffm. On Feb. 6th, 1905, Mr. Evans sent me a remarkable variety of *A. longa*, with abnormally long tail, segments numbering 240, and of a warm brick-red colour instead of dull sienna. For farther details reference may be made to the excellent paper by Mr. Evans, to which allusion has already been made.

7. FIFESHIRE.—Our knowledge of the annelids of Fife is entirely due to Mr. Evans, who has sent me his gleanings from time to time for identification and record. They were chiefly made in March, 1910, and include one record (*Allurus hercynius*) which is unique. "I was in Fife to-day," writes Mr. Evans on March 19th, "and, seeing ploughs at work in a field near Thornton, I went in and followed them for fully an hour. Worms were plentiful, the most common, perhaps, being (1) *Octolasion cyaneum*, which I was delighted to see. Under stones in an old pasture some other species were found, and a *Dendrobæna* under bark of a rotten stump. . . . I enclose the bulk of the collection for your examination." The species I found were (2) *L. terrestris*, (3) *L. rubellus*, and (4) *L. castaneus*, (5) *Dendrobæna mammalis*, (6) *Bimastus constrictus*, (7) *A. caliginosa*, (8) *E. rosea*, and (9) *Allurus hercynius*, new to Britain, with its common relative (10) *A. tetrædrus*, and (11) *A. chlorotica*. Mr. Evans adds (12) *D. arborea*, and (13) *D. subrubicunda*.

8. HADDINGTON.—April 19th, 1910. Mr. Evans sent me gleanings from Athelstoneford and Tyne, containing eight species, as follows:—(1) *L. terrestris*, (2) *L. rubellus*, (3) *L. castaneus*, (4) *A. longa*, (5) *A. turgida*, (6) *A. chlorotica*, (7) *Eisenia rosea*, and (8) *Allurus tetrædrus*. These are, as will be seen, the most widely distributed of British Earthworms, and are always among the first to be collected. Although Claparède many years ago did good work among the smaller annelids of the Hebrides, I have no records of earthworms therefrom.

9. INVERNESS.—The Rev. Mr. Macpherson, M.A., sent me

eight species of annelids from Grantown-on-Spey in September, 1898. They were as follows:—(1) *L. terrestris*, (2) *L. rubellus*, (3) *L. castaneus*, (4) *Allolobophora turgida*, (5) *A. chlorotica*, (6) *A. longa*, (7) *Dendrobæna subrubicunda*, and (8) *Allurus tetrædrus*.

10. KINROSS.—Mr. Evans records (1) *Allurus tetrædrus*, Sav., and (2) *A. caliginosa*.

11. LANARK.—Although I have at different times had much correspondence with Glasgow and other naturalists, and many promises of help, nothing has ever come of it. The only species recorded is *Allolobophora trapezoides*, which was reported to be damaging a bowling-green in March, 1904.

12. LINLITHGOW.—A collection made March 12th, 1910, by Mr. Evans contained (1) *L. terrestris*, (2) *L. rubellus*, (3) *L. castaneus*, (4) *A. longa*, (5) *A. caliginosa*, (6) *A. chlorotica*, (7) *D. mammalis*, (8) *Eisenia rosea*, and (9) *D. arborea*. No records are to hand from Moray or Nairn.

13. PEEBLES.—The list for this county is a good one, considering that it is based on one day's collecting by Mr. Evans in April, 1910. I find exactly a dozen species in my list. There are the three species of *Lumbricus*, (1) *L. rubellus*, (2) *L. castaneus*, and (3) *L. terrestris*, with (4) *A. longa*, (5) *A. caliginosa*, (6) *A. chlorotica*, anomalous form, (7) *Dendrobæna mammalis*, (8) *D. arborea*, (9) *Eisenia fætida*, (10) *Octolasion cyaneum* (= *studiosum*), (11) *O. profugum* (= *lacteum*), and (12) that rare worm, *Dendrobæna octædra*, at present unknown elsewhere in Scotland save from Paisley (see Renfrew below), and only occasionally met with in England.

14. PERTSHIRE.—In September, 1890, I received (1) *L. castaneus* from Mr. D. Andrew, who was visiting his brother, Dr. Andrew, at Doune. In June, Mr. S. T. Ellison, of Perth, sent me specimens from the city, including the foregoing, with (2) *A. longa*, one of which was abnormal, (3) *A. turgida*, in vast numbers, (4) *A. chlorotica*, (5) *Eisenia rosea*, and (6) *Allurus tetrædrus*. On September 15th, 1905, Mr. Evans wrote that he had collected "*L. castaneus* (1) and *A. chlorotica* (4) on Perthshire hills at 3250 ft. and 2700 ft. respectively." He has taken (7) *Dendrobæna mammalis* at 2500 ft., and also from the summit of Ben Lawers, 2980 ft., in July, 1906. In April, 1910, Mr. Evans sent me from Balquhidder (8) *L. rubellus*, of an unusual

form, also Nos. 3, 4, 5, and 6, besides (9) *D. arborea*, (10) *D. subrubicunda*, and two species new to Scotland, viz. (11) *Octolasion gracile*, and (12) *Dendrobæna* (= *Eisenia*) *alpina*, which is unique for Great Britain.

15. RENFREW.—In 1892 I had an excellent correspondent in Mr. Morris Young, Curator of the Paisley Museum. On July 3rd Mr. Young informed me that he knew certain worms occurred in the locality, and gave their names. In order that they might be authenticated, he sent me specimens on the 7th, and my list shows no fewer than thirteen species. The four species of *Lumbricus* were all present: (1) *L. terrestris*, (2) *L. rubellus*, (3) *L. festivus*, and (4) *L. castaneus*. Of Allolobophoras and the allies there were (5) *A. longa*, (6) *A. chlorotica*, with variety, (7) *A. turgida* and (8) *A. trapezoides*, which are two forms of *A. caliginosa*, (9) *Eisenia fœtida* and (10) *E. mucosa* (= *rosea*), (11) *Dendrobæna mammalis*, (12) *D. subrubicunda*, and (13) *D. octœdra* (see above, Peebles). Later gleanings added two further species, viz. (14) *Allurus tetrædrus*, and (15) *Octolasion lacteum*, while a further species could not be determined with certainty.

16. ROXBURGH.—While Ross is still, so far as I am aware, without a single record, Johnston's 'Catalogue' alludes to (1) *L. anatomicus* and (2) *L.* (= *Eisenia*) *fœtidus* as having been found in Roxburgh.

17. SHETLAND ISLES.—The Rev. W. G. Dixon sent me samples some years ago, but the list is mislaid. They were, however, all common types, and numbered about half a dozen species. There ought to be a dozen at least, and one or two would in all probability be of exceptional interest.

18. STIRLINGSHIRE.—In March, 1910, when Mr. Evans was very active in this department, he sent me from Falkirk about seventy specimens, which are referred to nine species as follows: Three species of *Lumbricus*, (1) *L. terrestris*, (2) *L. rubellus*, (3) *L. castaneus*, with (4) *A. longa*, (5) *A. caliginosa*, (6) *A. chlorotica*, (7) *D. subrubicunda*, (8) *D. mammalis*, (9) *Eisenia rosea*; and he adds (10) *Allurus tetrædrus*, Sav., and (11) *Eisenia fœtida*.

It will be seen that much remains to be done. The Highlands would well repay careful study, and the western coasts and islands would be certain to yield some good results if only a good collector would devote some little attention to their investigation.

Appended is a list of species so far known to occur in Scotland. Where necessary the synonym is also given:—

1. *Allurus* (= *Eiseniella*) *tetrædrus*, Sav.—Common.
2. *A.* (= *Eiseniella*) *hercynius*, Mich.—One specimen (from Fife) only found. Unknown elsewhere in Great Britain.
3. *Eisenia* *fætida*, Sav.—Brandling. Common.
4. *E.* (*Dendrobæna*) *alpina*, Rosa.—Once found in Perthshire. The only British record.
5. *E. rosea*, Sav. (= *mucosa*, Eisen).—Common.
6. *Allolobophora caliginosa*, Sav.—Under two forms: (1) *A. turgida*, Eisen, and (2) *A. trapezoides*, Dugès.
7. *A. longa*, Ude.—Widely distributed.
8. *A.* (*Aporrectodea*) *chlorotica*, Sav.—Common.
9. *Dendrobæna subrubicunda*, Eisen.—The Gilt-tail.
10. *D. arborea*, Eisen. The Treeworm.—Not uncommon.
11. *D. mammalis*, Sav. (= *A. celtica*, Rosa).—Rather widely distributed.
12. *D. octædra*, Sav. (= *bæckii*, Eisen).—Only twice recorded for Scotland; rare in England.
13. *Helodrilus oculatus*, Hoffmeister.—Near Edinburgh. Widely spread in England; also found in Dublin and Jersey.
14. *Bimastus eiseni*, Levinsen.—Rather rare; Edinburgh (Ravelrig) is the only record for Scotland.
15. *B. constrictus*, Rosa.—Fairly common.
16. *Octolasion cyaneum*, Sav. (= *A. studiosa*, Rosa).—Local. Reported for Fifeshire and Peebles.
17. *O. lacteum*, Oerley (= *A. profuga*, Rosa).—Received hitherto from Renfrew only for Scotland.
18. *O. gracile*, Oerley.—Quite a distinct species in England, though not so regarded on the Continent. So far known in Scotland only from Perthshire. (See 'Science Progress,' July, 1913.)
19. *Lumbricus rubellus*, Hoffmeister.—Generally distributed.
20. *L. castaneus*, Sav.—Usually plentiful.
21. *L. festivus*, Sav. (= *L. rubescens*, Friend).—Rare; Isle of May and Renfrew (Paisley).
22. *L. terrestris*, Linn.—Common.

VARIATION (AS ILLUSTRATED BY A DOUBLE-HEADED WORM).

BY H. VICTOR JONES,

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DURING the summer of 1912, while examining a number of earthworms of the species *Lumbricus*, which had been brought to the laboratory by Mr. J. A. Baxter, of Llanfairfechan, for the purpose of dissection, I was fortunate enough to come across a specimen of *Lumbricus* which showed marked Meristematic Variation, commonly known as a Double-headed Worm. A second worm was also discovered, showing incipient bifurcation. Both worms were sexually mature, and in very good condition when obtained.

A close observation was kept on the habits and instincts of these creatures, for the purpose of finding out whether they behaved differently from normal individuals of the same species. They were under observation for a period of eight weeks, during which time they were in a thriving condition. From the character of their Variation many interesting facts were obtained.

At the end of the series of experiments, under the control and supervision of Professor P. J. White, the worms were killed, and will at some future time be examined anatomically, as it will be interesting to follow the Variation in the internal structures of the alimentary and nervous systems respectively.

Before giving a very brief account, morphologically and physiologically, of these worms, it would be advisable to give here a summary of the *extent* of the knowledge and importance of Variation.

Bateson, in his 'Materials for the Study of Variation,' 1894, gives a very clear and concise explanation of the subject: "To solve the problem of the forms of living things is the aim of the present-day naturalists." He asks: "How have living things

become what they are, and what are the forces which govern them?"

Darwin, no doubt, gave us the first hope of a solution in the production of his 'Origin of Species': "No character of Form is common to all things." On the contrary, Form is infinitely diverse.

The existence among living creatures of a specific difference is a characteristic of Life, and to these phenomena of the occurrence of differences between the structure, the instincts or other elements which constitute the individual, the term "Variation" has been given. The importance of Variation is clearly shown by the fact that it is upon these phenomena that all theories of Evolution are based.

It is unnecessary to enter into the theory of the 'Doctrine of Descent,' which states that all living beings are genetically linked, unless the alternative theory is held, namely, that separate creations were resorted to, which theory is now held to be absurd, but still, although the balance of evidence is in its favour, we must bear in mind that it is as yet to a great extent an assumption, and that it is adopted as a working postulate.

Lamarck, as will be remembered, regarded organisms as machines, which have the power of adaptation as an inherent quality in them. Therefore, as the world changes, so does the individual—that is, the universe and the individual change *pari passu*. This is Lamarck's explanation of the occurrence of Variation. Darwin, on the other hand, acknowledges the presence of Variation, but does not suggest emphatically any cause for its presence, because he found that some of the Variations were not adaptations, but quite the contrary.

The readiest way, and one which is being universally adopted, of solving the problem of Variation is to study the facts of Variation. This is done in two ways:—

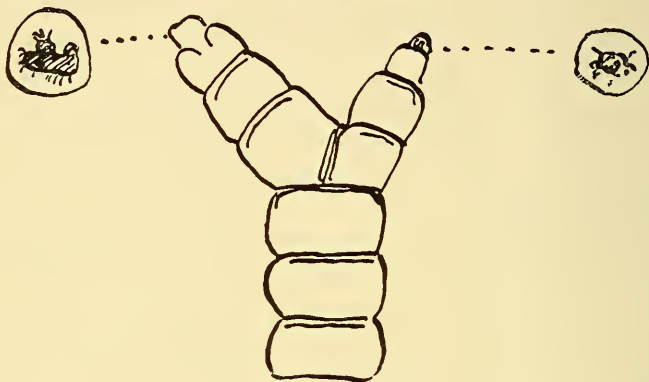
(1) Embryologically.

(2) By the study of adaptation as shown in the organism.

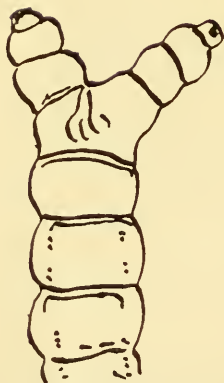
The first has as yet given little light upon the subject; the second much more.

Getting now to the subject of Variation as exhibited by earthworms, so far as examination has gone, Bateson, in his valuable book, 'Materials for the Study of Variation,' states

that double-tailed earthworms are plentiful, but that double-headed earthworms are of rare occurrence, only a very few specimens having been recorded up to 1904. Bifurcation of the head region to an extreme degree is shown by a specimen in the possession of Professor J. A. Thomson, of Aberdeen, who very kindly examined the present specimen.



Dorsal view.



Ventral view.



Contracted.



Expanded.

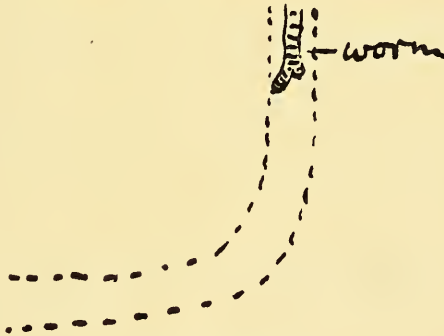
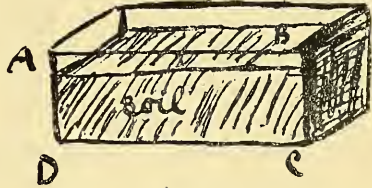
Positions of heads while burrowing.

Description of Worm.—The worm, as already stated, was sexually mature, and about nine inches long. The bifurcation was very nearly symmetrical, one head having four complete segments, the other three (*vide* diagrams). Both heads showed the first segment or prostomium very clearly. Each of the two heads had a mouth—an open lumen—both of which were capable of taking in food.

Observations.—The worms were kept for observation in a box two feet square by one foot deep, one side of which, A, B, C, D, was of glass. This box was nearly filled with vegetable mould, sifted so as to be of fine texture, and fairly well dried, in order to facilitate penetration in burrowing by the worm.

The following, briefly, are the facts observed :—

(1) On being placed on the surface of the soil near the glass side, and a cloth placed over the glass, it was seen, by the removal of the cloth from time to time, that the worm burrowed by keeping the lesser head in a retracted condition, and alternately expanding and retracting the larger head, thus penetrating the soil after the manner of the normal individual of the same species. The path, however, always took the form of a curve in the direction of the larger head, owing, no doubt, to the slightly increased irritation of



Path of Burrow.

the smaller head causing a deflection in the opposite direction, being an attempt to lessen the irritation. This seemed decidedly the case, for whenever the smaller head came against the smooth glass (therefore, no appreciable friction and irritation) the path took the normal irregular direction.

(2) When the glass side was uncovered, the burrowing ceased and was not resumed until darkness again prevailed. The head part was much more sensitive to light than the hinder end.

(3) Sounds seemed to affect the worm to *no* appreciable extent.

(4) The sense of touch was developed to an extreme degree, the slightest contact with the glass causing the worm to stop work and contract, a sure sign that it appreciated the proximity of danger.

(5) However, when the provocation proved of a natural order, such, for instance, as a glass rod inserted into the soil in imitation of a burrowing mole, the worm would penetrate the soil quickly, making its way to the surface and not deeper into the soil. This seems to point to the fact that worms can discriminate between disturbances of the soil caused by various means, and also that they instinctively seek the surface, knowing that a mole would avoid the light as much as possible.

(6) When it was placed on a fairly smooth surface it invariably moved in *a circle*, the larger head always being towards the centre of the circle.

(7) In its progress, the larger head expands and contracts in point of time slightly in advance of the smaller, showing that the greater degree of sensitiveness is placed in the larger head.

(8) Again, when the progress of the worm was barred by placing a pin vertically at the forking of the heads, it was invariably found that the worm passed the pin by allowing the *larger* and not the lesser head to slide past the obstruction, which confirms the surmise that greater sensitiveness is possessed by the larger head.

The above are some of the observations briefly stated.

Before bringing this paper to a close, it might be stated that concerning the embryological study of Variation we have the results of Roux and others concerning the segmentation of the metazoon ovum, showing that in certain species the first cleavage plane divides the body into the future right and left halves of the adult animal.*

This suggestion, which is an old one, received support from the fact of Meristematic Variation, especially the formation of homologous twins and double-headed monsters, which are shown to arise from one ovum by division. (*Vide* Driesch, *Zt. f. w. Zool.* 1891, liii. p. 160.)

* It is the second cleavage in many cases. (*Vide* E. B. Wilson, *Anat. Anz.* vii. 1892, p. 732.)

Now, this theory is difficult of explanation in regard to the appearance of double-headed worms, unless we take the possibility that the potentiality of a *Double Individual* in the ovum, for some inexplicable reason, has been delayed until the time of the formation of the head region, thus giving only an approach to the possible double individual which was prophesied of in the original ovum.

On the other hand, division of the meristematic cell may explain the problem, and this, as yet, is by far the most likely. Still the question remains an open one.

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NOTES AND QUERIES.

MAMMALIA.

Black Rabbits.—Black Rabbits have, in my experience, always been rare in this neighbourhood, and until last autumn I had not seen one for a number of years. Then, curiously enough, I shot two. The first was at Bloxham, on Oct. 25th—coal-black all over. The other I got at South Newington Hill, about three miles off, on Nov. 28th. It was of a beautifully shining black, with a few white hairs scattered over it, rather like “silver-fox” fur, and had a small white spot about the size of an average sweet-pea seed on the under side of the tail. There are a great many Rabbits at the latter place, and during the last few years I have shot and seen a considerable number, but I never before saw a “variety” of any kind there. I do not think domestic Rabbits have ever been turned out there (or at Bloxham); the difficulty has been to keep the Rabbits down, although Badgers live in the same hillside (and Foxes in the gorse below), and are commonly believed to dig out the “stops” when the Rabbits are breeding. In some parts of the country Black Rabbits are, I know, not at all uncommon.—O. V. APLIN (Bloxham, Oxon).

Decrease of the Squirrel.—I should be glad to know if the Squirrel has decreased in England generally. In this neighbourhood, in my younger days, it was quite common (although there are no large woods about here), inhabiting even small spinneys and plantation belts, and being met with often in rows of trees away from them out of the breeding season. They were in the habit of visiting orchards and walled-in gardens in villages, where they used to steal the plums and other wall-fruit. But for a good many years they have been getting gradually scarcer, and I do not remember having seen one in this parish for several years. Bloxham Grove was formerly a great place for Squirrels, which used to breed in the big trees in front of the house, and were a familiar sight running over the turf from tree to tree. It was here, I think, that I first saw what have been described as “white-tailed” Squirrels. They have all been gone for years, and the owner told me a few days ago that one he saw on his property about a year ago is the only Squirrel he has met with for a

long time. At Wroxton, too—where there are some woods—I am told they have very few Squirrels now.—O. V. APLIN (Bloxham, Oxon).

A V E S.

White Wagtails in Co. Mayo.—On their spring migration this season *Motacilla alba* has paid its usual visit to the island of Bartragh, Killala Bay. On April 24th four birds were observed on their usual haunt, a wet sandy flat growing a short coarse grass, extending from the shore of the estuary to the sandhills, and situated close to the stackyard and garden. On the 28th another small party were noticed at the same place, out of which Captain Kirkwood kindly obtained three specimens for me to send to friends. Now, with the exception of one season, they have regularly visited Bartragh every season since 1897, proving without any doubt that the *Motacilla alba* have a regular line of flight, passing over the island of Bartragh on their way to their northern breeding grounds. It is strange that being so regular in visiting the island on their spring migration only *once* was a solitary bird observed in autumn.—ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

Willow-Titmouse in Norfolk.—The Willow-Tit, which was identified at Beccles by Mr. C. B. Ticehurst last August, was erroneously entered in the "Report for Norfolk" (*ante*, p. 175) as having belonged to the northern race, instead of being recorded as a British Willow-Titmouse (*Parus atricapillus kleinschmidti*, Hallmayr); see 'Hand-list of British Birds,' p. 46.—J. H. GURNEY (Keswick, Norwich).

A Bornean Example of *Buteron capelli*, Temm., with Double Hallux.—According to Bateson, in his 'Materials for the Study of Variation,' 1894, p. 390, the records of polydactylism in birds are few and far between; perhaps therefore the following case may be worth placing on record:—A wild female Large Thick-billed Green Pigeon (*Buteron capelli*, Temm.)—a species confined to Malaya—was shot recently near Bau, Sarawak, by Mr. R. B. Williams, and presented by him to the Sarawak Museum. In both feet the hallux is duplicated from the tarso-metatarsus, the additional hallux, perfectly formed with separate metatarsal, arising between the ordinary hallux and the second digit, and with a web loosely connecting the proximal phalanges of the double hallux, but not thus connected to the second digit. The ordinary hallux is similar in size and development to that of an undeformed specimen, and the additional hallux is the same, or if anything very slightly larger. The specimen is now in the Sarawak Museum.—J. C. MOULTON, Curator of the Sarawak Museum (Sarawak).

Dark Variety of the Red-legged Partridge.—Three very dark-coloured Red-legged Partridges were shot by some friends of mine in the autumn of 1912 when “driving” between Hook Norton and Sibford, in this county—two of them on Nov. 18th and the other on Dec. 28th. They were all believed to have belonged to the same covey, but whether there were any more in it of the same colour is not known. They were so dark in general appearance that some of the guns spoke of them as “black.” One of the birds killed in November was given to me, and I have had the skin preserved. It was a fine well-grown young male, fully moulted, and weighed $18\frac{1}{2}$ oz. The whole plumage has a dark smoky cast over it. The upper parts show distinct blackish edges to the feathers. Throat smoky grey instead of white. Breast a fine dark slaty blue. Middle of the belly smoky brown instead of chestnut, becoming still more dusky towards the lower tail coverts. Thighs blackish brown instead of chestnut. The legs and beak were of a rich, deep blood-red.—O. V. APLIN (Bloxham, Oxon).

Squacco Heron (*Ardea ralloides*) in Co. Cork.—A specimen of this rare visitor to Ireland was shot on May 13th by Mr. Beecher near one of the small loughs adjacent to Skibbereen; it is a female in the breeding plumage. The first specimen of this rare Heron captured in Ireland was shot, in Killeagh Bog, near Youghal, the beginning of April, 1849, and, falling into the hands of Mr. Samuel Moss (after being mounted), was sent for identification to his friend Dr. Harvey, of Cork, with whom I saw the specimen a few days afterwards. I believe that from the date of this first capture only seven or eight specimens have been obtained in Ireland.—ROBERT WARREN (Ardnaree, Monkstown, Co. Cork).

Crane in Oxfordshire.—An adult Crane was shot near Adderbury on March 10th, 1913, and seen in the flesh by me. It is quite probable that it was an escaped bird, although the plumage showed no signs of this; the bird was, however, rather fat. I should be glad to hear if anyone lost a Crane about that time. This individual may be recognized by the following peculiarities, *viz.* the bill was slightly bent to one side near the tip, and the inner primary of one wing was white. I was only able to make rough measurements, and these were as follows: bill a bare four inches in length; tarsus, 8 in.; wing, 21 in.; total length to the end of the tail, 42 in.—O. V. APLIN (Bloxham, Oxon).

INSECTA.

Surrey Odonata.—While angling in the Mole near Horley, on June 16th, I was frequently visited by two females of the beautiful Dragonfly, *Calopteryx virgo*. The only other record I know of the species on the Mole is given in Lucas's 'British Dragonflies,' viz.: "River Mole, near Leatherhead (W. J. Ashdown)." Last year I found this insect literally swarming in South-west Cornwall, where it is a common species. On Aug. 17th, 1912, I was very surprised to find a fine specimen of *Æschna grandis* trying to enter my greenhouse at Norwood. He became a permanent lodger as a cabinet specimen.—W. L. DISTANT.

OBITUARY.

SIR JONATHAN HUTCHINSON, F.R.S., LL.D.

THE medical and surgical work of the late Sir Jonathan Hutchinson has received its great and deserved tribute in the columns of every daily paper, and in many other periodicals. A short notice on Sir Jonathan's interest in Natural History will not be out of place in 'The Zoologist.'

There is a story that the late King Edward, at the mention of Jonathan Hutchinson's name, many years ago, exclaimed: "Ah, yes, he's the man who keeps a farm for diseased animals." This was hardly the whole truth and nothing but the truth, but there was this much truth in it—that every ailment amongst his animals was of the utmost interest to Sir Jonathan, and that most of them were treated by himself. And it would almost be fair to say that he would have been rather disappointed had his farm supplied him with no interesting patients. To learn something from everything, great or small, and to impart his knowledge (in no pedantic manner, be it said) were the two great joys of his life. His only recreation (apart from change of work, which he considered sufficient) was shooting. He liked to wander round his farm with a gun, and occasionally to have a shooting party. Big bags were an abomination to him, and an impossibility on the lines on which those shooting parties were carried out. Halfway across a turnip field some such object as an arrow-head, or a fungus on the leaves, would catch his eye, and those

nearest to him would be treated to a discourse, or asked for information on the subject. The whole line would be kept waiting, but those at a distance were the only ones who were bored by the interruption. If a bird or a rabbit exhibited unusual signs when shot, it had to be kept apart and examined *post mortem*, to see what portion of brain or other part was affected. On one occasion a rabbit which fell dead in a somewhat curious way was found to have no shot wound in it anywhere, and was diagnosed as having died of "heart failure." The shooting was a means to an end with Sir Jonathan, not the only end in view for the day, as with most sportsmen.

The Haslemere Museum began in quite a small way in the old barns at Inval, Sir Jonathan's home, and there he was delighted to see his friends and the members of the Natural History Society on Sundays, and to discourse to them on a great variety of subjects. In 1896 the present Museum was built, and the home collections transferred there. A curator was engaged, and with his usual intuition Sir Jonathan found in Mr. E. W. Swanton exactly the man he wanted. Under Mr. Swanton's care the Museum has grown and prospered wonderfully, and from attendances of three or four hundred per annum the numbers have run into seven and eight thousand. Sir Jonathan was an inveterate frequenter of Stevens's Sale Rooms, whence came many of the exhibits in his Museums both at Haslemere and Selby. Rarities did not interest him to any extent unless there was something special to learn from them. He did not worry about having a complete collection of local insects, animals, or plants. If they came along, well and good, and many a splendid donation of this kind has been made to the Haslemere collections. But something to learn from, and to teach from, was considered of far more importance than some unique specimen or first record. It will be of interest to quote from the programme of Sunday lectures two of the lists of subjects on which Sir Jonathan would address his hearers at a single sitting (or more probably *standing*, for they would be led from one department to another as the subject changed):—"Sunday, June 7th. The Thickness of the Earth's Crust. The Moa and the *Æpiornis*. Elephants. John Wesley. July 19th. The Earliest Traces of Man. Indian Corn. Seaside Objects. Cowper and his Poetry." Curious mixtures, one thinks! But this was the idea:—"To travel with his audience for a short distance along four of the great pathways of knowledge; for instance, (1) Geology, as representing the inorganic earth which we inhabit; (2) organic life, such as Botany or Anatomy; (3) to turn over a leaf of the great book of

human history; (4) to focus the attention upon the special study of some one great man who stood out from among his fellows." No one was ever, or could be, bored at these lectures. The most unlikely people found themselves gaining an interest in some subject that had never appealed to them before. One of his sons' schoolfellows, a boy keen on athletics and sport mainly in those days, said many years after that it was to the breakfast-table talks of his host, during the holidays, that he owed his present love of both natural history and poetry. How Sir Jonathan, with his great surgical and consulting practice, found time to study such a multitude of other subjects, and to learn by heart much of our best poetry, will always be a marvel to those who knew him. But he never said in his life that he "hadn't time," until the closing months, when he would sometimes sigh that there was so much still to do, so little time and strength to do it.

L. H.

NOTICES OF NEW BOOKS.

"J." *A Memoir of John Willis Clark, Registrary of the University of Cambridge and sometime Fellow of Trinity College.* By A. E. SHIPLEY, Master of Christ's College. Smith, Elder & Co.

THIS is a delightful book to read; it describes a unique personality, a hard-working official, and an enthusiastic lover of his University; he was, moreover, a zoologist in taste, zeal, and museum activity. The fact that he was known as "J." denotes his popularity, though he was not apparently always all smiles, nor did he seem to "suffer fools gladly"; but the book describes a real man, and one more loved for being very human, as well as staunch and sincere. His father issued, at the age of sixty-eight, his translation of Van der Hoeven's 'Handbook of Zoology,' and as translator had to learn Dutch before he could put it into English; as Dr. Shipley remarks: "a remarkable performance for a man nearing seventy."

This publication is quite outside the usual biographical horror, in which its subject is always a hero and dressed in his best meeting-house clothes. John Willis Clark is never more and never less than the beloved "J.," erudite, critical, and laborious, while the pages in which he is described are reminiscent of old customs in old University days. Dr. Shipley has also spared no pains in the identification of many who appeared in the same orbit as the subject of his memoir, and in this way much social and local history will be found by writers of books, while there are some really good stories. One must be reproduced; it relates to a Don who, married late in life, "returning to his church after a honeymoon of six weeks, publicly thanked God for *three* weeks of unalloyed connubial bliss."

Zoologists will find their prey in Appendix I. "J. as Superintendent of the Museum of Zoology," for it is a life-history of that institution, being a full record of the many able men who have taught there and arranged the collections, and a record of all the principal acquisitions and their donors. There is great value to naturalists in this information.

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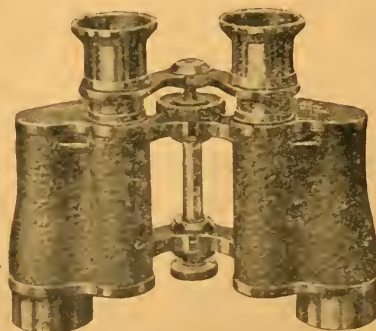
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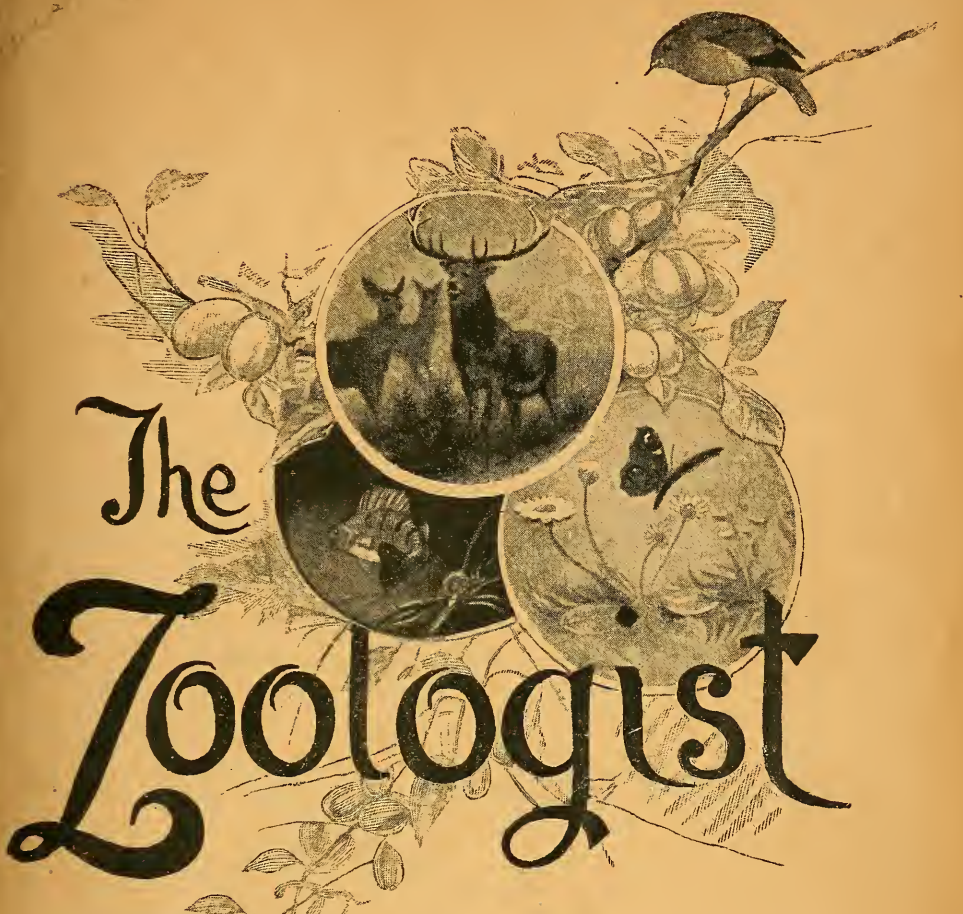
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THE ZOOLOGIST

No. 866.—August 15th, 1913.

SOME NOTES ON A LUMINOUS SOUTH AFRICAN
FULGORID INSECT (*RHINORTHA GUTTATA*,
WALK.), TOGETHER WITH A DESCRIPTION OF
ITS PARASITIC LEPIDOPTEROUS LARVA.

BY H. W. BELL-MARLEY.

AMONG our South African *Fulgoridæ*, we have here, at Durban, one of two recorded species of the genus *Rhinortha*, viz. *R. guttata*, Walk. (Distant's 'Insecta Transvaaliensia,' vol. i. p. 186, tab. xviii. f. 1), the other being *R. marleyi*, Dist., more recently described (*l. c.* p. 206, f. 37), and I confine attention to the former species. This South African Fulgorid, in common with all the other members of the Family, inhabits thick hedges and bush, preferring these, I suppose, as a protection against their many enemies—birds, especially *Cinnyris*, and lizards. This insect, though long known to me in Natal, has never been plentiful, not more than half a dozen or so coming to light during the season.

Quite early in April last my attention was drawn to this species, which had been more than a nuisance to the occupants of one house in particular, their evening siestas and "bridge" parties being quite disorganised by the abrupt appearance of these insects, which could be counted in dozens at a time, and, after having struck the verandah lights, crept wherever their fancy led them. My friend, wishing to save some for my inspection, placed a couple in a tumbler, but these, I learned, had aroused the Persian kitten's attention, who ate them, so I could only hazard a guess as to what the species was like.

One fine afternoon later, on looking for something else in the garden hedges, I caught sight of a brown movement behind a

stem ; this I at once recognized to be no other than a large but strange *Rhinortha guttata*, but, owing to the thorny nature of these bushes, my coat-sleeve caught ; I at the same time lost sight of the Fulgorid, and it was not until a subsequent date (? May 14th) that I was again afforded another opportunity of visiting the garden—only this time it was in the evening, after dinner, when, thinking I saw an old Glowworm (*Lampyrus*) close by, I made for the spot. Some mention may be made of this shrub, which is widely distributed about the gardens on the Berea and elsewhere. Besides being ornamental, it produces a large, oval, scarlet fruit, rather acrid but tempting ; its foliage is as handsome as the rest—dark green leaves, with light under surfaces, supported by firm stems, and is strongly fortified with crowns of sharp thorns, which give most painful scratches. To the natives it is known as the “Amatungulu,” but I see in Medley-Wood’s ‘Natal Flora,’ p. 81, it is enumerated as *Carissa grandiflorus*, Linn. The evening was warm, a short shower having freshened things up a little, giving the foliage, &c., a silvery appearance, while overhead, without a moon, some stars with the scintillating points of the Southern Cross were just visible. On my approach—which, I suppose, had been noticed—the light moved away almost out of sight, and my curiosity being aroused, I waited until I saw it reappear, which it did, but higher up, making it still more difficult to observe, as I have already alluded to these strongly guarded bushes, which will not permit any liberties being taken with them. Keeping my eye on this spectre, which kept constantly moving its position, I wedged my hand in between the foliage, and grabbed in the direction of this luminous body. I was at once sure that if I had missed my object, I had something else of a painful nature to console myself with. My next object was to examine what I held, and which I carried to the dining-room lights. Now came a perplexing feature. I found, besides some fine specimens of thorns, I had secured an old worn and battered *R. guttata*, which has already been referred to ; another was unlike anything I had seen—a perfect stranger to my entomological experience—certainly no glowworm. For some moments I surveyed their respective peculiarities, turning over in my mind what were their relations to each other. This surely was the beginning of some

mystery. This woodlouse-shaped grub, just over half an inch long, but tapering slightly at both ends, with a thick white mantle which broke apart in rings when it made any movement, gave a slug-like appearance to its other points. As it is to again occupy some more of our attention, we will leave it for the present. That night and the one following I looked in the hedges for another light, but was not rewarded with success.

In the 'Transactions' of the Entomological Society of London for the year 1895, p. 429, the question of luminosity among certain *Fulgoridæ* was discussed by Mr. Distant,* and later the same writer makes allusion again to the subject in his 'Insecta Transvaaliensia,' vol. i. p. 182. The late Mr. A. D. Millar, of Durban, a keen collector, once told me he had noticed a light one night when hunting in Zululand, which he attributed to a species of *Pyrops*, a larger insect than any of our other Fulgorids; his reason for mentioning this Fulgorid was their presence and visits to the tent lights. The natives gave it the name of "Nkanyezi" (a candle). Mr. Distant (*supra*), speaking of this luminous property in *Fulgorinæ*, says it is an exploded theory, and long since disproved by collectors, but concludes his remarks by saying that explanation might be found in parasitic and luminous micro-organisms as have been discovered to have caused the luminosity of midges (*Chironomidæ*), and *Talitrus*, a genus of Crustacea (*Amphipoda*). When I likened the light as mentioned to that of a glowworm, it may be readily conceived this would be the first thought to enter one's mind. Having been quite satisfied that the light was the work of this *Rhinortha* and parasite, I took them to a dark room and awaited further developments, but nothing would induce it to repeat the phenomenon. The white powdery material that adorned the larva puzzled me, and it was not till some time after this that I was able to understand its purpose, as I hope later to explain. Another strange feature about the light, which was white and not electric white, as shown by *Lampyridæ*, was, it appeared paler from a distance.

The subject is, indeed, an interesting one, and it is not without a little satisfaction that I am, so far as one species is

* "On a Probable Explanation of an Unverified Observation relative to the Family *Fulgoridæ*."

concerned, able to announce this rare occurrence in Natal, and, it may be, the means to throw more light upon the subject as I proceed with these notes. With the assistance of my friend, Mr. Cooper, we examined the bushes again for more material to work upon, and in one sunny corner of the grounds where the bushes were blooming—their beautiful stellar-shaped flowers and fruit attracting numerous visitors—we collected from the inside stems nine old examples of *R. guttata* of various sizes, each one more or less carrying its parasite: on two large females there were one grub on each side of their bodies, where they were partly hidden by their host's wings, each larva as heavy as herself. In other cases I counted as many as five, all of different sizes, attached to the wings and back; on another small female there were two large larvæ, one a little larger than the other, each protected with the white mantle, besides the wings. As may be supposed, the Fulgorid could only with difficulty lift her abdomen to crawl, and quite unable to jump, a habit with most *Fulgoridæ*. I could not help pitying these miserable starved insects, for it looked as if here Nature had made some error; and from what I could see at this stage, the Fulgorid's life was a matter of a short time, contented by crawling to a stem, where it remains till the larva thinks fit to leave it.

As may be surmised, having located the grub, I was equally anxious to learn more about its pupa, which we agreed could not be far distant; this we also succeeded in discovering, Mr. Cooper finding the first one. When I had found six or seven, it seemed strange our eyes should have deceived us so long. Overhead, attached to the under surface of a leaf, was a white oval mass of a beautiful fleece-like formation, with little flakes suspended; this, with its support and the sun shining through, gave the green an opaqueness, with a darker silhouette for a background, which must be seen to be appreciated. I noticed almost all these cocoons were spun to leaves on the top of the trees; here, I suppose, the pupa would receive more warmth from the sun at this time of year, and, except some were smaller than others, all were prepared in the same way and place; on the leaves of some I noticed a small black ant (*Formica*) running about in an inquisitive manner.

With a survey of this paper, we see, as a summary, the

Fulgorid parasite and host, with its luminosity suggested, and, lastly, the next stage to the metamorphosis being to complete its cocoon. As *R. guttata* is of a retiring and quiet disposition, it will be interesting to relate how its parasite takes possession of its host.

About the end of the rainy season (March) she seeks a hole or some other place where she deposits her ova, after which she leaves for the green stalks of the "Amatungulu," behind which, too, she hides, as during pregnancy her body is partly covered with the same material as that which clothes the larvæ, and so to hide these she has to look for suitable places. In this position she will remain for days, only altering or moving away on the approach of danger or alarm. I have already alluded to these parasites, who pass their whole life upon her, where her fertile body supplies them with nourishment; but the question will be asked: How do they find their way there, and what kind of parent is it that makes this provision for its future progeny? To this solution I have not yet arrived at any definite conclusion, but it may possibly be surmised in reason that the female Fulgorid during pregnancy in some way attracts the lepidopterous parent. These parasites, too, at an early age, may find their way up the Fulgorid's legs on to her body. Then there is another remarkable feature which struck me when examining these insects—the number of minute larvæ that could be found on one insect, and the impossibility, it would seem, of more than two ever attaining maturity. Was this not an indiscretion on the part of the parent, and quite unusual? for very likely all these larvæ may be out of one brood, but stunted by reason of short rations! This theory of mine is open to confirmation, of course; at the same time, of the two suppositions I am inclined to favour this one. Had these *Fulgoridæ* which I had under observation lived long enough, I might have been able to determine their respective ages; I firmly believe they are some seven or eight weeks before pupating. Another point to consider is, most of these Fulgorids died shortly after capture, and their parasites had followed suit; so it seems quite clear the parasite has to take its chance. Those insects I examined where the larvæ had fastened on showed the parts much bruised, with their covering of white

powder removed. The reason is apparent, since the egg cavity of the Fulgorid serves the purpose of feeding its parasite; if this grub attracts her for any other purpose, I cannot conceive any motive in its object.

From time to time I have become acquainted with most of our Natal *Fulgoridæ*, and on these I have never noticed any signs of parasites. One insect (? *Dictyophara* sp.)* which I received from P. Shepstone some years ago I sent to Mr. Distant, with what looked like a small membracid larva attached to one of its wings. My recent observations now confirm it to be a parasite similar to the one we have been describing, but unfortunately this package, with other Rhynchota, never reached its destination.

It will now be interesting to learn how the cocoon is prepared; this necessitates us going back to the larva. During this stage I was able to watch, with much interest, the manner in which this little engineer worked, showing great persistency in attaining its object, and before I close its career, with the opportunity at hand, I will describe it further. In removing both grub and host to a glass jar with some foliage, by accident the larva was brushed off; having lost its grip and finding itself separated from its host, it at once moved away, looking and feeling for the Fulgorid, as so it appeared. Acquaintances being resumed, and without any apparent notice on the part of the Fulgorid, which allowed it to approach and try its luck again of regaining its place. After many acrobatic failures it gave it up; having felt round for something else, and not liking the glassy sides, it finally decided upon a leaf; its legs not being adapted for clutching smooth surfaces, this was remedied by a preparation of fine silky threads, with which it covered the leaf and made progress easy. The difficulty obviated, its next move was to remove some of the mantle which covered it, and prepare a foundation for the cocoon. Those who made a study during schoolboy days of keeping silkworms (*Bombyx mori*) will understand these preliminaries and the pleasure that attended them. For some time I watched these proceedings, the larva working vigorously, removing first the fleece that covered its lower body, twisting its body at all angles without shifting

* 'Insecta Transvaaliensia,' vol. i. p. 190.

once its position. Unfortunately time prevented my stopping longer, and on the next occasion, about an hour after, it had buried itself beneath; so, like the story of the professor and the mushrooms, I had lost my chance. The cocoon made had all the characteristics of the former; I found the same piled-up heap, with its slender little filament, adorning carefully this architecture. Next day, for the purpose of seeing what it now looked like, I prised up the covering from the leaf; the larva, so quiet before, now evinced great alarm by beating its head to and fro so rapidly that for the space of several seconds I thought it would never stop. I was able at last to examine it. But how different, reduced to a small maggot, nearly white all over, unlike any caterpillar in my experience; body composed of segmented rings, fore legs soft and bulbous, without hooks, the third pair being different, much stouter; between these and the claspers (four pairs) was a cavity like in some *Lamellicornia*! Larva again much creased; the clasping legs were very short, but firm and large; the anal extremity was tubular—possibly, only I could not see—composed of another pair of claspers. This description appears, perhaps, a little vague, but was made after death, without the aid of a microscope.

I omitted to state that the pupa covering was very tough, resisting a sharp penknife in penetrating. The chrysalis, again, from white turns black, much like a *Sesia* ("clearwings"), but with no hooks about the segments. The first imago took sixty-one days, others sixty-nine and seventy-one days respectively, to emerge, with a temperature not lower than 63° indoors. The exit is made between the covering and the leaf, the larva having left that part flexible for that purpose. But I may note, as it is worthy of attention, perhaps, this feat on the part of the moth is not accomplished without some hard work by its pupa, and in every instance of emergence the exit was facing the leaf's stem. The metamorphosis now complete, a short description of the moth will terminate this communication.

The first moth emerged early one morning between 6 and 7 o'clock—a black moth, with nothing to recommend her, unless it is her quiet modesty as she clings to the leaf supporting her white sepulchre. As I inspect her, which she allows me to do without the least signs of any timidity, I find I am wrong in my

judgment. As the early morning sun catches her sheeny black wings with shades beautifully marbled with violet-black, I find it difficult to determine the class to which she belongs. About $\frac{7}{8}$ in. in expansion. Antennæ very feathery; body with lighter bands; the last segment is slightly fringed, giving the anal extremity a naked appearance, which she allows to be exposed; in the centre of each top wing is a small copper irregular dot, otherwise she appears sooty black. The legs are long for such a small insect, and I noticed, when resting, these were always straightened out as she folds her wings under about them. One I had under observation till she died never once left her first position, and never attempted to fly when touched. From this I was led to suppose she would under more natural conditions lay her eggs on the pupa-case or thereabouts.

Seeing now that the moth (June) is out, and the ova of the Fulgorid awaiting the early rains before hatching—probably September or later—the ova of the fertile moth deposited now would not, I think, hatch out till winter was well over. In this I am able, as it were, to lend support to my contention of the young larvæ finding their host, which then would be well advanced. I regret, though both male and female were out at the same time, no copulation took place in the breeding apparatus. The male moth is so much smaller, and not black, as the female; his wings have a faded appearance of being mixed with umbers and browns, not by any means equalling the lustre of his mate. He is very quick on the wing; at the least disturbance he takes flight, and tumbles about some time before resting.

As I am enclosing for my friend the Editor both sexes, together with larva and host, &c., I shall await with impatience his report as to what genus and species it will be known by in future.

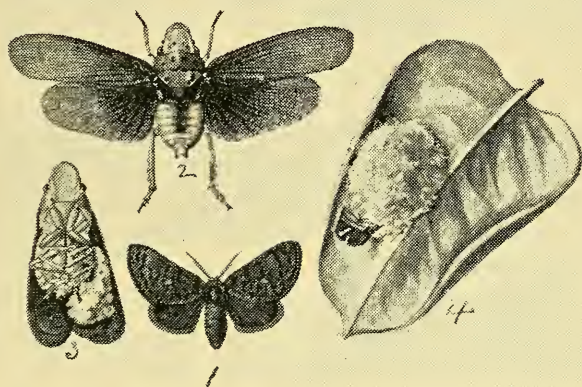
What puzzles me not a little since I made this discovery, and keeps returning to my mind as I write, is that this larva or its cocoon should have evaded me so long. I have inspected these same bushes for almost ten years—weekly, I may say. *R. guttata*, with others, I have found, and had either been there at these times, it is only reasonable to suppose I should have noticed them.

I believe some years ago the late Mr. A. D. Millar found, when breeding two species of *Lycænidæ* in Natal, that both butter-

flies (*D'urbania* spp.) afforded the rare occurrence, in the larval stage, of being parasitical. (Notes wanting.)

With approach of cold weather all signs of the Fulgorid parasites disappeared, their purpose in life seemingly unfinished, and, as usual, the busy little red ant and others could each day be noticed persevering in their labours of removing the awkward pieces of the legacy left them.

Once more, as it were, we see one of the many instances where Nature seems not to interfere in the struggle for existence.



1. *Epipyrops fulvipunctata*. 4. Pupa of same. 2 and 3. *Rhinortha guttata*, Walk.

We cannot understand her motives in choosing for the perpetuation of some species, in the way these pages have shown. What better example can we have for the "Survival of the Fittest," quite of an unorthodox kind? We have been afforded an opportunity of studying a phenomenon perhaps with an individuality of its own.

Natal: Durban.

ADDENDA BY W. L. DISTANT.

Genus EPIPYROPS.

Epipyrops, Westw., Proc. and Trans. Ent. Soc. Lond. 1876, pp. xxiv. and 522; Hmps. Journ. Bomb. Nat. Hist. Soc. xx. p. 109 (1910).

Epipyrops fulvipunctata, sp. n. (fig. 1).

Head, thorax, and anterior wings somewhat shining black; abdomen and posterior wings pitchy-black, and more opaque; anterior wings with an ochraceous spot near middle; the scales of the anterior wings have a distinctly rugose appearance; margins of the abdominal segments narrowly and obscurely ochraceous, more distinct beneath than above.

Exp. ♂ 19, ♀ 23 millim.

Hab. Natal; Durban (Bell-Marley).

I have placed all the specimens figured in the illustration, and which were sent to me by Mr. Bell-Marley, in the collection of the British Museum.

BIBLIOGRAPHY.

In the compilation of this Bibliography I have been kindly assisted by Sir G. F. Hampson and Mr. J. H. Durrant.

The genus *Epipyrops* has been located in several families by different entomologists: Westwood (1) having placed it in the *Arctiidæ*; Kirby (Cat. Lep. Het. i. p. 490 (1892)) listed it under the *Liparidæ*; Dyar (4) and Rothschild (9) among the Tineids; but Hampson and Sharp consider it to rightfully belong to the *Limacodidæ*.

(1) *Epipyrops anomala*, Westw., Trans. Ent. Soc. Lond. 1876, p. 522.—Hong Kong. This description is contained in a paper entitled "Notes on the Habits of a Lepidopterous insect parasitic on *Fulgora candelaria*."

(2) "Notes on the Parasitism of certain Lepidopterous Insects," by Prof. J. O. Westwood (Trans. Ent. Soc. Lond. 1877, p. 433).—This communication refers to a species of *Epipyrops* found on the Fulgorids, *Aphæna* sp., and on *Eurybrachis spinosa*; both species found in British India.

(3) G. C. Champion (Proc. Ent. Soc. Lond. p. xx. 1883) states that "he had not infrequently found larvæ attached to and feeding on the white cottony secretion so abundant about some of the smaller *Fulgoridæ*" in Central America.

(4) *Epipyrops barberiana*, Dyar, Ent. Soc. Washington, v. p. 43 (1902).—New Mexico. Perkins (Hawaiian Sugar Plant. Assoc., Bull. No. 4, p. 59 (1907)) records that Koebele found

this species very common in Arizona affecting *Fulgorinæ* (*Issinæ*, *Amphiscepinaæ*, and *Pœcilopterinaæ*).

(5) Dyar, Proc. Ent. Soc. Wash. v. pp. 180-81 (1903). Makes further remarks on *E. barberiana*, and on the Japanese species subsequently named *E. nawai*.

(6) *Epipyrops nawai*, Dyar, Proc. Ent. Soc. Washington, vi. p. 19 (1904).—Japan. Nawa, 'The Insect World' (published in Japan), vii. pl. i. (1903); Kirkaldy ('Entomologist,' xxxvi. p. 130 (1903)) gives some extracts from this paper written by U. Nawa, which states that the larvæ live on some *Cicadidæ* (*Tanna japonensis*, Dist., *Oncotympana maculaticollis*, Motsch., and *Graptopsaltria colorata*, Stål), as well as on the Fulgorid, *Ricania japonica*.

(7) Fam. *Epipyropidæ*. Perkins, Hawaiian Sugar Plant. Assoc., Bull. No. 1, p. 79 (1905), describes three genera—*Palæopsyche*, *Agamopsyche*, and *Heteropsysche*.

Palæopsyche melanais, Perkins, l. c., p. 80.—Queensland. On a Jassid.

Heteropsysche pœcilochroma, Perkins, l. c., p. 82. — Cairns. Bred from a Fulgorid.

H. melanochroma, Perkins, l. c.—Sydney, New South Wales. From various Fulgorids and Jassids.

H. micromorpha, Perkins, l. c., p. 83.—Sydney, New South Wales. From a peculiar Fulgorid on fern.

H. dyscrita, Perkins, l. c.—Sydney, New South Wales. From minute Fulgorid.

H. stenomorpha, Perkins, l. c.—Sydney, New South Wales.

Agamopsyche threnodes, Perkins, l. c., p. 84.—Cairns. On Delphacids.

(8) *Epipomponia*, gen. n., Dyar, for *Epipyrops nawai*. New York J. Ent. Soc. xiv. p. 111 (1906).

(9) *Epipyrops doddi*, Rothsch., 'Novitates Zoologicæ,' xiii. p. 162 (1906).—Queensland. To this description is added some field and breeding notes by its discoverer. Mr. F. P. Dodd. Found on several species of the *Fulgorinæ*, viz. *Dictyophora præferrata*, Dist., *Olonia* sp., and a species belonging to the *Flatinaæ*.

(10) *Epipyrops poliographa*, Hmps., J. Bomb. Nat. Hist. Soc. xx. p. 109, pl. f. f. 12 (1910).—Ceylon.

(11) "Über parasitisch lebende Lepidopteren," by H. Zerny, Wien Verh. zool.-bot. Ges. 1910, p. 8.

LITHOBIUS DUBOSCQUI, BRÖLEMANN, A CENTIPEDE
NEW TO THE BRITISH FAUNA.

BY RICHARD S. BAGNALL, F.L.S., F.E.S.
(Hope Department of Zoology, University Museum, Oxford.)

ON several occasions I have observed a small Lithobiid, which, when disturbed, instead of running swiftly to the edge of a stone and perhaps dropping like the common *L. crassipes*, immediately curls up and rolls off the surface of the stone that has just been raised on to the ground. The small number of antennal joints (up to twenty-eight) as compared with *L. microps* puzzled me, and I therefore submitted examples to Dr. Brölemann, of Pau, who replied that the species was referable to *Lithobius duboscqui*, Brölemann. I have compared my examples very carefully with Brölemann's description, a copy of which he kindly sent me, and they agree in every particular.

As examples of this species will almost certainly be found standing for *L. microps* in British collections, I give the following roughly translated extracts from the original description.

The rounded hind angles of *all* the dorsal scuta place it in the section *Archilithobius*.

LITHOBIUS DUBOSCQUI, Bröl.

Brölemann. 'La Feuille des jeunes Naturalistes,' iii^e sér., xxvi., Nos. 318-319, 1896.

Body very convex, shining, somewhat parallel or more or less narrowed anteriorly, constricted behind the head and broadest about the eighth segment. Yellow, head reddish-brown and the legs light, especially the two posterior pairs, which are yellow-ochre or pale yellow. Length 5.5 to 7 mm., breadth 0.6 to 0.8 mm.

Cephalic plate subcordiform, the posterior angles rounded and the posterior border margined. Antennæ very short, composed of twenty-three to twenty-eight segments, broader than

long, the last equal to about the length of the two preceding together. . . . Ocelli always three in number, disposed in a horizontal line, the posterior ocellus being the smallest and the following the largest. Coxæ of poison-claws longer than broad, with a very distinct median furrow; armed with 2 + 2 small but nevertheless well-formed and sharp teeth. All scuta margined laterally. . . .

The two last pairs of legs are short, very stout, and without furrows or apophyses in the male. Coxæ unarmed.

Armature of fourteenth pair $\frac{0. 0. 1. 0. 0}{0. 1. 2-1. 1-0. 0}$ claw double.

Armature of fifteenth pair $\frac{0. 0. 1. 0. 0}{0. 1. 1. 1. 0}$ claw double.

Coxal pores small, circular . . . disposition generally as follows:—1. 2. 2. 2 or 2. 2. 3. 2 (exceptionally 2. 3. 3. 3 in one, and in another 1. 2. 2/3. 2.).

External genital organs in the female armed with 2 + 2 very strong and long spines, especially the outer pair, which are sometimes a little curved outwardly. Claw (*unguis*) large, trilobed, with the two inner "teeth" much more developed than the third, which is frequently reduced to a pointed spine.

It is recorded by Brölemann from various parts of France.

I first collected specimens of this species from under stones lying on or slightly embedded in loose rich soil on the Durham banks of the Derwent near Blanchland, April, 1913, and in the same month discovered it in the neighbourhood of Oxford and Manchester.

Dr. Brölemann informs me (*in litt.* April 28th, 1913) that the species must now be known as *Monotarsobius duboscqui* (Bröl.).

A DIARY OF ORNITHOLOGICAL OBSERVATION MADE
IN ICELAND DURING JUNE AND JULY, 1912.

BY EDMUND SELOUS.

(Continued from p. 136.)

June 10th.—It is curious that, during all this time, I have not seen the cygnets feeding or being encouraged, in any way, to do so, by either of the parent Swans, who seem themselves, also, to have gone fasting. Now, however—from 2 to 3 p.m., that is to say—there is an appearance of something of the sort, though, owing to the distance, I cannot be certain, for the birds have all gone over to the opposite side of the stream, in its wildest part, and no help being now afforded by any promontory or projection of the shore, I have to watch them from the crest of the nearest hill, which is too far for any clear view of minutæ. I get the impression, however, first, that one of the two is pulling up some grass or moist vegetation, for the cygnets, in a little creek of the shore, where they have landed, and, later, for the first time to-day that I have seen, she pulls up weeds from under the water, in the characteristic way, which appear either to drop, each time, on its surface, or remain upon it, as her head comes up—for certainly, I think, she does not eat them. She rests on the water, too, once or twice, after doing this, and her cygnets gather about her, which, it seems, is her intention; but that the latter eat the weed thus provided is not very apparent. If they do, I think it must be in a very toying, uneager sort of way, but this, if I remember, I have observed in similarly fed young cygnets of our own Mute Swan. Soon after this both birds come on shore again, followed by the young, and sit down on the grass, at the regulation distance—ten paces or so from one another. The chicks endeavour to press under the body of (presumably) their mother, as though she were on the nest. To avoid this, apparently, or because the position is not suitable

for it, she moves a little way off, and sits down again, and this is twice repeated. All this time she keeps cropping the grass about her, as she sits, but whether for the chicks or herself, I cannot determine, for it is impossible to see whether she lets it drop or swallows it—it may be either or both. Finally, however, the cygnets disappear beneath her plumage, and both birds lie, now, asleep, or at least with their heads on their backs. The Great Northern Diver is also asleep. He has been about, on the water, all this time, and now floats upon it, in the same attitude.

I now rise, and, without stooping or taking any precautions, walk away from them over the hill. I have not taken more than two or three steps when both the heads are thrown up, and the birds observing me. They cannot, therefore, it would seem, be really asleep, though they had every appearance of it. Certainly they seem like the proverbial weasel in this respect, yet by keeping still, and never either standing or sitting upright, I have been able to watch them at quite luxurious distance for the glasses. The stranger Swan has been absent now for the last two hours or so.

Harlequin Ducks are very numerous on the river. They delight in the little side nooks of comparatively smooth water, skirting the white, foaming torrents which here abound. Here they sit sunning (or, more often, clouding) themselves upon the rocks, and, when startled, will often throw themselves into the white, broken water, at such places as make it seem probable that they may sometimes lose their lives in this way. However, like others, they draw the line somewhere, and take to the wing when the turmoil is very tremendous. The pantaloon- rather than harlequin-like colouring of the male Harlequin Duck is extraordinary, and, from the point of view of concealing coloration, "enough to make Quintilian gasp and stare," but I, from the point of view of sexual selection, am more particularly interested in the white false eye, as one may call it, placed at about an inch from the real one. In the plate of this bird given in vol. vi. of Dresser's 'Birds of Europe' (as for the pagination of that work, I totally give it up) this spot is given quite wrongly, both by its size and position being made quite ineffective. Pains seem to have been taken (as would probably

be the artist's instinct) to get rid of the bizarre effect which it produces under nature, and to show the proper eye in a proper and ordinary manner. In reality, however, it is very difficult to see the bird with any eye but this false, staring white one, which, as it were, puts the real eye out, and though not near enough to it, properly to take its place, in appearance, yet is sufficiently so to stand for it in a burlesque sort of way; so that with this much more conspicuous and larger white circular mark, forcing itself on his attention, the observer finds it difficult to give the right pictorial value to the actual eye, or even, without an effort, to see or locate it, as such. A sort of pantomime effect of a grotesque-looking bird with a great, flat, white eye, which he knows is no eye, but can't help placing and seeing as such—it so overpowers, as it were, the real one—is what one gets in live nature, but not at all in the plate referred to, nor, I suspect in any plate. Now, the eyes of various birds are so brilliantly coloured as to make it indubitable for anyone who accepts the Darwinian theory of sexual selection (its acceptance, I believe, will, one day, be universal) that they have been rendered thus conspicuous through its agency. This makes this white spot, in place, as it were, of an eye which alone is quiet and orderly, in the midst of a face suggestive of carnival time an interesting thing. It is as though the female Harlequin Duck had missed, in it, something that should have been more in accordance with the general bizzarerie of its surroundings, and as the iris itself did not afford the necessary variations for selection to seize upon, had used, as a substitute, some which occurred, not far off it, in the feathering, and thus produced a mock eye, such as the law of artistic harmony (parallel to that which governs vocalic utterance) required in such a setting. It is difficult to assign any other special significance to these white spots. Signal- or recognition-marks they can hardly be, for they are eclipsed in this possible function by the much larger ones against the bill—too large for the effect here noticed, even had they been in place—and, moreover, the whole bird, if we accept this view, has been evolved as a signal, but only of one sex to the other. Of course, it may be said that the spot being thus situated, and just of the size and shape that it is, is a mere chance which has no significance. But to talk in this way, where

the coloration of any one species is concerned, is to use a very double-edged weapon indeed. On the other hand, if it has really been evolved as a more effective substitute for an eye not in keeping with the rest of the face, this is an interesting circumstance, as showing how active a factor the taste of a female bird is. But this is involved in the doctrine of sexual selection, and surely it is no more strange that variations which have ultimately produced a sort of mock eye should have been noticed and appreciated, than those should have been which have made a real one as yellow as is that of the Golden-eye, or as brightly ruby-coloured as is that of the Slavonian Grebe.

As for any effect being produced by the pantomime plumage of the male Harlequin Duck, by virtue of which it could be supposed to add one more to the many pungent illustrations of concealing coloration, which now usurp the province of sexual selection, I can only, after seeing the bird at large, protest against any such idea. No doubt it can hide itself, and, by keeping perfectly still, it might not be noticed, even by the keen-eyed Hawk or Falcon. But that only shows the protective powers of immobility, and how effective this agency is (though so little, comparatively, is said about it) as an antidote even to conspicuous coloration, and, in a certain degree, even to scent.* It is, in fact, that which has probably made the first of these, and, along with it, selection, possible—for the bird, or other animal, that, being hard pressed by enemies, yet keeps constantly in motion, will fare badly, however it may blend and harmonise.

June 11th.—I go to bed about 8, and get up again, at 11, with the idea of watching through the night. As I come out of my tent, there on the water, just in front of me, is the Great Northern Diver again, accompanied, this time, by its mate, which I take to be the female, for there is a noticeable difference in size between the two, and in the larger, rightly or wrongly, I seem to recognize the one I have seen before. These birds are not at all afraid of me. They dive and swim about together, often side by side, or float, facing each other, in attached and friendly fashion, sometimes quite near. Both are very vocal,

* The scent, through keeping still, will be less left about; thus lessening the chances of its being struck.

but the cry which they keep uttering is now quite a different one from that first heard—a softly shrill, quavering note, which is sometimes lower and softer, sometimes higher and shriller. The quavering quality gives it some resemblance to a laugh—a queer sort of laugh, indeed, from which the human element is wanting, yet suggestive of it, if even by its difference—elementals might laugh like this. To have these birds thus disporting within a few yards of one, sometimes, and looking at one curiously, without anything like shyness, is delightful. After a little time the two get separated, and, a little later on, having returned from an attempt to find the Swans, I only see the male—I think, at least, it is the larger of the two that is left. The other is now nowhere to be seen, which makes me think there must be a nest somewhere near—probably on the island—which she has left, to catch a fish or two, and now returned to.

As for the Swans, the pair seem gone, for the time, but between 11 and 12 p.m. the single one swims down the stream, and then flies off, over the first waterfall, with a complaining though musical cry. It must have circled back beyond the hill-line, for, a little later, I see it fly out from behind the island, in a way that I think I know, and, accordingly, it is very soon followed by another—I have no doubt the female of the pair—putting it to flight. The latter, having chased it, a little, comes down on the water, and swims back to the same point of the island from which she flew out. Here she lands, and, walking just beyond my sight, I, at once, hear the note of rejoicing, but it is only a single one, nor has she been met, on her return, by the male, who, had he been there, would in all probability have flown down to her, on the water, as he did on a former occasion—I feel sure, at any rate, that I should have seen something of him. Just as the male left his partner and cygnets, last night, on the nest, so he has also to-night, when they have abandoned it. It would seem to be his custom thus to fly abroad, nightly, as it would, no doubt, be that of the female as well, were it not for the cygnets. It is the return to the cygnets, therefore, which occasions these glad cries from the one parent, at any rate—the mother—whilst the male is equally moved to them by the return of his mate; and she too, no doubt, will be

better pleased to find him there. That the two are excited by each other's presence, and lift up their voices more joyously on that account, cannot be doubted, and I feel sure, myself, that the sally and putting to flight of the intruder has also its full effect, though it is quite possible that every home-coming may be thus signalised—that it is a part of the general beauty of swan life. What, indeed, can be the fundamental cause of such melodising, with the eloquent actions which accompany it, other than affectionate excitement? It is on the permanent factor of the domestic affections that the special stimulus acts.

The sun appeared above the mountains at 2.30 a.m. (it was, of course, light enough before), but took over a quarter of an hour to top them. I waited for it, and then went back to bed, Sigurdsson waking me, with a bottle of hot tea, wrapped in a lamb-skin, at a little after 8. Going out, then, with the glasses, I saw the two Swans, with their cygnets, on the island. The parents were cropping the grass, but whether they laid any of it down for the cygnets was difficult to make out, and before I could feel certain about it, all of them had taken the water, again. They swam out into the lake, or lake-like stream, and when they had reached the middle of it, and were all in a group, the female, first, rose, a little, in the water, and expanded the wings, with their tips still touching it. Then, face to face, and close together, the two birds threw up their heads, waved their wings, and rejoiced most musically—the scene that I have now many times recorded, but no stranger Swan had inaugurated it, or was to be seen on the water. Had she approached, as before, she would certainly have been chased away, in the usual manner, and had she even been within the range of binocular vision, my glasses must have detected her. Here, then, were spontaneous glad liftings up of the spirit, without any extraneous provocatives. There can hardly, I think, be a doubt as to the nature of the emotions manifested. The cry, the attitude, all the various movements and actions of the two birds, with their mutual excitement, and especially their close approach to and turning towards each other—everything shows pleasurable emotion, and, indeed, there is not much else that such a scene can proceed from, for that anger or alarm have nothing to do with it is fairly obvious. How happy, then, are these birds, how innocent is

their happiness, and how lovely the expression of it! With how many human ones, either in the savage or civilized state, does not this Swan family compare favourably, in all these respects; yet to bring death and non-fulfilment into the one is a crime, and into the other, a pastime. This makes our humanity but a matter of power or self-tenderness—the application of the golden rule, for there to be anything of sterling gold in it, should extend to all life, where possible, but so far is this from being the case that where men themselves are as incapable of enforcing their “rights” as are these Swans, they stand in very much the same position, or, owing to causes quite simple to follow, in a very much worse one—witness the Putumayo and Congo. What, then, is that which we designate a right, either amongst animals or men? Nature, all conscienceless, would seem to answer—Might; since not one can be pointed to which does not, at least, owe its origin to this factor. Does it not stand thus, then—that when we may, with impunity, and yet do *not* exercise a power by which we gain against others, the restraining influence is a sort of shame and compunction at using such power, which will sometimes withhold individuals, but not masses of individuals? But this feeling is only a bye-product, born out of complexity, and not of noble parentage either. It had no real, shaping influence in the evolution of species, or of man out of beast—nothing to do with that struggle which, though masked, is being still carried pitilessly on by the most humane man and the most seeming-pitiful* woman. Of all reflections that make towards pessimism, this, perhaps, is the deepest grounded, that all that seems best in one’s nature is the outcome not of main forces, but of bye-product only. The first, it can be said, have brought forth the second; and, if closely looked into, it may be answered, they will be found to smack of their origin.

After the scene which has given rise to these reflections, first, one of the Swans—the male, I think—and, before long, both of them, kept dipping for weeds, and I watched attentively to see if they were feeding the cygnets. For a long time this was difficult to make out, but, at last, I had the satisfaction of

* “Shamming-pitiful” would perhaps be a better expression, having regard to the feminine hat, &c.

seeing the cygnets nibbling at something in the water, which must, I think, have been the weeds brought up by the parents, for there was no appearance of any growing weed on the surface. They did so, however, only now and again, and in a casual and desultory way, as if they were learning, and did not clearly connect the finding of the weed with the parents getting it for them. As far as I could see, the general plan of the Swans was to keep dropping or leaving the weed (by which last I mean leaving go of it as soon as their heads emerged) about on the water, in a circumscribed area—quite a small space, where they kept all the time—and letting the cygnets find it, as they happened to, but I twice, at least, saw one of them (I think the mother) stretch out her neck towards one or other of the cygnets, and then bring down her bill upon the water. It was funny, sometimes, to see the cygnets clustered round the after half of the parent's body, as it stood upright in the air. I twice saw some weed—it must have been a fair quantity—thrown up by the feet of the submerged bird, as she paddled with them vigorously, to maintain her perpendicular attitude; but I cannot say if this was consciously done or not—probably not, for she must, I think, first have brought it up in her bill.

Previous to my last expedition, Sigurdsson had told me of a pair of Merlins that had their eyrie in a ravine of one of the mountains hereabouts, and I resolved to make this the next object of my investigation. We started accordingly on the afternoon of the day of my return, and had the tent pitched by about 4.30. The birds had made their home amidst very grim and wild scenery—*macabre* one might call it, could that be, apart from humanity—which, however, in a way, was represented. The mountain, it need hardly be said, is volcanic, and its black face of igneous precipices, with fragment-strewn slopes at their bases, is rent at irregular intervals by gorges so gloomy and titanic-looking, that to enter any one of them is to leave earth and move amidst a sort of infernal scenery. In one of the gloomiest of these there rose, almost from the centre of the chasm, an irregular prominence, crowned by a huge overjutting mass, the shape of which—with a green eye of lichen, and up-staring bristles of grass—suggested some nightmare-like animal; whilst almost opposite to it, flung out from the cliffs on one side,

a tall spire of rock, ending in a really striking resemblance to the head of a grim-looking, professorial old man, stood like a sentinel. On a ledge of the first of these two salient features—pressed, as it were, into the flank of the nameless creature forming its summit—hung the eyrie (small enough, almost, to call a nest), whilst on the chin, or long, thin nose, or sort of Scotch cap (for he wore one) of the other rock-born being, one or other of the birds would occasionally sit perched. These fantastic resemblances, I may say, are, or have appeared to me to be, more common amidst volcanic mountain scenery than where the outlines have been produced by the slow upheaval of sedentary rock-masses. The former, being largely due to the cracking of the cooled lava-sheet, this may be the effect of the greater variety of shapes which the fractured edges have assumed, since the chances of any such accidental resemblance would be thereby proportionately increased. Whatever the reason, these gloomy solitudes are often tenanted by monsters either of man or beast form.

There was only one place in which my tent could be pitched, so as to have a clear (which was also a near) view of the eyrie, and that was on the very crown, or forehead rather, of a little green knoll, surmounting and, as it were, peeping fearfully down into the horrors of the ravine below. Here it stood—one cord of it amidst the stones of the very rock's brow—uncomfortably shaken sometimes by spasmodic or continuous blasts of wind, but always firm-fixed—however it might be shivering—when I had strayed out, sometimes, and returned, and always there when I awoke in the morning. The eggs of these Merlins were still in process of incubation, on my arrival, and, at 5.45 p.m.—before Sigurdsson had left me—the female, who looks considerably larger than the male, had returned, and gone on to the nest, and she sat there continuously till a few minutes before 8, for the most part keeping very still, and only once turning round in it. At about 7, the male Merlin flew in, and sat in the near neighbourhood of the nest, first on one side of the gorge and then on the other, each time choosing the most salient point of an outstanding rocky buttress or bastion. He remained, thus perched, for perhaps twenty minutes, and then flew away without having visited the nest. A little before 8 p.m., as I say, the

female flew right down upon one of the lower slopes of the mountain, bounding the gorge, and, getting to the tent-door as soon as I could, I saw her there with the male bird, between whom and herself something was evidently taking place, for the one made several swift little darts at the other—the female, I think, at the male—but what with the wind and the flapping tent-sail, I lost them, and found it impossible to pick them up again with the glasses, upon the great surface of the slope, broken and irregular as it was. Both birds had been uttering their little quavering, shrill squeak of a cry (the same, in character, with that both of the Eagle and Sparrow-Hawk), and I still heard it, in a tone of import, though, to my vexation, I could not get them. The male now flew up to one of the points where he had perched before, and, shortly afterwards, I luckily got the glasses on the female, just as she flew from one place on the slope, where she had, I think, been all the time, to another, and here she made a few unmistakable, fierce, downward digs with her beak, to her feet, followed by the action of pulling something up from them, which assured me, in a moment, that she had prey, and was devouring it. It was the same scene, upon the mountain side, as with the Sparrow-Hawks, in Brittany, amidst trees, in the little plantation, nor can there be any doubt, I think, that, as in the case of the latter, the male Merlin had brought in booty for the incubating female. Just as with the Sparrow-Hawks, this was not brought to the nest, but to a place in its neighbourhood (though here much farther off), and in both instances this method may have been brought about owing to the sharp eyes and impatient spirit—or keen appetite rather—of the sitting bird. Never giving her husband time to come to her, it is natural that he should have got into the habit of waiting for her to come to him. Having finished her meal, the female Merlin flew back to the nest, and settled herself again on the eggs. She had been away, perhaps, a quarter of an hour. At 10.15 p.m. she hunches herself up on the eggs, and makes various movements, in which slightly spreading out the wings and bending down the tail are included—the head also is sometimes bent down into the nest. Now again, at 11.30, she goes through some quick rocking-horse-like movements not easy otherwise to describe. The object of these actions, or whether

there is any special one, I cannot tell. But for them, the bird has sat always in one position, her head turned the same way all the time. Soon after this I make up my bed, and retire.

June 12th.—When I look out of the tent, at a little before 3 a.m., I see the female bird still on the nest. She is very still, the head sunk, and I cannot see the eye—she appears to be asleep. So she remains for a quarter of an hour, then raises her head, opens her eyes and looks about, but she soon sinks it, and seems to go to sleep again. Then, at 3.30, she hunches herself up, a little, on the nest, and makes the same kind of movements as yesterday, but they are less marked and of shorter duration. No doubt the feeling of its eggs under it is an intense gratification to the brooding bird, and movements like these may mark the overflowing of such satisfaction, so to speak, as when a cat presses its paws, with delight, against the cushion on which she is lying. This, of course, would not apply to movements made for any definite purpose, but I can see none in these. It is a still morning, as yet, the sky obscured now, altogether, by heavy clouds, which, however, hang high, except upon the mountain tops. From the day after my arrival at Herra, Sigurdsson's farm, it has been wonderfully fine weather, especially the last three or four days, which have been all sun and blue sky, and quite hot, though always with a freshness in the air, which makes it very cold at night. A very still, calm morning is characteristic, after which the wind begins to rise, but sinks again in a few hours. Certainly this is generalising from a rather narrow basis of experience, but others do so, even where the basis is negative.

4.3 a.m.—More of the above-mentioned class of movement. The bird seems to hug herself on her eggs, as it were.

4.9.—Now she sinks her head under her into the nest, as though to examine, or rather to give herself the pleasure of touching the eggs, in a specialised manner; and again she makes these little hunchy movements upon them, as though she were hugging them. Then she preens her feathers, a little, and is now quiescent again. Whilst thus wholly given up to incubation, she hardly looks a bird of prey. Her expression is soft and maternal—the large, dark, full eye very fine. A bird

novelist might make something out of her—and the subject—I think; it should be a hen one, indeed, for none can praise the female like the female—“this was sometime a paradox, but now the time gives it proof.”

At 5.10 a.m. the male Merlin flies up, and the female out, to meet him, but I both miss her departure—my eye not being upon the ledge at the moment—and fail to see the first meeting. A moment or two later, I see the two birds together, on the side of the mountain, by the ravine. It was either in response to the cry of the male, or she uttered it herself, as she flew off, that the female left the nest. After the first meeting (probably) the male flew about twittering (for the cry is a sort of squeaking twitter, or twittering squeak, and twitter is the prettier word of the two) from point to point of the ravine side, perching now on one and now another, as before. I doubt whether, in this case, any booty was brought in by him for the female. If it was she must have disposed of it very quickly, for she was not engaged with it when I first picked her up on the hillside, and she had nothing in claw or beak when, shortly afterwards, she flew on to the cap of the old Scotchman's head—the pinnacle, that is, of the higher of the two peaks—whence, a moment later, she made a circle on to the ledge of the other, and covered her eggs. She was not, I think, absent five minutes. These two peaks, on a ledge of one of which the nest is situated, stand, as I have said, full in the ravine's path, but, though rising to some height, they are not lofty, as, indeed, the precipitous sides of the gorge, which overtop them upon either side, are not either—they scowl, but do not tower. My tent, therefore—perched upon its own little pinnacle—looks down, from a height of perhaps not more than twenty feet above it, directly on to the small eyrie, but over a chasm—formed by the bursting, as one may call it, of a tributary ravine into the central one—whose width may be about half that number of paces. Such a seat outwards, in my opinion, any thronèd one—“I would not change it.”

6.10.—For the first time since my own sitting here began, the sitting bird turns round on the nest. She soon comes half back again, however, and, a minute or two afterwards, sits as before. Her tail is turned towards me, and this enables me the

better to see the odd movements—recurrent at not very long intervals—which she makes on the nest. I do not understand these movements. They do not seem deliberate and directed to the attainment of some special end, but rather of a spontaneous kind, as though they had their origin in the bird's own feelings, whatever these may be supposed to be. If there be an object in them at all, the one which they might best seem to subserve would, perhaps, be the rolling over of the eggs, so that every part of their surface should come in contact with the bird's warm body. There may be a tactile pleasure in thus rolling the eggs under the body, which, if it brought about any beneficial result, would have been fostered, as well as kept within due limits, by natural selection. But this explanation hardly satisfies me, for certain movements which cannot, as far as I can see, have anything to do with this supposed object, are left unaccounted for; and the cat's-paw theory is no better. From what I could catch of the movements of the Eagle on the nest, they were much of the same kind as those of its small relative.

6.10.—The sitting bird utters the little, sharp, twittering cry, and flies from the nest. I follow her, this time, well with the glasses. She flies low over the ground, and at a certain point, seems just to stoop upon it, rising and flying on again, almost without a pause, and she then seems to be carrying something in her claws. It certainly gave me that impression, but owing to the distance, and the smallness of the bird's body, with my never being able to get it against the sky-line, I could not be sure, and, unfortunately, she soon dipped into a gorge, and was hidden. Immediately afterwards, the male Merlin appeared, flying from the direction in which the other had flown, and going up, I think, from the ground—so much I can say of him, and so much is in accord with the supposition that he had brought in prey for his partner. The latter, after a short interval, flies back and covers her eggs again. She came down on the ledge, and then made a curious little shuffling run on to the nest, with her body held quite low. I did not note the exact time of her return, but it must, I think, have been well before 6.30—she would, however, have had plenty of time for a meal. It is now 8.40, and there has been no further exeat. For the last twenty minutes, or so, the bird has reversed her position

on the nest, and, during a considerable part of this time, there have been the movements upon it which puzzle me. They include vigorous motions of the tail, and by this I do not mean the rectrices merely, which are bent sharply down, and waggled from side to side, but the whole anal region, the actions exactly simulating those of the male bird (I am here speaking generally) *in coitu*. The wings are, from time to time, raised and partially opened, and, besides this—a curious point, as it may seem, but which helps me to see a meaning in the whole—the bird sometimes seizes twigs of the grass, &c., round about the nest, in its bill. What can such actions as these have to do with turning the eggs? Rather, it seems a wonder that the eggs are not broken; but we have here, upon the actual nest itself, and after the proper period of nidification, precisely those movements which both the male and female Peewit, for example, indulge in, during the early spring, in conjunction with a rolling motion of the body, as a result of which small round hollows in the soil are produced, any one of which might be (and one of which, as I suggest, probably becomes) the actual nest. To my inference that nest-building, amongst birds, has been evolved out of movements of a sexual or sexually induced nature, I need only, in this place, refer; but the repetition of such actions by a bird sitting upon the completed nest, and engaged in the duty of incubation, would, in that case, perhaps, be explicable, through association of ideas or inherited habit, induced by such an origin. I do not remember coming across any reference to movements of this kind made by birds, whilst incubating. Possibly they may not, heretofore, have been observed, but there is, I believe, a considerable disposition, in field natural history, to put aside facts which do not appear to group themselves with other facts more generally representative of the department under consideration, into which they may obtrude themselves, particularly when they do not belong to the more orthodox class of observation or suggest the more usual currents of thought. Such facts interrupt and upset—are a bother, in fact—so as one does not know what to do with them, one forgets altogether about them—gives them the go-by, as it were—but they remain, and remain to be accounted for.

10.30 a.m.—Since some little time, the bird has turned

herself round, in the nest, again, and now she begins to pluck grass, and then, again turning, lays it, apparently, in the nest, on that side. It is difficult to think there is any real need for this; the ledge is grassy, and the eggs, when I saw them (five in number) seemed to lie in a quite secure cup. We see here, I believe, a mingling of the incubatory with the nidificatory instinct, and the latter expresses itself not only in the placing of materials, but in such actions as would not, I believe, form a part of it, had it been architectural in its origin.

The male now flies into the home-gorge again, but, this time, either without a cry, or with a very faint one. The female, at any rate, pays no attention if he has uttered it, and he certainly flies about from point to point in silence. It is some little time before the female leaves the nest, and when she does I miss seeing her go off it. Before very long, she returns and broods the eggs, again, but leaves them again shortly afterwards and flies down upon the mountain side. Here I for some time, watch her, but she is only preening herself, and, moreover, could not have taken anything from the male without my seeing her do so. Whether she did upon the occasion of his last visit I cannot be certain, but from the facts and appearances which I have recorded, I think it more than likely.

It is now midday, and the female bird continues to cover her eggs for another hour, when she again flies from the ledge, but a rising wind is keeping me, at this time, busy with the tent, which, as before intimated, is on the brink of something approaching a precipice, and my having to brace it up from outside may have accounted for this exit. If so, my apologies are due to all collectors for thus disturbing the bird.

As I now leave the tent, for a short walk, one of the Merlins flies over the gorge, but I think this is the male, and when I return at 1.45 p.m., the female is on the nest again. Shortly afterwards, she flies off it, with the usual shrilly note, to the male, who has again flown in. They fly together, or, rather, she pursuing him, over the hill-side, and come down upon it, at a short distance from one another. Then the female makes a little dart at the male, who rises just as she comes down, and flies to as far away again, and this is repeated once, at least, if not more. It is the same scene as took place between them

yesterday, and, in each case, I believe that the female was demanding food of the male, which she then got, but does not appear to have now, for I do not see her eating anything, and, in a short time, she flies back to the nest. In about a quarter of an hour the male flies, first, onto the top of the nesting-rock, and then onto the ledge itself. I am surprised, as he has not done this before, whilst I have been here, and imagine he is about, for the first time, to take his place on the eggs. He seems, however, nervous and apprehensive, and having advanced a step or two, thinks better of it, and flies away. How natural to attribute this to the presence of the tent!—but see the event, which suggests another and much more interesting explanation. In a few minutes he returns, comes down upon the ledge again, and after a doubtful moment or two, walks along it, to the eggs, when the female, who has been upon them, all the time, makes a little run out at him, with a more *aigre* edition than I have yet heard of the sole note these birds seem to have—and at once puts him to flight. This is quite a new development, for it seems as if the male were wishing to take some share in the incubation of the eggs, but that the female insisted upon engrossing it all to herself. That he is aware, through various similar experiences, of what her feelings may be in the matter, is hardly to be doubted, and the uncertainty of his reception may well account for his evident state of nervous anxiety when approaching the eggs, as well as for his previous retreat. Moreover, this conduct of his tallies in an interesting manner with that of the male of a pair of Sparrow-Hawks, which I watched so secretly that they never, I believe, from first to last knew of me at all except as an occasional passer through the plantation, which I generally entered whilst it was still dark, and sat completely shrouded in foliage. This bird, too, seemed to fear the nest, and on the one, or perhaps two, occasions when he deposited booty there, only just did so and immediately flew away. Anticipating, I may say here that neither of these Merlins seemed to care at all about the tent so long as I was inside it. When they saw me, indeed they were disturbed and that violently—but only with anger and indignation, for as long as I was in the immediate proximity of the gorge, which they considered their property. Once unseen or away from it, they cared not a

moment longer—fear held no place in either of those tiny bold bosoms. For these reasons, I do not believe that, from first to last, either of the pair varied their nesting habits by one jot or one tittle; the Sparrow-Hawks become, here, a valuable criterion.

At 3.10 p.m. the male flies into the gorge again, uttering his cry, and the female, with the same note, flies out to him. Getting, as quickly as I can, to the tent's mouth, I see them come down upon the mountain-side at some dozen or twenty paces from one another. The female has nothing in her claws that I can see, and there is no sign of her eating. I shortly lose them both, but, in a very few minutes, the male flies on to the ledge, and after standing for a moment or two where he alighted—a very handsome little bird in the sunlight, his colouring much warmer, as his size is much less than the female's—takes his place upon the nest. Hardly has he been there two minutes, however, when his wife returns, he at once flies off again, and she takes her accustomed place. This, with the foregoing, is sufficient, I think, to show that incubation is, to some extent, at least, and during some period, shared between the sexes. But the eggs now are probably near to being hatched, and it seems as if the female bird could hardly permit herself to be away from them for more than a few minutes.

4.7 p.m.—The male flies into the gorge again, and the female goes off the nest to him. He settles on a grassy ledge of the cliffs that wall the chasm, and she upon an outstanding point of them, but nothing is brought her, and there is no meeting. Then, in a minute, she rises and flies outward from the gorge; I lose her, and just afterwards, at 4.9, the male takes his place upon the eggs, and remains there till 4.35. During this time I notice him, more than once, make the same kind of movements on the eggs as the female has so often done, but not quite so pronounced as hers usually (but not always) are. At 4.35, as I am steadily watching the sitting male, through the glasses, the female comes down on the edge of the nesting-ledge, on which he rises and comes off the nest, and she walks along the ledge and goes onto it, with the curious little run, before described, just as he flies off. Neither bird utters any cry or sound that I can hear. The difference both in size and color-

tion between the two is well seen, as both stand on the ledge, the male being a handsomer little fellow, whilst the female has a more imposing appearance. This has been the female bird's exeat of the day, and it is to be hoped that twenty-eight minutes has enabled her to procure a meal, if only a "nuncheon."

At 5.30 I go out, to brace the tent, again, the wind continuing, and, as before, when I started for a walk, the male flies up from somewhere near, with his little twittering squeak. And now, twice again, in going and returning from another one, I have put him up from somewhere within the gorge, or in its immediate precincts. It is his habit, therefore, when not engaged in procuring food, to keep on guard in the neighbourhood of the nest, and, as has been seen, the pair (and I have no doubt either of them alone) are capable of molesting even Eagles, should they encroach upon their preserve.

June 13th.—From some time after 7 a.m. the female was on the nest, but left it, without my perceiving her, before 8. Just before (as also several times during the earlier morning), I had heard the cry of the male, and have no doubt that, as usual, he was the occasion of her going. At a few minutes before 8, she returned, and stayed on the nest till 10.30 a.m., when she was again called off, as I think it may be correctly termed, by the male, who, as usual, uttered his cry. At 10.30 he again flew in, with it, and the female again left the nest. I could not ascertain whether she received anything from him, this time, and still less am I able to say if she did the time before; but this, whether disappointed or not, is always what she seems to expect. After some five or ten minutes, the male flew to the ledge, but left it again, without going on to the eggs. He returned in a few moments and covered them, but almost immediately went off again, and had hardly been gone a moment when the female flew in and took his place—he must, I think, have seen her coming. At 12, being called for by Sigurdsson, I struck my tent, and, leaving the bird still on the nest, departed for "fresh woods and pastures new"—there are woods in Iceland, though dwarf ones.

From the foregoing notes it would appear that, as with the Sparrow Hawk, there is a considerable differentiation between the domestic duties of the male and female Merlin, even during

the incubatory period. The statement which I have made in my Observational Diary of the former bird, that the female alone incubates is indeed much too wide and general, but the male never came to the nest while there were eggs in it, during the time that I watched the birds, and, as I say, I was unseen and unthought of whilst I watched them. On the other hand, he kept flying into the plantation with a cry, in response to which the female flew off the nest to him, and on some, if not all, of these occasions, she received from him booty, which he brought her. It was much, if not just, the same with these Merlins. The male did, indeed, do some part of the incubation, but it was a very small part, and on two occasions certainly, and once again probably, the female showed an impatience of his presence at the nest—on the first of these, indeed, she refused to come off it, and drove him from the ledge. Also, just as with the female Sparrow-Hawk, she flew out, at intervals, as an accustomed thing, to his cry, and it was then evident that she expected to get something—booty, namely—from him, which, on at least two occasions, she did get. In these meetings, the male did not come to or near the nest, at all, but went down, with the female, on the hillside, right away from it, or waited for her there. On the few occasions when he did come to it, it was a quite distinct thing, either after the meeting or without any meeting at all of this special kind. Nothing could be clearer than this, as will be seen by a reference to the text. What I have called the home-gorge, I may remark, ran down the whole slope of the mountain, till it ceased to be one—a very long way, that is to say, beyond what anyone would consider the vicinity of the nest, though the birds seemed to claim the whole of it. The male Sparrow Hawk, though he never once, whilst I watched, came to the nest during the incubatory period, yet in his similar visits, either with, or rousing expectations of booty, came incidentally much nearer to it, for he seemed to consider it his duty to enter the plantation, which was a quite small one.* In these meetings, therefore, of the male and incubating female, in the cry uttered by both, and the evident hope of the latter, on hearing it, which is sometimes realized and

* Of course, in this case, the purview of the female did not extend to the country beyond the plantation.

sometimes not, we have a close parallel between the two species, and this specialization of the parental duties in either sex which we here see in its earlier stages, becomes, in both of them, more complete, after the hatching of the eggs (see *post*). In the domestic relations of the Peregrine, the same fact is illustrated, but with a curious reversal of the relative parts played by the male and female, as shown by Dr. Heatherley's interesting account of the breeding habits of these birds. At least it seems curious that the male, rather than the female, should actually feed the young, but whether it is so in the sense of being an exception to the general habits of the family, we are not yet, perhaps, in a position to say.

(To be continued.)

NOTES AND QUERIES.

A V E S.

The Grey Wagtail (*Motacilla melanope*) in Sussex.—The nesting of the Grey Wagtail in East and West Sussex has been recorded ('British Birds,' vol. vi. p. 17, and 'The Zoologist,' 1912, p. 228), and it would appear likely that it has now done so in a more central part of the county. If a few passing birds in August are excepted, the Grey Wagtail may be said to be a winter visitor only to this district, but this year I have met with it occasionally since the first week in April, and on June 13th I saw two young birds in Buxted Park. I see no reason why this bird should not nest here, as there must be many suitable places for it, but this is the first year that I have met with the Grey Wagtail in nuptial plumage in the district, or have seen young birds in June.—ROBERT MORRIS (Uckfield, Sussex).

Courting Actions of the Shag.—In the lately issued Section xi. of Kirkman's 'British Bird Book,' Mr. Hartert quotes my description of the courting actions of the Shag (*Phalacrocorax graculus*). This, however, was founded upon what I saw during the latter part of the breeding season only, which was not by any means enough to allow me to tear out the heart of the bird's mystery. This I have now done—or, at least, come nearer to doing—in an earlier and more continuous series of observations, and I should like to state that there are some peculiarities in the sexual relations of this species, which, as far as I know, have been hitherto unsuspected. My present notes make this evident, but I do not quite know when I shall be able to publish them.—EDMUND SELOUS.

Velocities of Migratory Birds: Corrections.—I hasten to correct an awkward slip in my paper of last month. On page 245, line 6 from the bottom, "3 minutes 56 seconds" should be "11 minutes 56 seconds." Col. Seely's exact words were "four seconds less than twelve minutes," but in this case 105 should be the velocity, rather than the 115 actually mentioned by him. Perhaps here I ought also to apologise for a cruelly redundant s in line 2, page 241, and an unintentional bit of phonetic spelling on the next page, line 13.—FREDK. J. STUBBS.

BIBLIOGRAPHY.

A Rare Zoological Publication.—The sale of the Huth Library has given us the opportunity to acquire a work to which at length the attention of zoologists should be drawn. We refer to the miniatures by Georg Hoefnagel, painted between 1576 and 1582, giving figures covering the whole range of the animal kingdom. Executed for the Emperor Rudolph II., who, it is related, paid one thousand golden crowns for each of the four volumes, still they must have passed out of the Imperial treasures, as in course of time they went successively from one private collection to another. We find references to the work in Sandrart's biographies (1774), in the biography of the artist by Fetis, in Nagler's 'Kuenstler Lexicon,' and in Hagen's 'Bibliotheca Entomologica,' but the meagre descriptions, given by the authors on art referred to, are copied from each other, and Hagen, though he realized its great value, was unfortunately unable to see the work.

Anyone examining Hoefnagel's paintings is bound to admit that they are the creations of a great artist, but the point of paramount importance is the fact that he must have been a keen observer, who, not merely working with imaginative genius upon drawings already in existence, depicted with inimitable skill the material he had before him in the faunas of his own and of other countries that he visited during his travels. A complete iconography being evidently his purpose, he had to include some animals which he could know only by repute or from the descriptions of others, and thus the eye is pleased with a credible Barnacle Goose and other mythical creatures.

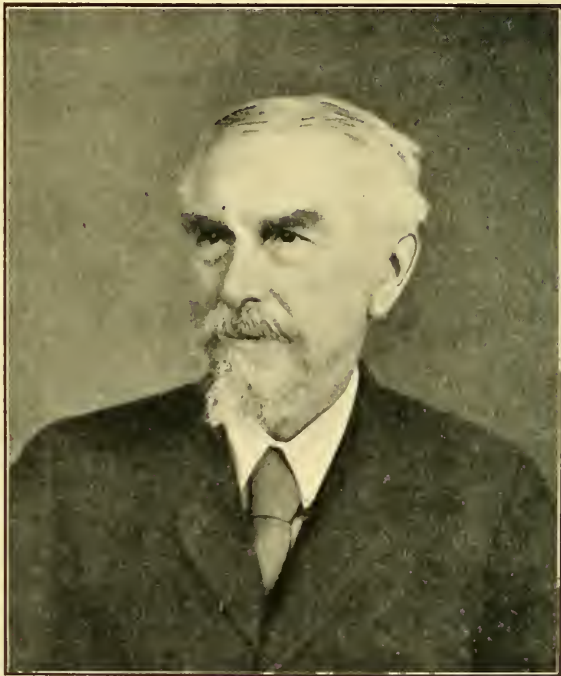
Though Georg Hoefnagel may be little known at present in the history of zoology, we claim for him his place as the father of the coloured zoological illustration, and that his work remains to the present day in many respects unsurpassed. The history of the art of depicting natural history objects remains to be written, but some readers of 'The Zoologist' may be interested in it. These are invited to inquire into the truth of our statement by personal inspection, by permission and request of its purchaser. — WM. WESLEY & SON (28, Essex Street, Strand, London).

[We are informed that the work is sold, and will find its home in a Hampshire library.—ED.]

OBITUARY.

PHILIP LUTLEY SCLATER.

ANOTHER of the prominent zoologists of our generation has passed away in the person of Dr. Philip Lutley Sclater, D.Sc., F.R.S., who died on June 27th last at the mature age of eighty-three years; he was born on November 4th, 1829, and lived a busy scientific life throughout.



As Secretary of the Zoological Society of London from 1859 to 1902, he would, if necessary, be alone remembered by British naturalists. He was essentially for many years the strong man of that Society, and at the time when the strong hand of an earnest zoologist was essential in building up what has been described by a well-known American authority as "the most wealthy and vigorous Zoological Society in the world," he wielded possibly a greater power

—and that for good—than is usually associated with purely secretarial responsibilities. The publications of the Society for the long period under his editorship, the growth of the great library, and the success of the Gardens, under old-time regulations, will bear ample witness to his official value and energetic action.

Dr. Sclater as an ornithologist has also left his mark on that favourite science; his studies and publications were principally in connection with the Central and South American faunas. He was one of the founders of the British Ornithologists' Union, and the first editor of its journal, 'The Ibis.' Both "Union" and "publication" will cherish his memory. He was conservative on the question of nomenclature, as are many more of us, though the proposed changes are clearly on the rising tide.

The biological standard of his career, and one that will outlive his faunistic labours, is his great pioneer work in the study of the Geographical Distribution of Animals. The natural divisions he recognized, and the names he gave them we use and write now, and they will be used and written hereafter; nor can we forget his paper "On the Distribution of Marine Mammalia," which was first printed in this Magazine (1897, p. 217).

Dr. Sclater, at the Zoological Society, possessed the methods of a business man in the best sense of the word; his legal training—for he was called to the Bar and went on the Western Circuit for several years—doubtless gave him the gift of personal analysis among those with whom he was thrown in contact. He could thus identify young men who were really naturalists at heart and by instinct; these he never failed to help and assist by all means in his knowledge, and he has doubtless promoted many careers. He was not only a zoologist, but was also of a fine manly character, which ensured the respect of those with whom he was associated. His first publication, a "Note on the Water-Rail," was in 'The Zoologist,' and appeared in 1844; so that we have probably lost our oldest contributor.

W. L. D.

NOTICES OF NEW BOOKS.

A Dictionary of English and Folk-Names of British Birds, &c.

By H. KIRKE SWANN. Witherby & Co.

THIS is a volume compiled with considerable knowledge and research, while it appeals to bookmen as well as ornithologists by its bird-lore, a subject in old literature to which a good reference is frequently imperative. In turning over its pages we noticed that the Cornish name for the Chough and also for the Hooded Crow is "Market Jew Crow," which has explained the well-known name of a street in Penzance—"Market Jew Street"—which had often puzzled us not a little. Some names of common birds in use by the old and now happily almost extinct professional birdcatchers would well bear record if they could be garnered, for doubtless they are still used in the quarters where these diminished gentry live, though no longer flourish. In the schoolboy days of the present writer a Chaffinch was always referred to by a man with the nets as a "chuck wido."

Mr. Swann gives a good bibliography, and has consulted most of the best books on the subject. In a future edition he might add to his list 'Bird Gods,' by Charles de Kay, a book from which something may be gleaned. Thus the Wryneck, "in the vulgar speech of Germany," is stated to be known as the "Cuckoo's maiden,* perhaps because the ancients fancied that the bird was twisting its head round to see its admired one, the Cuckoo." It is not, however, on what is unmentioned in this volume that we wish to be critical, but rather to gratefully acknowledge the large amount of information that can be found in its pages.

* In Suffolk it is sometimes known as the "Cuckoo-leader."

The Food of some British Wild Birds: a Study in Economic Ornithology. By WALTER E. COLLINGE, M.Sc., F.L.S. Dulau & Co. Limited.

WHEN we read in the Preface to this volume that the conclusions arrived at in its pages "have only been obtained after a considerable amount of work extending over many years, during which period numerous observations have been made in the field, and of the stomach contents of upwards of three thousand adult birds and three hundred nestlings" we feel that a considerable addition to our knowledge on the subject must have been made, nor are we disappointed on a perusal of the small book of slightly over a hundred pages. The majority of our wild birds are passed over, as some are so rare or small in numbers as to be practically ignored, those aquatic or littoral in habits are neglected, as are also those which feed exclusively on insect life; this leaves about thirty-five species, and of these twenty-nine are dealt with. Most of the well-known authorities are quoted, and each bird has its full record of diet and depredation. The Goldfinch certainly needs little consideration, as, Mr. Collinge states, "this bird is by no means so common in the Midland counties as formerly," while in Surrey, or at least in a large part of that county, we can answer for its ever-growing scarcity, whilst its worst character is that of a distributor of "weed seeds." The House-Sparrow, however well deserving its name of "avian rat," is certainly a notorious pest, though we quite agree with the conclusion of our author: "The Sparrow has been allowed to increase to such an extent that it has become one of the worst bird pests we have, but if it were reduced to such numbers as to be no commoner than, say, the Robin, I believe the good it would do would more than compensate for the harm. At present the attitude of all farmers must be one of extermination, and to this end it would seem very desirable that the use of poisoned grain should be permitted."

The Bibliography is almost confined to publications written in the English language.

EDITORIAL GLEANINGS.

MR. PERCY M. CLARK, F.R.G.S., writes from the Victoria Falls, calling attention to the trapping of small Monkeys which is being carried on there. He points out that the Monkeys are entirely inoffensive, and are, in their natural haunts, of great interest to visitors, and it seems a great pity that they should be frightened away, as will be the case in a short time if this trapping continues. Visitors to the Falls, he adds, much prefer to see Monkeys in the Rain Forest and Palm Kloof than boxed up in a cage. That is not natural, and the little fellows are so absolutely harmless.—‘The African World,’ August 9th, 1913.

ROOKS AT SANDOWN PARK.—“Gareth,” writing in the ‘Referee’ of August 10th, 1913, says:—I heard something during the afternoon, unconnected with horses, which interested me not a little, being a student and a lover of birds. As sportsmen are aware, there is an extensive rookery at Sandown. In the immediate neighbourhood of the racecourse a considerable amount of corn is grown, and it might be supposed that the Rooks would take liberal toll. These birds are generally accused of doing an infinity of mischief to buds, blossoms, and growing crops in all stages of their growth, from the time the sprouts appear to the period when the corn is ripe. Mr. Hwfa Williams assures me that the Sandown Rooks are never known to go outside the Park; the corn does not in the least tempt them, nor have they any hankering after other vegetarian diet; they busily devote themselves to destroying the five-furlong course by delving down for wireworms, which, of course, are a pest; so the birds do a great deal of good and no harm to farmers and fruit-growers round about, though the mischief they effect on the course—why they should prefer the five-furlong to the rest of the grounds I have no idea, but so it appears to be—is a standing cause of expenditure.

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OF

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THE ZOOLOGIST

No. 867.—September 15th, 1913.

NOTES ON THE ORNITHOLOGY OF OXFORDSHIRE,
1910-1912.

By O. V. APLIN, F.L.S.

1910.

January 3rd.—Mild weather; Mistle-Thrush, Song-Thrushes, Hedge-Sparrow, Wren, and Starling sing, and Wood-Pigeons "coo." A Jay seen in my shrubbery.

6th.—A great many Bullfinches about hedges this winter, and they are now continually about my garden.

7th.—I counted to-day fifteen Pied Wagtails close together following the plough just outside the village; there were a few more not far off, perhaps twenty altogether, in the field, and one Meadow-Pipit. A single Wagtail, or at most a pair, is all we expect to see in winter. These birds must have wintered not far away, contrary to their usual custom, for it is too early for an oversea migration, or even for one from the South of England. News from Mr. Fowler of a Crossbill shot from a small flock on the 1st inst.

10th.—Bullfinches reported from Kingham in great numbers, and at the beginning of the month Wood-Pigeons were reported to have been seen in great numbers in the district round Shipton-under-Wychwood for some weeks. Blackbird singing.

12th.—Heavy fall of snow. A "wisp" of half a dozen Snipe in flooded meadow at Barford.

14th.—Mild. Two Larks singing, the first this year. There have been fair numbers of Fieldfares all the winter, and many early in the season.

A mild month, but frosts towards the end. Less than two inches of rain on seventeen days; wind S.W.; temperature over freezing on twenty days.

February 5th.—A good many Thrushes have returned.

6th.—Pied Wagtail sang. Blackbird with rattling breeding note.

12th.—Chaffinch singing.

20th.—Most violent February storm ever known here. Thunderstorm, hurricane, torrents of rain, and very big hail.

21st.—Rooks building the last few days.

26th.—Several Yellowhammers singing.

A mild month, twenty-seven days over freezing; $3\frac{3}{4}$ in. of rain on twenty-five days; S.W. The valleys more or less flooded last two months.

March 2nd.—Bullfinches numerous and destructive lately.

6th.—A Nuthatch at the back of the house, the first seen here this winter. I heard two at Wroxton on 5th.

26th.—News from Mr. Fowler of Crossbills still at Cornwell, and possibly nesting. Also of a Spotted Woodpecker seen by him in Churchill Heath Wood on the 25th, where he had not seen one since 1888. Wryneck in Hanwell Park.

29th.—A Peregrine here. Nuthatch at Bloxham Grove.

30th.—Three Herring-Gulls flew over very low down, going N.E.; perhaps brought down by the calls of my neighbour's pinioned Gulls. Chaffinch's nest with one egg—very early.

April 2nd.—Four or five Redshanks reported at Kingham by Mr. Fowler. They did not stay.

12th.—This evening a Barn-Owl flew over the garden with something in its claws, including a long straw, no doubt snatched up with a mouse!

27th.—Several Goldfinches seen lately, probably recent arrivals. A pair in my orchard.

28th.—Examined a very fine adult female Dotterel shot from a "trip" of five at Sibford on the 23rd.

May 3rd.—Visited the heronry at Old Paddock, near Thame, but I found that most of the trees in the grove of fine oaks where they bred had been felled just when the birds were nesting last year, and the Herons have deserted the place. This is a great loss to the county. This spot is in what was once Rycote Park,

where there was once a fine mansion, and deer within the memory of a former correspondent of mine. Rycote Pool is close by, and it was a grand place for a heronry. A man who had lived close to the wood for many years told me he had counted as many as thirty birds. There were several pairs of Coots on the Pool, as well as Dabchicks, Duck, and Moorhens. Several Nightingales.

4th.—Nuthatch at Thame Park.

7th.—A Wild Duck rose from her nest on an island in a small pond near the village, and a long way from any brook. A Blackbird's nest quite ten feet up in a huge hawthorn hedge. The bird refused to come off for some time, feeling herself and nest quite safe.

10th.—A Gull passing N.E. yesterday, and three seen a week ago; rather stormy weather.

16th.—Signs of Long-eared Owls in Claydon Hill Wood.

21st.—Great thunderstorm and a deluge of rain.

25th.—Cinnabar moth appeared.

31st.—Young Starlings in small flocks.

June 2nd.—Wood-Wren in Churchill Heath Wood. Mr. Calvert told me he found a Grey Wagtail's nest in the stonework of the lasher at Ascott-under-Wychwood Mill, with eggs, on April 15th, and another nest of young near there in May. He subsequently informed me by letter that the young were nearly fit to fly at the time of the flood (June 7th and 8th), and he feared they were washed out of the nest, as the river rose in the middle of the night. He thinks the birds laid a third time, as he used to see a brood about there when he was fishing at the end of August.

3rd.—More Nightingales in the district this year than usual. A female Red-backed Shrike. Goldfinches rather common.

7th.—Great storms of thunder and rain and heavy floods about this time. I was away from home.

15th.—Heard a Corn-Crake between here and the Grove, from the house. About 10.30 p.m. Golden Plovers were passing N., calling loudly.

19th.—A Wren's nest which was being built on March 27th, and was, I thought, deserted, was found to contain eggs a day or two ago.

27th.—Barred Woodpecker noisy in elm tree, and I think has young out; a brood reported in an orchard at Tadmarton this spring.

July 13th.—The Corn-Crake I heard was seen when the field (clover) was cut a day or two ago. No nest was found, but the young may have been hatched.

16th.—A Peewit mobbed me as if it had small young. These birds often get their eggs destroyed twice or more times (when obstinately trying to breed in some field) by agricultural work. Perhaps they finally hatch a very late brood.

25th.—Common Sandpiper by the canal at Bodicote; the hounds killed an Otter at King's Sutton.

August 21st.—Swifts, I think, still here in full strength, flying round and screaming loudly. Some young on the wing on 16th. Though we have more Swifts than last year, there are not many, perhaps not half our average number. A cold summer. The bulk of them must have left the next morning. Stray birds seen until the 25th.

September 3rd.—Counted up to one hundred and twenty-seven Martins on my roof this morning, but there were more; some were often moving, and I think some had flown away earlier. Three Land-Rails shot to-day out of standing barley. A few Meadow-Pipits in roots; this is very early for this migration.

10th.—One Land-Rail.

12th.—A few Pipits.

30th.—Chiffchaff singing.

October 1st.—Many Meadow-Pipits.

10th.—A Cormorant—small and probably a Shag—flew over the garden this morning low down, going N.

19th.—News of a pair of Hobbies shot and nestling taken at Wytham (on the Berks side of the river) this year, and an adult male shot at Glympton this summer. Woodcock shot on or before 17th.

22nd.—Redwings. 24th.—Fieldfares.

November 8th.—A few days ago a Little Owl flushed from a hedgebank at Horley.

15th.—A great many Wood-Pigeons about here now.

Nearly four inches of rain in November, and nearly six in December, and great floods.

December 23rd.—A few Bramblings with small birds near some beech trees. Very few Fieldfares and Redwings this autumn; there are no haws.

1911.

January 6th.—A Hawfinch in my garden.

14th.—A few scattered Bramblings about. Weather frosty lately. About 4.30 p.m. I saw a Great Tit perched on a lump of fat which hangs on a string in front of one of the windows, fast asleep, with his head “under his wing”—other birds had gone to roost. I went out and caught him. He seemed drowsy but quite well, and probably was so full of fat that he went to sleep at the table!

February 25th.—A female Goldcrest has been here yesterday and to-day picking up small bread-crumbs.

March 27th.—Our one pair of Nuthatches continue with us and I hope will breed.

April 1st.—A pair of Hawfinches in the kitchen garden. Bullfinches now most destructive to primroses; they bite off the flowers for the sake of the green seeds in the nectaries.

3rd.—Goldcrests which have been noticeably abundant all the latter end of the winter are still about here. Jays, too, have been unusually common.

10th.—A fine male Hawfinch in holly tree by study window. They always come into the village when the crop of haws fails, as it did last autumn. Many were seen in a plum orchard at Milcomb in the latter part of the winter.

13th.—News of a cream-coloured Snipe shot in Milcomb gorse at the end of February. It was badly shot, forgotten, and then thrown away! Water-Rails have been seen lately about the small pond near the railway station.

27th.—Examined Little Owl shot at Barford about the middle of the month, a small warmly coloured Buzzard shot at Somerton on March 11th, and a male Ring-Ouzel shot at Westbury, Bucks, early in April.

May 6th.—Two Nightingales near the village this year.

15th.—A male Red-backed Shrike here. The leaves came out so early this year that it is now very difficult to see young Rooks. An adult Redshank, which I afterwards saw, was shot

this month at Slat Mill, near Cropredy. This looks as if the breeding birds were pushing up the Cherwell Valley.

June 2nd.—Mistle-Thrush still in song.

July 11th.—Saw a Reed-Warbler in the Cherwell just above King's Sutton. Also saw an *old* Cuckoo, though I had not heard one for several days before June 25th. Rooks have been very destructive this dry season, and I was told to-day of one and a half acres of peas completely destroyed by them and Jackdaws.

15th.—A boy brought me a deserted nest and four eggs of a Nightingale, taken close to where I had seen a bird in May. The yolks of the eggs were only curdled, and, considering the very hot dry weather, the eggs could not have been laid long.

21st.—Wheat ripe ; oats cut, and pasture fields quite brown.

24th.—Martins congregating on the roof. Song-Thrushes have deserted the garden ; a pair which have young in front of the house are, my man says, feeding them on green cabbage caterpillars.

August 9th.—Said to be the hottest day ever known in England ; here only 90°. Swifts enjoyed it, but the Greenfinch was the only bird in the garden that could sing. All the Swifts here this evening, but only one seen afterwards.

12th.—A young Red-backed Shrike.

14th.—A Gull (probably immature Herring) flew over, N.E.

19th.—Harvest finished.

September 1st.—About one hundred Martins on roof, 8.30 a.m. They have been more numerous than usual this year, a good many having arrived after the middle of May.

5th.—Over one hundred Martins on roof.

6th.—Shot a white horseshoed Partridge—a female of last year. About one hundred and twenty Martins on roof.

7th.—Small Copper Butterflies very abundant now. I saw five close together in my garden even.

8th.—About half a dozen Meadow-Pipits in roots ; 84° in shade.

26th.—One field of roots pretty full of Pipits, despite the smell of the mildewed and rotting plants ; few in others. Two little " charms " of Goldfinches.

29th.—Nearly all the Swallows and Martins gone ; the last gathering on the roof of the latter was on 23rd. The great

drought, which lasted above five months and ended with this month, was most destructive to vegetation, some trees and shrubs dying. The ground had cracks into which a man could put his foot, and two feet deep. In the five months, May to September, only just over five and a half inches of rain fell at Banbury, and still less at some places round there.

October 10th.—Swallows and Martins appear to have gone; one of the latter here to-day, none the last two days.

11th.—Wild Geese reported flying over.

12th.—One Swallow.

14th.—Redwings.

27th.—Fieldfares.

November 8th.—Little Owl shot at Horley in mistake for a Woodcock, from the same spot in a fence where one was flushed within a day or two of this date last year. Expanse of wings, $21\frac{1}{4}$ in.; weight nearly 7 oz.

12th.—Blackbird singing a little in low tone.

30th.—At 3.5 p.m. flock of about one hundred and fifty Fieldfares flew over, followed in five or ten minutes by a big flock estimated at four or five hundred; going S.E. Air still, south, dull and cloudy. Very few (and of Redwings also) about here since they came, the crops of haws being small and irregular.

December 19th.—A Lark sang.

20th.—Winter aconite flowering.

Year closed with the still, dark, dry weather White speaks of. Wren, Song- and Mistle-Thrushes, Robin, Hedge-Sparrow, Starling, and Great and Coal Tits singing.

1912.

January 1st.—A great deal of bird song, and a Blackbird sang.

13th.—For the first time this season I noticed a few Bramblings about the fields. No beech-mast last autumn, but a record crop of acorns.

27th.—Saw a Short-eared Owl in a tall tree near Banbury, into which it had been driven. It was alarmed, and its little ears could be clearly seen against the sky.

29th.—Two small Swans flew over the garden low down; adult. I caught sight of a flash of yellow on their beaks. Severe weather lately.

31st.—Scarlet Grosbeak seen at Adderbury (*vide* Zool. 1912, p. 460).

February.—Our pair of tame Nuthatches disappeared in the severe weather, and I may add we had none here all the rest of the year.

March 1st.—A Wren's nest finished externally.

7th.—Migratory Meadow-Pipits in Cherwell Valley, pushing up the valley over the floods. Examined a fine adult Slavonian Grebe shot at Wroxton recently.

28th.—Some Goldfinches have arrived: an early appearance for these migratory birds.

April 10th.—Magpie's nest with three eggs, which is early.

12th.—Crow's nest with five eggs.

15th.—A flock of fifty to one hundred Fieldfares passed E. this morning, high up and noisy.

17th.—More passed, and some remained here.

19th.—Young Song-Thrushes on the wing.

20th.—Grey Wagtail's nest with five eggs found at a mill-lasher on the Evenlode.

28th.—The spring drought which has lasted over a month seems to have checked the nesting of some birds. A Mistle-Thrush now sitting low down in the main fork of a plum tree, and very tame, became very bold after the young were hatched, dashing within a yard of our heads, and perching with loud croaks not two yards away. The nest is fairly well hidden.

May 6th.—Shot Rooks; unusually early, but the leaves already out so much that it was difficult to see the birds in some trees.

One Nightingale here (on the Grove), and one near Crouch Hill. Crows seem to be laying full sets of five this year; in some years four is the usual number. Seven sets of five have been brought in, and no completed set of less, unless two eggs three-quarters set upon, small abnormal eggs, could be called so.

17th.—For the third time this season a pair of Peewits have laid their eggs in a small field, and lost them through agricultural operations.

21st.—At Upper Heyford, in an old disused lock-garden,

where there is a good growth of reeds, I found a little colony of Reed-Warblers. I heard three birds singing, and saw a completed nest. This bird is rare on the Cherwell, sporadic in distribution, and apt to be found one year in a place and not the next. A pair of Tree-Sparrows breeding in a girder-bridge carrying the railway over the canal near there. I am told that twenty-six dozen young Rooks were killed at North Aston Rook-shooting.

June 2nd.—A pair of Flycatchers (for which a careful look-out has been kept) appeared in the garden on the 29th ult. To-day the nest was finished and the first egg laid. A Black-bird's nest, of which there was no sign on the 30th ult., is finished to-day. All the building must have been done in the very early hours of these long days, for the nest is in a rose-arch crossing a most frequented path.

11th.—Mr. Fowler showed me nest of Stonechat in bank by roadside near Kingham Station. This pair of birds had a brood in April.

July 14th.—Heard a Quail calling about 9 p.m.

27th.—A "Holly Blue" butterfly in the garden.

The latter end of this month was very wet.

August 10th.—Received from Mr. Fowler an adult female Wood-Sandpiper, shot from a flock of about eight in a flooded meadow in the Evenlode Valley at Kingham on the 3rd inst. Although stale, it weighed $2\frac{3}{4}$ oz. Both Green and Common Sandpipers were noticed there about the same time, and one of the former was shot. This is the first time the Wood-Sandpiper has been proved to occur in Oxon so far as I am aware. Mr. Fowler also sent me word that the pair of Stonechats had built another nest, and probably reared young, by the roadside in his absence. Examined a male adult Hobby shot at Tusmore on the 9th inst. A Hobby was shot at Bletchingdon early in June in the act of snatching up a Sparrow feeding on the food at the Pheasant-coops.

The following notes on the Swifts in this cold and very wet month may be worth recording:—

9th.—Our full lot and rather noisy at evening; some young out, and for some days early this month. But I think the old birds have reared few this year on account of the cold and wet

late summer. 10th. Could only see three together. 11th. Two. 12th. None. 13th. Two and one young one (55°). 16th. Two. 18th. Numbers. Since the 9th I could not see more than three together, and on some cold, wet days none at all. I think they stay in their holes in such wet, cold weather as we have had, or only come out for a short time in the day. I almost always go to observe them about 6 or 7 p.m. To-night—a nice and warmer evening—up to 7 p.m. the whole colony seemed to be out, and some young with them. I should think there were over forty in the air, and they screamed a little. They have hardly screamed at all this summer, and I had not heard them since the 9th. 19th. Some; screamed. 22nd. Eight or ten. 24th. About a score, and quite noisy in the sunny evening; some young out. 25th. About a dozen. 29th. Two, and young.

24th.—Whimbrel heard passing west about 8 p.m.

28th.—Walked on the tow-path from Lower Heyford, along the Cherwell Valley to Aynho Station. The valley seemed one long lake. Machines of all kinds and haycocks peeped out of the water at intervals. There were hundreds, perhaps thousands, of Peewits along the flood-edge. Some Ducks and Herons and a Common Sandpiper were seen, though it was impossible to search for small waders. I also saw a Wheatear.

30th.—A “Holly Blue.”

September 5th. — News of a Golden Plover at Rollright yesterday.

6th.—Two Land-Rails flushed out of oats being cut.

7th.—A Red-backed Shrike seen. A very few Meadow-Pipits in roots; none on 2nd. Another Land-Rail.

9th.—Two Land-Rails. A good many Pipits—about a hundred in one bit of roots.

10th.—A good many Martins and some Swallows already gone.

19th.—Some meadows from which the floods has at last run off are covered with mud; on one of them near King's Sutton were hundreds of Peewits, with Rooks and a few Crows.

21st.—Saw a male Ring-Ouzel between here and Milton.

24th.—At the junction of the Sorbrook and Cherwell near Adderbury a great number of Peewits were feeding in two meadows. I counted parts of the flocks, and think there

could not be less than 1750. Some Snipes and Herons about there.

26th.—Swallows and Martins seem to be quite gone. Wag-tails passing over.

This fine month is drying the country up. About ten inches of rain fell in July and August.

October 1st.—Four or five Martins flying about the house.

3rd.—Many Pipits about the Milcomb hills.

4th.—One Martin. Sharp white frost.

5th.—Twelve or fifteen Martins, doubtless on passage, stayed all the afternoon.

6th.—Some half-dozen.

7th.—Long-eared Owl hooting gently from spinney at South Newington Hill in the afternoon.

9th.—News from Mr. Fowler that he saw a Grey Crow at Kingham (the first he ever saw there) on the 8th.

10th.—Three Martins.

11th.—Lot of Pipits. When lunching at a cattle-hovel between Milton and Coombe Hill to-day, we found a Little Owl quite lively in the sun.

17th.—Saw a Little Owl at South Newington Hill. I think they move about this month and early in the next.

21st.—A Woodcock near South Newington.

25th.—A single Golden Plover flew over, calling. Field-fares.

26th.—Cold and wet as it was, Larks sang well, showing that their autumn song does not depend on fine weather. Yet it takes a *very* fine, warm, sunny day to produce a song in winter after the autumn song is over.

November 1st.—Redwings.

18th.—Grey Crow reported at Milton.

19th.—Winter aconite flowering, the first I ever saw in November. The Thrush tribe here in abundance, enjoying the soft weather and abundant haws. Dark variety of Red-legged Partridge at Hook Norton (*vide* Zool. 1913, p. 276).

21st.—Examined an immature Sheld-drake shot on the floods near the mouth of the Sorbrook about the end of August. Also a Hobby, a bird of the year (and said to be a female), shot between Barford and Newington on September 17th.

23rd.—Lark still sings.

24th.—Most of the migratory Thrush tribe have gone on, leaving us our winter stock of Thrushes and Blackbirds.

December 10th.—Three Woodcocks reported as seen in Milcomb bushes ; there are more than usual this season.

15th.—Put up a Partridge in my orchard garden in the middle of the village (Sunday).

20th.—Lots of Fieldfares again, in flocks, but no Redwings noticed. Heard of two Quails shot at Wroxton in September.

22nd.—No fewer than thirty-three plants in bloom in the garden. Notwithstanding nice mild days since the Larks were stopped by cold days, they have not sung since November 23rd.

23rd.—Many Fieldfares passed over in straggling flocks, going S. and E.

28th.—The beaters saw a "milk-white" Lark at Milton. A good many Fieldfares, but no Redwings, strange to say.

ASIATIC SKY-LARK ON MIGRATION OBTAINED AT THE TUSKAR ROCK LIGHT-STATION.

BY Prof. C. J. PATTEN, M.A., M.D., Sc.D.

IN the 'Irish Naturalist,' March, 1912, vol. xxi. pp. 49-51, I mentioned that I obtained a strange species of Sky-Lark, then unknown to Ireland. From the first I surmised that it was a different species from our Common Sky-Lark, and not merely a light variety of the latter. I felt convinced that it was either the Southern (Mediterranean) or the Eastern (Asiatic) Sky-Lark, and, for reasons which I shall give presently, provisionally designated it the former. Before, however, touching on this point, I shall briefly indicate the circumstances under which it was procured, for, excepting the date of its capture, I have recorded nothing in my previous communication. On Thursday, October 5th, 1911, at 11 a.m., having spent more than two hours searching for dead or wounded birds amid the rock-crevices, I went out on the roof of the dwelling-house of Tuskar Light-Station, and there found two Sky-Larks. From the shrunken conditions of the eyes, and from other *post-mortem* features unnecessary to detail here, it was evident that the birds had been dead a few days, and inasmuch as no birds, save one Blackbird, were seen at the lantern since October 1st—the weather conditions being unfavourable for alluring migrants to the rays—it is well-nigh certain that these two Larks met their fate on the night of October 1st, probably by striking the lantern-glass, at the same time that great numbers of other Larks, as well as Blackbirds, Song-Thrushes, Starlings, Wheatears, Goldcrests, Redstarts (and probably several other species not identified), held up by adverse weather, gathered round the lantern, soon forming a huge fraternity. Larks were most numerous: numbers killed themselves outright either by striking the glass, the balcony-rails, or other part of the lantern framework. I picked up thirty-nine specimens, which afforded me most useful material in making comparisons. Thrushes, Blackbirds, Starlings, and Goldcrests appeared also in considerable numbers,

and several specimens were obtained. Though many Wheatears appeared in the rays, very few came into actual contact with the glass; most of them, allured by the light, disappeared by ascending over the dome of the lantern. I picked up only one specimen. Probably several Redstarts were in the same assemblage, but I identified only one beyond a doubt. None of the above-named species appeared near the lantern until about 11.15 p.m.—that is to say, just as the sky became well overcast, and the wind dropped from a moderate to a gentle breeze. The direction of the wind throughout the night was west, and drizzling rain began to fall at 1 a.m.: such was the state of the weather till dawn. The birds continued to fly round the lantern until the first indication of daybreak appeared in the east. Having carefully compared the strange Lark with thirty-nine Common Sky-Larks, I measured, weighed, and skinned them all without delay. I left the Tuskar Light-Station on Saturday, October 7th, 1911, and visited Mr. Ussher at Dungarvan. On examining the bird he seemed definite in his opinion that it was other than a Common Sky-Lark. On October 17th, 1911, we re-examined the bird at the British Museum in the presence of other ornithologists. The general opinion was that the bird was either the Mediterranean or Asiatic form. Personally I thought it resembled the Mediterranean form, and so provisionally called it *Alauda cantarella*. In the ensuing March, *i. e.* 1912, I published a paper in the 'Irish Naturalist,'* recording the occurrence of this specimen. Two criticisms followed regarding the validity of the species. One appeared in the next issue (April) of the 'Irish Naturalist,' written by Mr. Barrington, who stated that he "should hesitate to include this form [that is, the Mediterranean Sky-Lark] in the Irish List, as it [my bird] may be only a pale specimen of the Common Sky-Lark."† With such a suggestion I could not agree, especially as there were other distinctive characters besides shades of plumage, which strongly suggested that the bird was not a Common Sky-Lark. In a subsequent issue of the 'Irish Naturalist'‡ I replied to my critic in regard to these points.

* *Vide* 'Irish Naturalist,' vol. xxi. March, 1912, p. 50.

† *Ibid.*, vol. xxi. April, 1912, p. 84.

‡ *Ibid.*, vol. xxi. August, 1912, p. 156.

The second comment appeared in 'British Birds' a month later.* The writer, Mr. Witherby, said: "It would seem more likely that the Sky-Lark is an example of *A. a. cinerea*, the Eastern form, which has been taken at Fair Islet [February 24th, 1906], than the very similar South European form, *A. a. cantarella*." I take it that as Mr. Witherby had not seen my specimen before he wrote, it was mainly because the Eastern form had already been recorded from the British Isles he favoured the view that my bird was another example of the same species which had pursued a westward route. On June 9th, 1912, I showed him the bird, and he expressed the opinion that if compared with a good series of skins the bird would probably turn out to be a genuine example of *A. a. cinerea*. On November 8th, 1912, Mr. Eagle Clarke examined the specimen, and pronounced it to be a strange species. Careful comparison was made with all the specimens in the Royal Scottish Museum, and before finally deciding that it was *A. a. cinerea* Mr. Eagle Clarke proposed to take the bird to Tring Museum, in order there to compare it with the unrivalled wealth of appropriate material. On January 23rd, 1913, the bird was taken to Tring, and after an exhaustive examination, most kindly conducted by Dr. Hartert and Mr. Clarke, my bird was most nearly matched by the Asiatic Sky-Lark. Since obtaining this bird I have been interested to learn that Mr. Barrington has brought to light from his collection a specimen of *A. a. cinerea*, which was killed striking at the Old Head of Kinsale, Co. Cork, on October 7th, 1910, and which had remained unidentified for more than two years.† These two Irish specimens, captured as they were in the consecutive seasons of 1910 and 1911, and almost at the same time in October, are highly interesting. But until further data are forthcoming we are hardly in a position even to suggest that the Siberian Sky-Lark, as a rule, spreads far westward over Europe during its autumn migration. For the only other British and, at the same time, European specimen is that taken at the lantern of the Flannan

* *Vide* 'British Birds,' vol. v. May, 1912, p. 240, in note on "Reed-Warblers in Ireland."

† Fair Isle appears to be a mistake; it should read Flannan Isles.

‡ *Vide* "Siberian Sky-Lark in Co. Cork," 'Irish Naturalist,' vol. xxii. January, 1913, p. 20; also *vide* "Eastern Sky-Lark in Ireland," 'British Birds,' vol. vi. January, 1913, p. 254.

Islands Lighthouse on February 24th, 1906.* Concerning this bird, Mr. Eagle Clarke writes:—"This form was described by Ehmcke in the 'Journ. für Ornithologie' in 1903 (p. 149) as *Alauda cinerea*, and is the *Alauda arvensis cinerea* of Dr. Hartert's 'Vogel der Palaarktischen Fauna' (p. 247). This capture well illustrates the advantage that accrues from a knowledge of racial forms, since it enables us to determine the areas whence came this remarkable grey Sky-Lark to our shores. It has not hitherto been detected in Europe, except in the far east, but according to Dr. Hartert it has its home in Western Siberia, Turkestan, Persia, and possibly in Palestine, and in winter is found on the northern side of the Caucasus, Egypt, Tunis, and Algeria."

The following particulars relate to the Asiatic Sky-Lark which I found at the Tuskar Light-Station:—Length, 17·3 cm. Wing, 10·1 cm. Tail, 7 cm. Foot, 2·4 cm. Spur, 1·4 cm. Culmen, 8 mm. Weight, 1 oz. 3 drams. Condition, very good, much fat under skin. Gizzard empty. Plumage good; moult finished. Sex, male. Age, immature. Injury, fracture of the roof of the right orbit, and of the right parietal and right occipital regions of the skull. Such injuries were more than likely sustained as the bird came with great force against the lantern-glass.

N.B.—The measurements fairly represent the average found in the Common Sky-Lark, but the weight in this Asiatic bird is on the whole proportionately greater. Its remarkably fat condition is noteworthy, that is, if we are to correlate such with a lengthened and continuous journey already performed before reaching Ireland. I have noticed how very fat and in what excellent condition are many birds taken on migration. Such condition must mean a special adaptative or physiological state acquired to sustain the voyagers when, unable to secure food, they are pressed with the pangs of hunger. If, in conjunction with this factor, we consider the wonderful endurance and wing-power in birds, we can better understand how it is that they, affecting a very protracted migration, often reach their destination in a decidedly vigorous condition.

* "Some Rare Birds from Scottish Stations," Eagle Clarke, 'Annals of Scottish Natural History,' 1906, p. 139.

THE FIRST RELIABLE ACCOUNT OF THE ORANG-UTAN (*SIMIA SATYRUS*, L.).

BY J. C. MOULTON, F.Z.S., Curator of the Sarawak Museum.

IN 'Evidence as to Man's Place in Nature' Prof. Huxley gives a most interesting account of the natural history of Man-like Apes, tracing the growth of our knowledge of them from earliest records to 1863 (the year in which that book appeared).

He writes that he has not met with any notice of these Man-like Apes of earlier date than that contained in Pigafetta's 'Regnum Congo' (1558); in this, however, there is only a brief note, and Huxley tells us that it is not till the publication of Purchas's book in 1613 that we find the first account of two Man-like Apes, written down by Purchas from the narrative of one Andrew Battell, who spent many years in the Congo. He called the larger kind the "Pongo," which is now known to us as the Gorilla, the largest of the Man-like Apes, and the smaller the "Engeco," now known as the Chimpanzee. Andrew Battell therefore has the credit of being the "discoverer" (in the European sense) of the Gorilla and Chimpanzee.

Bontius apparently is one of the first to give an account of an Orang-Utan (1658); but Huxley styles it as "altogether fabulous and ridiculous," and says the picture given is "nothing but a very hairy woman of rather comely aspect, and proportions and feet wholly human."

Vosmaer would appear to be the first to give a careful account of a young Orang-Utan (1778), and a year or two after we get a full description of an adult shot near Pontianak by a Mr. Palm, a Dutch resident in Borneo. This animal was examined by a German naturalist, Von Wurmb, who published a careful description in Batavia. And although Huxley does not expressly say so, we are led to infer that Vosmaer, Palm, and Von Wurmb share the honour of being the first to tell us about the Orang-Utan, and that only some 130 years ago.

In view of this, I thought the following much older account might be of some interest to zoologists. It is taken from an old book entitled 'A Voyage To and From the Island of Borneo in the East Indies,'* by Captain Daniel BEECKMAN, published in London in 1718. The author was sent out by the Honourable East India Company to try and reopen trade at Banjermassin, in South-east Borneo, where the first British Settlement in Borneo had failed so ignominiously eleven years before (1702). Captain BEECKMAN left London in October, 1713—just 200 years ago—and reached Banjermassin at the end of the following June. After six months passed in successful trading he returned *viâ* the Bali Straits, the Cape, St. Helena, and Ascension, reaching England again in October, 1715. Space forbids mention of the hardships and adventures encountered on the voyages out and back, but the reader may be sure that they provided incidents of more moment than one is likely to meet in the month's run out to or from the East nowadays.

In describing the leading natural history features of Banjer-massin he mentions the Orang-Utan, and gives the following description, which I venture to put forward as "the first reliable account of the Orang-Utan":—

"The Monkeys, Apes, and Baboons are of many different Sorts and Shapes; but the most remarkable are those they call Orang-ootans, which in their Language signifies Men of the Woods: These grow up to be six Foot high; they walk upright, have longer Arms than Men, tolerable good Faces (handsomer I am sure than some Hottentots that I have seen), large Teeth, no Tails nor Hair, but on those Parts where it grows on humane Bodies; they are very nimble footed and mighty strong; they throw great Stones, Sticks, and Billets at those Persons that

* The full title of the book continues thus:—"With a Description of the said Island: Giving an Account of the Inhabitants, their Manners, Customs, Religion, Product, chief Ports, and Trade, together with the Re-establishment of the English Trade there, An. 1714, after our Factory had been destroyed by the Banjareens some years before. Also a Description of the Islands of Canary, Cape Verd, Java, Mandura; of the Streights of Bally, the Cape of Good Hope, the Hottentots, the Island of St. Helena, Ascension, etc. With some Remarks and Directions touching Trade, etc. The whole very pleasant and very useful to such as shall have occasion to go into those Parts."

offend them. The Natives do really believe that these were formerly Men, but Metamorphosed into Beasts for their Blasphemy. They told me many strange Stories of them, too tedious to be inserted here. I bought one out of curiosity, for six Spanish Dollars; it lived with me seven Months, but then died of a Flux; he was too young to show me many Pranks, therefore I shall only tell you that he was a great Thief, and loved strong Liquors: for if our Backs were turned, he would be at the Punch-bowl, and very often would open the Brandy Case, take out a Bottle, drink plentifully, and put it very carefully into its place again. He slept lying along in a humane Posture with one Hand under his Head. He could not swim, but I know not whether he might not be capable of being taught. If at any time I was angry with him, he would sigh, sob, and cry, till he found that I was reconled (*sic* ? reconciled) to him; and tho' he was but about twelve Months old when he died, yet he was stronger than any Man in the Ship."

Accompanying this account is a most unnatural picture of a muscular, naked man with a very large mouth and a well-drawn thumb in place of his big toe. There is no mention of the artist, and one must suppose that it was drawn in England from the author's written or verbal description. Besides this picture, there are one or two passages in the above account which may well make the reader question the correctness of my title, "*reliable* account." For instance, no Orang-Utan reaches six feet in height; Wallace gives 4 ft. 2 in. as the most. The Orang-Utan does not walk upright, although of course they can and do stand upright when occasion demands. "Tolerable good Faces" I think must be taken as an indication of the change in our ideas of beauty since the days of our great-grandfathers, two hundred years ago, for I doubt if any visitor to the Zoo would be inclined to prefer the facial beauty of the Orangs there to that of members of his own species. The statements that they are without hair, "but on those Parts where it grows on humane Bodies," and that "they are very nimble footed," are difficult to account for if we are to believe any of the author's description. The Orang-Utan, as everyone knows, has a coat of coarse reddish hair (though not on his face, and often only thinly on head and abdomen), and his movements are

remarkably sluggish and deliberate, in marked contrast to the lively activity of other Monkeys.

However, to dispel these doubts and to justify the claim to reliability, let me quote our author's opening remarks, entitled :—

“TO THE READER.

“It is a common saying, and indeed generally proves true, *That Old Men and Travellers do give themselves great Liberty in relating fictitious and improbable Stories.* The Distance of Time being as great a Protection to the former as that of Place is to the latter: But I can assure my Reader, that the case is otherwise here; for I made it my Study to adhere, as much as possible could be, to Truth, especially in those things which fell within the pale of my own Knowledge, having always made it my Maxim to have a greater regard to Utility than Pleasure. As to what I had by Hear-say from the Natives, I neither have inserted the Hundredth part of what they told me, neither do I much insist on the Truth of what I have inserted, though more probable than what I omitted; but do leave it to the Reader's choice to believe or reject as he shall think fit.”

And here I, too, must leave it to the reader's choice to regard or not, “as he shall think fit,” the Englishman, Captain Daniel Beekman, as the first to describe the Orang-Utan.

STUDIES IN GARDEN ANNELIDS: THE BOTANIC
GARDENS, OXFORD.

BY THE REV. HILDERIC FRIEND, F.R.M.S.

DURING recent years quite a number of new worms have been described by me in these columns. The articles, however, have usually been confined to a somewhat systematic account of individuals or their distribution, and hitherto little has been done to show what Annelids may be found in gardens as a whole. It is proposed, therefore, to study the subject of garden worms from a new standpoint, and give an account of the principal forms to be met with in some of the best known gardens in the country. Having recently paid special visits to Leicestershire, Notts, Oxfordshire, Sussex, Ireland, and other places for the study of Annelid Economics and Bionomics, I have been able, by aid of a Government Grant, to add greatly to our knowledge of this important subject in relation to agriculture and horticulture, and I am anxious that gardeners in particular should know a little about a theme which has been far too little studied. Perhaps I cannot do better than begin with an account of some of the Annelids to be found in the Botanic Gardens at Oxford. It is many years since my attention was first directed to this interesting spot, as was shown in 'The Zoologist' (*ante*, pp. 70-1). It is nearly ten years since I gave, in the 'Gardener's Chronicle,' an account of some of these creatures (March 12th, 1904), while in a later issue (Nov. 27th, 1909) a worm new to science was described from these gardens. They were revisited during the month of April last, and the study was extended to the Whiteworms, or Enchytræids, and the Waterworms. Up till that date fifteen species of *Lumbricidæ* had been recorded, but nothing was known of the two other families. We are still in total ignorance of the Oxford *Naididæ*, *Lumbriculidæ*, and other families, but these are not of general interest to gardeners.

Let us begin with those species which are most familiar—the species of true *Lumbricus*—of which four are found in England and a fifth in Ireland. They are known by their ruddy-brown colour, the girdle extending over six segments, with a band on the under surface of the inner four, and by the shape of the head. Three of these, all common, have been found in Oxford Gardens—the true Earthworm (*L. terrestris*), the Red Worm (*L. rubellus*), and the Purple Worm (*L. castaneus*). The genus *Allolobophora* is a large one, and has of recent years been divided into several subgenera. We find here the Long Worm (*A. longa*), which was formerly always confused with the true Earthworm; the Turgid Worm (*A. turgida*), with papillæ on segments 31 and 33; and the Brandling (*Eisenia fætida*), which is always to be found in manure-heaps, is known by its alternate brown and yellow stripes, and is greatly in request among anglers. Its near relative, the Rosy or Mucous Worm (*E. rosea*), is also present, with the very common Green Worm (*A. chlorotica*), which is very sluggish, and gives off, like the Brandling, a large quantity of turbid fluid when irritated.

All the foregoing are to be found universally distributed in this country, and are invariably of value to the gardener. Possibly an exception might at times be made in reference to the Green Worm, which has been accused of damaging crops, but I believe it has never been shown to injure plants until they showed signs of unhealthiness or decay. Among the less frequent forms, I found at Oxford the pretty Celtic Worm (*Dendrobæna mammalis*) in fair numbers. It is not so much a denizen of the garden as of the rough places which are usually to be found on the outskirts, where rubbish, old potting material, refuse of various kinds, road-scrapings, and other forms of *débris* accumulate. It is not so common as the Gilt-tail (*D. sub-rubicunda*), which is usually very profuse in old leaf-mould, and is a very valuable aid to the gardener. The Oxford Gardens have yielded me, in addition to the above, several other *Lumbricidæ* more or less rare. There are, for example, two steel-blue worms with yellow tails and clay-coloured girdles, known as *Octolasion*. One of these (*O. cyaneum*) has the girdle on segments 29 to 34, while the other (*O. lacteum*) has it one segment further back. Related to these is another species (*O. inter-*

medium), which seems never to have been found elsewhere. It is the creature described in the 'Gardener's Chronicle' of November, 1909. The same applies to the variety (*tepidaria*) described in March, 1904, though several other forms have been found elsewhere. In addition to the Square-tailed Worm (*Allurus*), I also found another which is a denizen of soft mud. It had never been found in Oxford before (*Helodrilus oculatus*), though I have recorded it for the Botanic Garden, Cambridge, and have found it of recent years in many parts of Great Britain. It is very useful where the soil is stiff, and can thrive in situations which all other worms eschew.

The foregoing is a pretty complete list of the *Lumbricidæ* so far as the Oxford Gardens go. Others would no doubt be added if I could be regularly supplied with specimens, or could personally visit the grounds at other seasons of the year. But now we come to other forms. It almost always happens that Botanic Gardens contain a variety of foreign or doubtful species, and in this respect Oxford is no exception. In the warm house where the Nymphæas are grown the Eastern worm, usually known as *Perichæta indica*, is not uncommon; in spite of the fact that Mr. Baker had recently had the old earth removed and the beds remade. Had the material so removed been examined by an expert, it would doubtless have yielded many valuable and interesting species, which it will now be for ever impossible to record. Along with *Perichæta* I found specimens of a very attenuated Annelid which has never been under observation before. Unfortunately, the specimens succumbed to the cold before I could examine them, and for the present the species and genus must remain undecided. It was not an indigenous worm, and seemed to me new to science. Its value lay in the ease with which it could force its way through the stiff loam.

All the foregoing are terrestrial. In the water and mud a number of aquatic Annelids are to be found. The *Tubificidæ* are slender, red-blooded creatures, which, by the movements of their tails, keep the water oxygenated, while they pass the mud through their intestines and pour it out in streams. Here I found *Branchiura* busy at work. It is an interesting discovery, having been first taken many years ago in the *Victoria regia* tank in Regent's Park, and described in 1892 by Beddard. Since

then it has been found at Kew, Hamburg, Dublin, and elsewhere, but Benham seems to have had no suspicion of its existence at Oxford, though he worked there for some years. Along with this interesting Annelid were at least three species of the allied genus *Limnodrilus*. One of these (*L. hoffmeisteri*) is pretty common in England. Two other species, however, are rare or unknown. This is not the place to enter into details, but it may be stated that one species is marked by its golden tail, the other by the mass of circular corpuscles which abound in the cœlom. The latter may be new to science.

Finally, attention must be paid to those important though little-known creatures, the White Worms, or Enchytræids. If Annelids are ever guilty of injuring living plants, it is upon this group that the chief blame must fall. The Enchytræids are a vast family, and in our English gardens there are an incredible number of species. They belong to many genera, such as *Enchytræus*, *Henlea*, *Buchholzia*, and *Fridericia*. Of the Henleas alone we have upwards of thirty British species, already described by myself, while the known Fridericias exceed that number, and still are by no means completely known. Belonging to the genus *Enchytræus* I found three species in the leaf-mould. Of these one at least (*E. parvulus* = *E. argenteus*) is with reason suspected of being very dangerous to flowering plants. The largest (*E. albidus*) is very common in well-rotted manure, and is doubtless beneficent, while the other (*E. minimus*) is, as its name implies, very minute, often not exceeding 2 to 3 mm.

Two species of *Henlea* occurred in April in the Gardens, but there is little doubt that the number would be greatly increased by a little systematic study. Finally, about half a dozen species of *Fridericia* were taken, and notes made of one or two other doubtful forms, which can only be determined when fresh material has been obtained. What is the net result? We have already on record for the Oxford Botanic Gardens some sixteen species of indigenous *Lunbricidæ*, a *Perichæta*, a foreign *Helodrilus* or its ally, four species of *Tubificidæ*, including *Branchiura*, and a dozen Enchytræids, making upwards of thirty different species of Oligochæts, nearly every one of which is of value to the gardener. This is the first attempt at such a study

in this country, and the results seem to justify a continuation of the work.

LIST OF THE OLIGOCHÆTS OF OXFORD BOTANIC GARDENS.

TUBIFICIDÆ.

1. *Branchiura sowerbyi*, Beddard. Abundant in lily pond.
2. *Limnodrilus hoffmeisteri*, Clapr.
3. *Limnodrilus* (two species not yet determined).

ENCHYTRÆIDÆ.

4. *Henlea rhætica*, Bretscher.
5. *H. inusitata*, Friend.
6. *Enchytræus albidus*, Henle.
7. *E. argenteus*, Mich. (= *E. parvulus*, Friend).
8. *E. minimus*, Bret.
9. *Fridericia bulbosa*, Rosa.
10. *F. perrieri*.
11. *Fridericia* (species not yet determined).
12. *Chamædrilus chlorophilus*, Friend (or ally).

MEGASCOLICIDÆ.

13. *Pheretima* (? *indica*). Perished before being identified.
14. Another foreign worm; also perished.

LUMBRICIDÆ.

15. *Helodrilus oculatus*, Hoffm.
16. *Eisenia rosea*.
17. *E. foetida*.
18. *E. veneta*, Rosa, var. *tepidaria*, Friend.
19. *Dendrobæna mammalis*.
20. *D. subrubicunda*.
21. *Allurus* (*Eiseniella*) *tetrædrus*.
22. *Allolobophora longa*, Ude.
23. *A. turgida*, Eisen.
24. *Aporrectodea chlorotica*.
25. *Octolasion intermedium*, Friend.
26. *O. cyaneum*.
27. *O. lacteum*.
28. *Lumbricus castaneus*, Sav.
29. *L. rubellus*, Hoffm.
30. *L. terrestris*, Linn.

NOTES AND QUERIES.

MAMMALIA.

Decrease of the Squirrel.—So far as my personal observations go, the decrease of the Squirrel (*ante*, p. 274)—at least, in the Midland Counties—is very general, and for what reason it is very difficult to conjecture. Their numbers used to be kept down on some estates, but this has ceased to be necessary nowadays, and with all the encouragement and preservation they receive at the hands of others their numbers have rapidly decreased. As a schoolboy in Bedfordshire (the county I know most intimately), some thirty years ago, Squirrel hunts were very much in vogue, and there was no difficulty in finding our quarry commonly in any of the larger spinneys and plantations and well-timbered parts of that county. From many of such localities it is now entirely absent, and comparatively rare in even the larger firwoods; so much so, it is often quite overlooked by the ordinary observer.—J. STEELE ELLIOTT (Dowles Manor, Salop).

AVES.

Grey Lag Geese in Cumberland.—The occurrence of *Anser cinereus* in any of the northern counties of England is always sufficiently rare at any season to make it worth putting on record, while it is quite unusual to find any kind of Wild Goose in the country during August. It was with no common interest, therefore, that on Sunday evening last (August 10th) I listened to the familiar gaggling of a party of Grey Lags passing overhead, about 11 p.m., two or three miles west of Alston, in North-west Cumberland. It was, of course, too dark to see anything of them at that hour, but the calling seemed to indicate that there might be at least half a dozen birds in the gaggle. The evening was absolutely calm, and their cries demonstrated that the birds were flying very high, travelling in a south-westerly direction, which would very shortly bring them over the Eden and Ulleswater valleys, where, according to the late Rev. H. A. Macpherson, the species once maintained a precarious footing. In 'The Birds of Northumberland and the Eastern Borders,' published just a year ago,

I gave one or two August records of Grey Lag Geese in that adjoining area, besides some other "summer" occurrences of "Grey Geese" whose identity was somewhat less well established, and one or two more old records of a similar nature might have been given from my journals; but it is not a little remarkable that Geese should be found sufficiently recovered from their autumn moult to undertake these long migrations so early in the season. That they have already moulted their flight-feathers is, of course, only assumed, but it seems improbable that they would venture to leave their summer quarters to run the risk of passing some weeks in the flightless condition in which the moult leaves them in any of their known winter resorts. Mr. Abel Chapman has observed that they do not usually arrive in Spain before November, though quitting their breeding haunts in Norway nearly two months previously, and asks rather pertinently where the bulk of them pass the intervening period ('Bird Life of the Borders,' 2nd ed. p. 350). I should like to ask whether there is any record of Geese having been seen anywhere, except at their breeding stations, unable to fly through the loss of their flight-feathers? In the days of less scientific ornithology, of not so very many years ago, the appearance of Wild Geese in this country, in August, would certainly have been put down as the forerunner of a severe and early winter. The real reason of their unusual visit in this case, I fear, must be assigned to their either not having bred at all, or to the early loss of their broods or nests. I was sorry to hear from a friend only a few days ago that during a visit to Ross-shire this summer he had been unable to see a single Grey Lag Goose in one of their ancient and best known breeding quarters.—GEORGE BOLAM.

The Turtle-Dove (*Turtur communis*) in the Border Counties.—In 'The Zoologist' for April last (*ante*, p. 121) there was a note of a nest of the Turtle-Dove having been found near Carlisle in June, 1912, which, it was then stated, was the first authenticated instance of the breeding of this species in Cumberland. Students of the county fauna would no doubt note this with reservations—mental or otherwise—but for the benefit of less well-informed readers, I was rather surprised that the statement was not afterwards qualified by reference to the fact that, in his 'Fauna of Lakeland' (p. 316), Mr. Macpherson had, so long ago as 1892, already referred to more than one nest in Cumberland—one of them at Scotby, near Carlisle, in 1885. Details of other occurrences will be found in his book, and need not be further referred to here, but, in view of the fact that the bird is yet

nowhere very well established in the North of England, the following may be worth putting upon record:—On August 26th of the present year I saw a single bird on the wing by the side of the Eden, near Langwathby, but was not near enough to it to be able to say whether it was adult or immature. Three days later an adult flew past a friend and myself close to Birdoswald, on the Irthing, while we were engaged in an examination of the Roman wall and its station there. The river here forms the boundary between Northumberland and Cumberland; Langwathby, it need hardly be added, is well within the latter county. On August 16th I saw a Turtle-Dove near Egglestone, in Teesdale, Co. Durham; and on July 13th, Mr. Abel Chapman told me that during the previous week an immature example had visited his garden at Houxy, on the North Tyne, Northumberland, the first he had seen there.—GEORGE BOLAM.

Notes on the Dabchick (*Podiceps fluviatilis*).—One of my daughters lives within a walk of this house, and has the rather unusual opportunity of watching Dabchicks from the windows which overlook the moat. This moat is a “protected area” for all wild life, with the one exception of the Brown Rat. A pair of Dabchicks have nested there twice this season, each brood consisting of two only. When watching the second brood I noticed that each parent took a chick in charge, and the two old birds kept some distance apart, continually diving and bringing up food for the young. One day I had a good view of a Dabchick walking on the soft ground close to the moat; the attitude was almost upright, and the bird seemed to walk without any difficulty. A Duck which visits the moat frequently was seen on one occasion to be fiercely pursued by one of the Dabchicks. — JULIAN G. TUCK (Tostock Rectory, Bury St. Edmunds).

Notes on Nest-Boxes.—There is nothing new to record in our nest-boxes this year, as they only attracted the usual tenants. Our list is:—Great Tit, Blue Tit (several of each), Coal Tit (one), Nut-hatch (one brood of six hatched out), Tree-Sparrow (many), Starling, Tawny Owl, and Stock-Dove. I did not go up to the Tawny Owl's nest till the young were hatched; there were only two, which got off safely. The birds used the same box which they occupied two years ago, in a yew tree near the house. On March 8th a Stock-Dove had two eggs in a box, and in this three pairs of young have since been reared, probably by the same parents. Redstarts and Wrynecks seem almost extinct here; I have not seen a nest of either for several years, though our garden-boy assures me that he heard the “Cuckoo-

leader" in a plantation near the house this spring.—JULIAN G. TUCK (Tostock Rectory, Bury St. Edmunds).

AMPHIBIA.

Scarcity of the Frog.—Have any readers of 'The Zoologist' noticed that the Frog is becoming a scarce animal in their parts of the country? It is so here. The other day my man was cutting a patch of rather long grass when a very fine one sprang out at our feet, and he remarked at once that he did not know when he had seen one last. Years ago the little cattle ponds were noisy in March, and the hay meadows were full of Frogs. But it is long since I have heard a good Frog concert about here, and you may go through a whole summer and hardly see a Frog. Toads, on the other hand, seem as common as ever. Why do Toads insist on coming into buildings? We have had two in the house lately (June)—one of them in the middle of the hall—and I found a third in the tool-house. One could understand their coming indoors when the weather was cold.—O. V. APLIN (Bloxham, Oxon).

INSECTA.

Notes on Butterflies.—Possibly, as an after-effect of the wet summer last year, and partly owing to the wet months of March and April this year, when rain to the amount of about eight inches fell on nearly forty days, butterflies up to the time of writing (July 1st) have been very scarce indeed, with the exception of some of the open-ground species, Meadow Browns, &c. The Brimstone is generally very common here in spring, but this year I have only seen one specimen, and that not until May 23rd. There were "many" on the wing on April 3rd the previous year. The ordinary hybernated Small Tortoiseshells have been few and far between, April 29th (the day of the great flood in the village) being, I think, the first day on which I saw as many as three or four. The same day I saw the only Peacock, so far. The Orange Tip, on the other hand, which appeared on April 29th (22nd last year), was fairly common for a short time. I noticed the Holly Blue in May both here and at Wroxton. Since writing the above we have had for the last fortnight a good many Large and Small Garden Whites, and a fair number of Small Tortoiseshells, but I have not yet (August 11th) seen a Red Admiral. I may also mention that I have not this season seen a single specimen of the Cinnabar Moth, an insect which is generally quite common in my garden.—O. V. APLIN (Bloxham, Oxon).

MOLLUSCA.

The "Flying Squid" (*Ommastrephes* sp.). — The Squids have been often recorded as leaping from the water on board ships. Bennett (1840), in his 'Narrative of a Whaling Voyage round the Globe' (vol. ii. p. 291), records an instance of one reaching the deck in lat. 34° N. My son William Distant, when travelling to West Africa on board the mail steamship 'Falaba' in the early part of last month (August), when in lat. 27° 43' N. and long. 15° 19' W., writes me that no fewer than about thirty specimens reached the deck, which they covered "with a black fluid"; a photograph of four examples which he sent me left no doubt as to their identity. They are gregarious, and are pursued by many enemies, such as Dolphins, Cachalots, Albacore, and the larger Petrels. But that thirty should reach the deck of a mail steamer is somewhat of a record.—W. L. DISTANT.

NOTICES OF NEW BOOKS.

A Naturalist in Cannibal Land. By A. S. MEEK. T. Fisher Unwin.

MR. MEEK has travelled widely in the Papuan regions as a collector of natural history specimens, almost entirely for birds and Lepidoptera. He is a true enthusiast in his work, dangers are the spice of his adventures, he is a most modest narrator of his own achievements and disclaims any scientific pretensions, his success in his own work has been signal. The Tring Museum is the storehouse of his collections and discoveries, as most readers of the 'Novitates Zoologicae' are aware, and in the owner of that Museum, the Hon. Walter Rothschild, he has found his Mæcenas and inspiring patron—in fact, we can almost trace cause and effect.

The book is a most attractive one for the naturalist, and especially for the lepidopterist. Mr. Meek has had great success with those giant and beautiful eastern butterflies generally known by the generic name of *Ornithoptera*, and has discovered some magnificent species and local races belonging to it. He has also

given some vivid descriptions of the remote and little known islands he has visited. But beyond this the book, without any anthropological pretence, is of the greatest value to students of the science of man. He describes the primitive peoples with whom he has sojourned at first hand, without the hamper of preconceived notions, and in simple recital makes us acquainted with many interesting and some important details of customs and belief. The photographic illustrations are of anthropological excellence, and one in particular, "The kiss, Papua," is important, for kissing is not a universal custom of mankind, and it is not everyone who knew it was followed in Papua. By-the-bye, Mr. Meek does not tell us either whether he took these portraits himself, or whence they were obtained.

Mr. Meek, who is apparently immune from the dangers of wild life in Papua, but was—as he states—recently nearly killed by a taxi-cab in London, is returning to the South Seas, "with another ten years at least to look forward to of collecting in wild country." May his forecast be assured, and may we also hope to read a new book on his return!

Hampstead Heath : its Geology and Natural History. Prepared under the Auspices of the Hampstead Scientific Society. T. Fisher Unwin.

THIS is a book with many contributors, and in such a case is naturally a little uneven. Geology is described by F. W. Rudler, and when we see that name it is at once apparent that his subject will be not only treated with absolute knowledge, but will also be written with lucidity. Needless to say, we are not disappointed, and, having been well introduced to the geological floor, we can turn to the living things above it. Three chapters are devoted to "Plant Life," a subject beyond the purview of 'The Zoologist,' Mr. Goodchild has undertaken "Bird Life," and Mr. Hugh Findon "Mammals, Fishes, and Reptiles," as well as "Molluscs." "Insect Life" is undertaken by Dr. F. O'Brien Ellison, and although some very interesting entomological information is given regarding special insects, the specific list at the end of his chapter refers only to Lepidoptera and Coleoptera, the latter especially being a very attenuated enumera-

tion. Mr. James Burton has written a chapter on "Pond Life." As an Appendix, is given "A Select List of Books," which is really a very judicious compilation, and there are some very attractive illustrations.

This book is a very excellent introduction to the natural history of Hampstead Heath, a locality better known as a holiday resort by the public, and for many reminiscences by literary men, than as a classic ground by naturalists. May this volume create a new interest, and its readers may possibly be able by intelligent exertion to add to the lists of plants and animals—especially the less developed animals—which its pages contain.

EDITORIAL GLEANINGS.

THE following is an extract from the recently published report of the Warden of the Transvaal Game Reserves, Major Stevenson-Hamilton:—

"But for Government action there would now have been nothing left in all the low country, especially in view of the introduction and general use of repeating weapons, and the facilities of travel now available. Elands have been absolutely exterminated; elephants had been all killed or driven out of the country; the white and nearly all the black rhinoceros had vanished; the buffalo had disappeared before the rinderpest came from everywhere excepting the Sabi Bush and a small patch near the Olifants River; roan antelope were on the very verge of extinction; the days of the giraffe were numbered; the hippos, in spite of recruiting from Portuguese territory, were rapidly disappearing. The last survivors of the once magnificent Transvaal fauna had in fact been rounded up into one little strip near the foot of the Lebombo Hills, the hunters were closing in on them from all sides, and the last act in the drama was about to commence. Small-bore rifles and swarms of hunters would quickly have accounted for the last representatives of the last species remaining. Before the Reserves were inaugurated, the animals had to face not only the biltong and other hunting by white men all the winter, but the almost equally destructive agency of hordes of

natives armed with guns, and coming from both the Transvaal and Portuguese territory during all the long months when the withdrawal of all Europeans from the hunting grounds gave them the field to themselves.”

The following extracts are taken from the Annual Report by the Police Committee of the Commissioners of the River Tweed:—

“SHOOTING OF CORMORANTS.—The Committee have received a very interesting report from Mr. R. Herbert Dodds on the shooting of Cormorants in the lower reaches. The number of these destructive birds shot and delivered was 125, as compared with 53 last year, and it is evident that they are gradually finding their way higher up the river, as one of the cormorants killed was shot at Kelso Mill, a few hundred yards above Kelso Bridge, near the junction of Tweed and Teviot, while another was got at Sprouston, and two at Carham. Two were reported as far inland as Innerleithen, but were not secured, and one was shot on the Whitadder. Mr. Dodds reports, as the heaviest bird taken, one shot on January 20th at Gainslaw. It weighed $10\frac{1}{2}$ lb., and was found to contain in its gullet a sea trout kelt of $1\frac{3}{4}$ lb., leaving the net weight of the bird $8\frac{3}{4}$ lb. Mr. Dodds believes the weight to be a record one for the species. Other cormorants killed and cut open also contained trout and small fry. It may be mentioned that the killing of cormorants at sea has not been encouraged, as it was for birds frequenting the river itself that a reward was primarily offered. At the same time the Committee feel that far the most effective way in which to reduce the number of cormorants to a reasonable limit would be by destroying the eggs of the birds at their nearest nesting haunts. The Committee are renewing their request that the eggs of cormorants should be destroyed at the Farne Islands.

“REDUCING THE NUMBER OF COARSE FISH.—A determined effort has been made during the present summer to reduce the number of grayling and other coarse fish in the river. The operations were placed by the sub-committee in charge of the matter in the hands of Mr. Smith, the superintendent of the River Tweed Police, by whom a crew of water bailiffs, accustomed to the use of the net, was formed; and, with the ready consent and co-operation of the proprietors of the various waters fished, this crew has netted the Tweed for grayling from Ashiestiel, in Selkirkshire, to Horncliffe, near Norham, and its tributary, the Teviot, from Monteviot to Roxburgh Castle. Operations were begun on April 7th, and concluded on August 9th.

The number of days on which fishing took place was 162, and there were 1672 shots of the net. The number of coarse fish taken out and destroyed was as follows:—Grayling, 5791; roach, 1436; perch, 234; pike, 42; gudgeon, 585; eels, 78—total, 8166. There were also caught by the net during operations 23 salmon, 5 grilse, 54 sea trout, and 3280 fresh water trout, which were carefully returned to the river. The largest catch of grayling was at Monteviot, where 1186 were taken, Birgham being next with 970. Roach and gudgeon were entirely confined to the waters below Cornhill, with the exception of 2 roach secured at Monteviot and Roxburgh Castle on the Teviot. Perch were mainly in the lower waters, though 54 were taken at Hendersyde. Pike were mainly in the higher reaches netted, while eels were taken nearly all over. Most of the salmon were netted in the upper waters, while brown trout were taken everywhere. Many of the fish destroyed were opened, but pike and perch were the only fish in whose stomachs anything was found. One pike contained two yellow trout (six and nine inches) and five small fish so far digested that they could not be identified. Another had three smolts, and a third two yellow trout about eight inches each. Twelve of the perch had small fry in their stomachs.”—(‘The Scotsman,’ August 30th, 1913.)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF
SCIENCE, BIRMINGHAM, 1913.

ADDRESS TO THE ZOOLOGICAL SECTION.

BY H. F. GADOW, M.A., PH.D., F.R.S., *President of the Section.*

“ ADDRESS your audience about what you yourself happen to be most interested in, speak from the fullness of your heart, and make a clean breast of your troubles.” That seemed good advice, and I shall endeavour to follow it, taking for my text old and new aims and methods of morphology, with special reference to resemblances in function and structure on the part of organs and their owners in the animal kingdom. First, however, allow me to tell you what has brought me to such a well-worn theme. Amongst the many impressions which it has been my good luck to gather during my travels in that enchanting country Mexico are the two following :—

First, the poisonous Coral snakes, *Elaps*, in their beautiful black, red, and yellow garb; it varies in detail in the various species of *Elaps*, and this garb, with most of the variations too, occurs also in an astonishing number of genera and families of semi-poisonous and quite harmless Mexican snakes, some of which inhabit the same districts. A somewhat exhaustive study of these beauties has shown incontestably that these often astoundingly close resemblances are not cases of mimicry, but due to some other co-operations.

Secondly, in the wilds of the State of Michoacan, at two places, about twenty and seventy miles from the Pacific Coast, I myself collected specimens of *Typhlops* which Dr. Boulenger without hesitation has determined as *Typhlops braminus*. Now, whilst this genus of wormlike, blind little snakes has a wide circumtropical distribution, *T. braminus* had hitherto been known only from the islands and countries of the Indian Ocean basin, never from America, nor from any of the Pacific Islands which possess other kinds of *Typhlops*. Accidental introduction is out of the question. Although the genus is, to judge from its characters, an especially old one, we cannot possibly assume that the species *braminus*, if the little thing had made its way from Asia to Mexico by a natural mode of spreading, has remained unaltered even to the slightest detail since that geological epoch during which such a journey could have taken place. There remains the assumption that amongst the of course countless generations of *Typhlops* in Mexico some have hit off exactly the same kind of permutation and combination of those characters which we have hitherto considered as specific of *braminus*, just as a pack of cards may in a long series of deals be dealt out more than once in the same sequence.

The two cases are impressive. They reminded me vividly that many examples of very discontinuous distribution—which anyone

who has worked at zoogeography will call to mind—are exhibited by genera, families, and even orders, without our knowing whether the groups in which we class them are natural or artificial. The ultimate appeal lies with anatomy.

Introduced to Zoology when Haeckel and Gegenbaur were both at their zenith, I have been long enough a worker and teacher to feel elated by its progress and depressed by its shortcomings and failures. Perhaps we have gone too fast, carried along by methods which have yielded so much, and therefore have made us expect too much from them.

Gegenbaur founded the modern comparative anatomy by basing it upon the theory of descent. The leading idea in all his great works is to show that Transformation, "continuous adjustment" (Spencer), has taken place; he stated the problem of comparative anatomy as the reduction of the differences in the organization of the various animals to a common condition; and as homologous organs he defined those which are of such a common, single origin. His first work in this new line is his classical treatise on the *Carpus* and *Tarsus* (1864).

It followed from this point of view that the degree of resemblance in structure between homologous organs and the number of such kindred organs present is a measure for the affinity of their owners. So was ushered in the era of pedigrees of organs, of functions, of the animals themselves. The tracing of the divergence of homogenous parts became all-important, whilst those organs or features which revealed themselves as of different origin, and therefore as analogous only, were discarded as misleading in the all-important search for pedigrees. Functional correspondence was dismissed as "mere analogy," and even the systematist has learnt to scorn these so-called physiological or adaptive characters as good enough only for artificial keys. A curious view of things, just as if it was not one and the same process which has produced and abolished both sets of characters, the so-called fundamental or "reliable" as well as the analogous.

As A. Willey has put it happily, there was more rejoicing over the discovery of the homology of some unimportant little organ than over the finding of the most appalling unrelated resemblance. Morphology had become somewhat intolerant in the application of its canons, especially since it was aided by the phenomenal growth of Embryology. You must not compare ectodermal with endodermal products. You must not make a likeness out of another germinal layer or anything that appertains to it, because if you do that would be a horror, a heresy, a homoplasy.

Haeckel went so far as to distinguish between a true Homology, or Homophyly, which depends upon the same origin, and a false Homology, which applies to all those organic resemblances which derive from an equivalent adaptation to similar developmental conditions. And he stated that the whole art of the morphologist consists in the successful distinction between these two categories. If we were able to draw this distinction in every case, possibly some

day the grand tree of each great phylum, maybe of the whole kingdom, might be reconstructed. That would indeed be a tree of knowledge, and, paradoxically enough, it would be the deathblow to classification, since in this, the one and only true natural system, every degree of consanguinity and relationship throughout all animated nature, past and present, would be accounted for; and to that system no classification would be applicable, since each horizon would require its own grouping. There could be definable neither classes, orders, families, nor species, since each of these conceptions would be boundless in an upward or downward direction.

Never mind the ensuing chaos; we should at least have the pedigree of all our fellow creatures, and of ourselves among them. Not absolute proof, but the nearest possible demonstration that transformation has taken place. Empirically we know this already, since, wherever sufficient material has been studied, be it organs, species, or larger groups, we find first that these units had ancestors, and, secondly, that the ancestors were a little different. Evolution is a fact of experience proved by circumstantial evidence. Nevertheless, we are not satisfied with the conviction that life is subject to an unceasing change, not even with the knowledge of the particular adjustments. We now want to understand the motive change. First What, then How, and now Why?

It is the active search for an answer to this question (Why?) which is characteristic of our time. More and more the organisms and their organs are considered as living, functional things. The mainspring of our science, perhaps of all science, is not its utility, not the desire to do good, but, as an eminently matter-of-fact man, the father of Frederick the Great, told his Royal Academicians (who, of course, were asking for monetary help) in the following shockingly homely words: "Der Grund ist derer Leute ihre verfluchte Curieuseitit." This blamed curiosity, the beginnings of which can be traced very far back in the lower animals, is most acutely centred in our desire to find out who we are, whence we have come, and whither we shall go. And even if Zoology, considering the first and last of these three questions as settled, should some day solve the problem: Whence have we come? there would remain outside Zoology the greater Why?

Generalizations, conclusions, can be arrived at only through comparison. Comparison leads no further where the objects are alike. If, for instance, we restrict ourselves to the search for true homologies, dealing with homogenes only, all we find is that once upon a time some organism has produced, invented, a certain arrangement of *Anlage* out of which that organ arose, the various features of which we have compared in the descendants. Result: we have arrived at an accomplished fact. These things, in spite of all their variety in structure and function, being homogenes, tell us nothing, because according to our mode of procedure we cannot compare that monophyletic *Anlage* with anything else, since we have reduced all the homogenous modifications to one. Logically, it is true that there can have been only one, but in the living world of nature there are

no such iron-bound categories and absolute distinctions. For instance, if we compare the organs of one and the same individual, we at once observe repetition, *e.g.* that of serial homology, which implies many difficulties, with very different interpretations. Even in such an apparently simple case as the relation between shoulder girdle and pelvis we are at a loss, since the decision depends upon our view as to the origin of the paired limbs, whether both are modified visceral arches, and in this case serially repeated homogenes, or whether they are the derivatives from one lateral fin, which is itself a serial compound, from which, however, the proximal elements, the girdles, are supposed to have arisen independently. What is metamerism? Is it the outcome of a process of successive repetitions so that the units are homogenes, or did the division take place at one time all along the line, or is it due to a combination of the two procedures?

The same vagueness finds its parallel when dealing with the corresponding organs of different animals, since these afford the absolute chance that organs of the same structure and function may not be reducible to one germ, but may be shown to have arisen independently in time as well as with reference to the space they occupy in their owners. As heterogenes they can be compared as to their causes. In the study of the evolution of homogenes the problem is to account for their divergencies, whilst the likeness, the agreements, so to speak, their greatest common measure, is *eo ipso* taken to be due to inheritance. When, on the contrary, dealing with heterogenes we are attracted by their resemblances, which, since they cannot be due to inheritance, must have a common cause outside themselves. Now, since a leading feature of the evolution of homogenes is divergence, whilst that of heterogenes implies convergence from different starting-points, it follows that the more distant are these respective starting-points (either in time or in the material) the better is our chance of extracting the greatest common measure out of the unknown number of causes which combine in the production of even the apparently simplest organ.

These resemblances are a very promising field and the balance of importance will more and more incline towards the investigation of Function, a study which, however, does not mean mere physiology with its present-day aims in the now tacitly accepted sense, but that broad study of life and death which is to yield the answer to the question Why?

Meantime, comparative anatomy will not be shelved; it will always retain the casting-vote as to the degree of affinity among resemblances, but emphatically its whole work is not to be restricted to this occupation. It will increasingly have to reckon with the functions, indeed, never without them. The animal refuses to yield its secrets unless it be considered as a living individual. It is true that Gegenbaur himself was most emphatic in asserting that an organ is the result of its function. Often he held up to scorn the embryographer's method of muddling cause and effect, or he mercilessly showed that in the reconstruction of the evolution of an organ certain features cannot have been phases unless they imply physio-

logical continuity. And yet how moderately is function dealt with in his monumental text-book and how little is there in others, even in text-books of Zoology!

Habt alle die Theile in der Hand,
Fehlt leider nur das geistige Band—Life!

We have become accustomed to the fact that like begets like with small differences, and from the accepted standpoint of evolution versus creation we no longer wonder that descendants slowly change and diverge. But we are rightly impressed when unlike comes to produce like, since this phenomenon seems to indicate a tendency, a set purpose, a *beau idéal*, which line of thought or rather imperfect way of expression leads dangerously near to the crassest teleology.

But, teleology apart, we can postulate a perfect agreement in function and structure between creatures which have no community of descent. The notion that such agreement *must* be due to blood-relationship involved, among other difficulties, the dangerous conclusion that the hypothetical ancestor of a given genuine group possessed in potentiality the *Anlagen* of all the characters exhibited by one or other of the component members of the said group.

The same line of thought explained the majority of human abnormalities as atavistic, a procedure which would turn the revered ancestor of our species into a perfect museum of antiquities, stocked with tools for every possible emergency.

The more elaborate certain resemblances are the more they seem to bear the hall-mark of near affinity of their owners. When occurring in far-related groups they are taken at least as indications of the homology of the organs. There is, for instance, a remarkable resemblance between the *bulla* of the whale's ear and that of the *Pythonomorph Plioplatycarpus*. If you homologise the mammalian tympanic with the quadrate the resemblance loses much of its perplexity, and certain Chelonians make it easier to understand how the modification may have been brought about. But, although we can arrange the Chelonian, Pythonomorph, and Cetacean conditions in a progressive line, this need not represent the pedigree of this *bulla*. Nor is it necessarily referable to the same *Anlage*. Lastly, if, as many anatomists believe, the reptilian quadrate appears in the mammals as the *incus*, then all homology and homogeny of these *bulla* is excluded. In either case we stand before the problem of the formation of a *bulla* as such. The significant point is this, that although we dismiss the *bulla* of whale and reptile as obvious homoplasy, such resemblances, if they occur in two orders of reptiles, we take as indicative of relationship until positive evidence to the contrary is produced. That this is an unsound method is brought home to us by an ever-increasing number of cases which tend to throw suspicion on many of our reconstructions. Not a few zoologists look upon such cases as a nuisance and the underlying principle as a bugbear. So far from that being the case, such study promises much beyond the pruning of our standard trees—by relieving them of what reveal themselves as grafts instead of genuine growth—

namely, the revelation of one or other of the many agencies in their growth and structure.

Since there are all sorts and conditions of resemblances we require technical terms. Of these there is abundance, and it is with reluctance that I propose adding to them. I do so because unfortunately some terms are undefined, perhaps not definable; others have not 'caught on,' or they suffer from that mischievous law of priority in nomenclature.

The terms concerning morphological homologies date from Owen; Gegenbaur and Haeckel re-arranged them slightly. Lankester, in 1870, introduced the terms homogenous, meaning alike born, and homoplastic or alike moulded. Mivart rightly found fault with the detailed definition and the subdivisions of Homoplasia, and very logically invented dozens of new terms, few of which, if any, have survived. It is not necessary to survey the ensuing literature. For expressing the same phenomenon we have now the choice between Homoplasia, Homomorphy, Isomorphy, Heterophyletic Convergence, Parallelism, &c. After various papers by Osborn, who has gone very fully into these questions, and Willey's 'Parallelism,' Abel, in his fascinating 'Grundzüge der Paläobiologie,' has striven to show by numerous examples that the resemblances or 'adaptive formations' are cases of parallelism if they depend upon the same function of homologous organs, and convergences if brought about by the same function of non-homologous organs.

I suggest an elastic terminology for the various resemblances indicative of the degree of homology of the respective organs, the degree of affinity of their owners, and lastly the degree of the structural likeness attained,

Homogeny.—The structural feature is invented once and is transmitted, without a break, to the descendants, in which it remains unaltered, or it changes by mutation or by divergence, neither of which changes can bring the ultimate results nearer to each other. Nor can their owners become more like each other, since the respective character made its first appearance either in one individual, or, more probably, in many of one and the same homogenous community.

Homoplasia.—The feature or character is invented more than once, and independently. This phenomenon excludes absolute identity; it implies some unlikeness due to some difference in the material, and there is further the chance of the two or more inventions, and therefore also of their owners, becoming more like each other than they were before.

(To be continued.)

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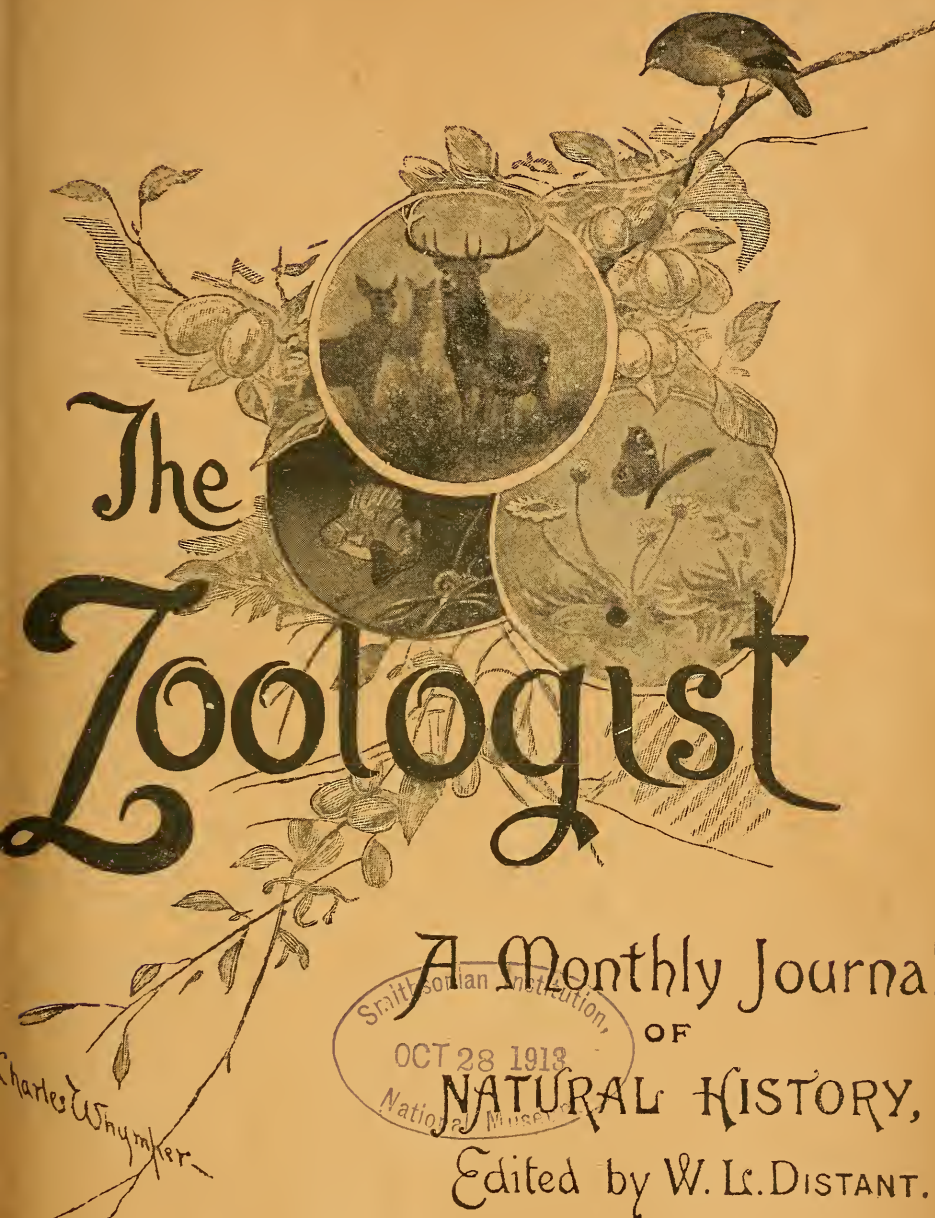
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THE ZOOLOGIST

No. 868.—October 15th, 1913.

SOME MISCELLANEOUS NOTES FROM GREAT YARMOUTH (1913).

BY ARTHUR H. PATTERSON.

IN entering notes into my logbook (a practice I have kept up since 1878), I have made it a constant habit to stand sponsor to only those that chronicle my own observations, with a careful overhauling of the few outside records admitted from other sources. I am confident that many rare and entertaining incidents are lost among gunners, fisherfolk, and those who see or handle creatures living or dead; and "more's the pity." My own opportunities for field work are somewhat restricted, and not every ramble in this over-drained, over-built, over-populated locality yields matter for delight and recording.

On January 10th flocks of nine, eleven, and thirty Brent Geese were observed flying outside the breakers, going southward. A south-easterly gale was setting in.

Quite one hundred and fifty Knots on Breydon on January 18th. I noticed a punt-gunner slyly sidling up to a flock of tame Geese that had assumed a semi-wild life, and had taken to gathering crustaceans and mollusca from the *Zostera*. I certainly thought he was about to try his accuracy of aim upon them, which he might have done, I imagine, with impunity, as I was the nearest to him, a good mile of flat and "drain" intervening between us. Fortunately for himself perhaps, as well as the fowl, a flock of Brent Geese flew between him and the tame birds, and drew him higher up Breydon in pursuit.

March 4th.—A number of northward-bound Redwings passed over, with large flocks of *Corvidæ* following in their wake. On March 14th Redwings were still plentifully flying N.E., whilst Blackbirds could be distinctly heard above head on the drizzly nights prevailing at the end of the month and early in April.

Nearly two hundred Wigeon on Breydon on March 17th. We still annually get a goodly number, week after week, during the period of the spring migration, the birds being attracted, as they have been probably for centuries past, by the *Zostera marina* clothing the mud-flats.

Water-Rails would seem to run some risk when making for their spring quarters. Two were shown to me in the earlier half of April that had come to grief, probably from contact with telegraph-wires. The first had entered a cellar on the quay-side; the second, with its breast bared of feathers and two rather bad bruises, was penned in a cage in the cattle sale-ground, and kept there for my inspection.

On May 2nd a Land-Rail, another species much given to eccentric movements, was shown to me in a cage, having entered the cellar of a public-house, causing some diversion in the hunt for it among leaden pipes and ale-barrels.

May 9th.—Three pairs of Swifts wheeling around on the quay-side in a somewhat unsettled manner; an old-time haunt of theirs having been effectually done away with last year, they seem at a loss where to settle. They eventually, with other arrivals, distributed themselves around in various directions, one pair finding nesting quarters in quite a new house.

On May 11th, the atmosphere being warm and heavy, insects flew low, many falling into the water, and were drifted by the tide on to the mud, to the delight of a number of Starlings and other foraging insect-loving birds. *Bibio marci* was greatly in evidence, and there were myriads of those other smaller Diptera which prove such a nuisance to painters. I myself was greatly annoyed by the swarm that, drifted by the light air and maybe attracted by some aroma from my paint, smothered the sides of my freshly painted houseboat.

A high tide on May 19th drove all the small spring Waders from the flats. I had an unpleasant episode with a bull and some heifers on one marsh when on the track of a big

flock of Ringed Plovers, whose gathering there had aroused my interest.

May 25th will be remembered by me as the day on which my new houseboat (Moorhen II.) made her first voyage across Breydon up the River Waveney, and also by the considerable number of Redshanks that this spring nested on the surrounding marshes. At every bend and from every marsh the sharp-winged birds sprang up, and with loud clamorous protest fussed around. The Bure marshes, undoubtedly becoming drier each year through improved drainage, are less and less peopled by nesting birds. Here they more than held their own. I estimated that there could not be less than one hundred pairs. A dozen birds would be excitedly clanging their call-notes above head at one time.

Sailing down stream in my punt in the quiet evening, I observed the "off-duty" birds bathing and feeding on the muddy edges showing up here and there as the ebb-tide left them bare. There was but the merest standing room, with their tails touching the reed-stems, and their bills in the soft ooze, their long sealing-wax-like legs reflecting lower still in the stream. Here they made quite sideway hits, as Duck do when beginning to bathe, and preened their feathers with wet mandibles. Those that fed evidently were seeking insect-life rather than crustacean. Here and there one alighted upon a gate-post or rail, and passed on remarks to his companions as to what he thought of me—"clat-clat-clattering" most persistently. I would like to have known the purport of their clamour!

We do not get many Oystercatchers at Yarmouth, which is curious, considering their numbers on the flats and shores of the Wash. Of course, the vast areas of Mussels left exposed by the ebb-tide are an attraction there. I considered seeing three grand birds on the flats on May 28th worth noting. Six more on June 19th.

June 1st.—Several Common Sandpipers around Breydon. I have a strong suspicion that odd pairs nest in the county, although I have the record of but one nest being discovered under a gooseberry bush at Hickling on May 25th, 1897.

3rd.—Early this morning I was punting up Breydon when I heard the whirring sound produced by an aeroplane above head.

At first it did not occur to me whence the noise proceeded, and I put my glasses on to the Acle Road, imagining it to be caused by a motor-car. Then I noticed the curious evolutions of a large flock of mixed Gulls, mostly Greater Black-backed, that were circling and gyrating around each other, like so many whirligig beetles on a ditch, but ascending on each sweep. Then I observed the cause of their affright to be the passing over of a biplane, which they evidently imagined to be some huge bird of prey or ill omen; they kept circling around until the machine outdistanced them, when they descended again to the flats, holding confab with outstretched necks and many signs of uneasiness. They had scarcely recovered their equilibrium when the uncanny creature reappeared in sight, and the same uneasy evolutions were repeated. I expect that a little more familiarity will breed in them the proverbial contempt.

13th.—On this date I sailed across Breydon, putting up a couple of Common Scoters. This is a rather unusual record for this month.

Next day I was still more astonished to see no fewer than twenty Bernicle Geese pass over my head at St. Olave's (five miles from Breydon). They were spread out in extended line leading from N.W. to S.E.; the wind was S.E. So close were they to me that I might have thrown a stone far beyond them, and they passed so low that I could easily note the markings on the back and wings. On the following day an odd bird flew in the same direction.

I was greatly disappointed by a couple of Swallows on June 14th. They flew into the cabin of my houseboat twice, and on each occasion went round and round, inspecting the rafters, paying small attention to me. I hoped they would fix up a nest inside, but they were apparently dissatisfied; they went into an adjoining half-finished houseboat, dabbed on a few beakfuls of mud, and then abandoned that.

Greenfinches come to my bank-side, and greedily devour the flowering heads of the groundsel; local, "sanchen."

In a secluded lane, a short walk from my mooring-place, the Red-backed Shrikes nest annually. In June I found several aged and dead "thorns" on which they impaled their favourite prey—the common bumble-bee. One day they "jabbed"—I

can call the action by no other name—a still living field-mouse, the thorn entering the throat and coming out at the back of the head. The “cinnabar” caterpillar abounded on the plentiful ragwort by hundreds: to these moths the Shrikes pay great attention. Later on I one day observed a young Shrike fly to the hedge-bottom and seize a belated caterpillar. It flew to an outstanding twig, knocked the curling larva two or three times sharply on the rough bark, and swallowed it.

The Red-hipped Bee swarmed the heather on a neighbouring common by thousands.

On one occasion, in June, I was watching a Greenfinch busy among the groundsel, when a sneaking Water-Vole arrested my attention as he slyly and with weasely cunning crept up through the covering grass, evidently endeavouring to get close to the bird. Whether he would really have attempted to seize the Greenfinch, I can only surmise; I know the rodent will devour a dead Roach. And the farmer hard by was emphatic in his assertion that the Voles once made off with some newly hatched chickens brought off in a hedgerow adjoining one of his ditches.

Night after night in July the hanger at the edge of the marsh was tenanted by Nightjars. They nested freely on the heathy common lands overlooking the Belton and St. Olave's marshes. Sitting on the limbs of an aged elm the male birds churned out their rattling notes in the gloaming. Their “music” reminded me greatly of the sound produced by a knife-grinder when busy with the emery wheel that is used after the rougher sharpening of a knife upon the sandstone wheel. It was odd to see them darting out and around with V-shaped flight, seizing the ghostly moths and droning beetles that circled about the trees. I noticed in showery weather these birds haunted belts of thick firs, under the sheltering branches of which the insects found tolerable hiding.

July 13th.—When watching a Kestrel hovering above a marsh hard by, I thought it seemed a considerable time making up its mind to drop, as it evidently saw something attractive below, when down it rushed, rising immediately with what I took to be a *dead* Short-tailed Field-Vole in its talons. In chatting with the farmer a few minutes after he assured me he

had killed four Voles the previous day at the spot indicated. We strolled over to it, finding two of the dead "mice" still left there. It was a hot noonday, and the Voles, both gravid females, were as warm as if alive, and already thickly spotted with fly-blows. It is evident to me that the hawk must have had young ones, as its deigning to collect dead animals seemed to warrant. In confinement, of course, the bird will readily take anything edible offered it, whether dead or alive.

On Saturday, July 20th, a market gardener driving up to market stopped to hand me a parcel. On opening it I found two dead Weasels and three Water-Shrews (*Crossopus fodiens*), two of them adults, the other a young one. These had been found alive with the Weasels, and were together promptly killed. Three or four other Shrews already dead had been discovered when turning over a "cock" of rough marsh-hay.

25th.—Local-bred Wheatears seen around Breydon walls and marshes.

Very few Terns visited Breydon this summer, fewer than have been known for many years. As is well known, there are large and thriving colonies nesting at Blakeney, Cley, and Wells, at the northern extremity of the county. In fine warm summers it would seem that herring-syle, their chief food, is plentiful and easily procured in their own particular neighbourhood, whereas in untoward seasons it is evident rough weather has a tendency to cause the young herrings to swim deeply. Other things also may be taken into account—tidal, and so forth. Then, it would seem, the Terns (Little and Common) put in to Breydon. Last year they swarmed here, and were quite a feature in late July and during all August. Unfortunately in such seasons they invariably prolong their stay until the beginning of September, when shooting commences, and when many become targets for indiscriminate, cruelly-minded gunners. This season they undoubtedly performed their southerly movement later, and when they moved steadily passed southward. Their scarcity here has been much commented upon.

I visited Easton Broad, in Suffolk, during August. It and a smaller bit of water known as Covehithe Broad are somewhat inaccessible, secluded lakes, making a long journey from Lowestoft necessary, although, had I been so minded in making a long

detour, I might have made the beach walk shorter, from Southwold. What seemed to me remarkable is their nearness to the sea. The smaller "lake" (Covehithe) had a well-defined channel scored in the intervening sand, showing how easily at high tides the sea gained access to it. The water was very brackish, almost salt, yet clumps of reed and rushes margined it. I found a few crustaceans of an eminently semi-marine kind. At Easton, a few yards farther from the sea, the water tasted quite fresh, and had the appearances characteristic of a freshwater Broad. It was crowded with Coots, and in all probability becomes a favourite resort of various wildfowl in the colder season.

A Wren had built a nest this year in a very curious position. A village blacksmith had strung together a lot of rusty old horse-shoes; in the midst of this curious assortment a cosy nest had been built, and young hatched and reared.

August 28th. — Getting near the end of the close-season. Birds simply swarmed on Breydon. When taking a spin round in my punt, I saw ten Sheld-Ducks feeding upon the flats; quite two hundred and fifty Curlews, several Common Sandpipers, with many small shore-birds—Ringed Plovers, Whimbrel, Dunlins. As showing the dryness of the marshes for want of rain, a dozen Lapwings had joined themselves to the other Waders on the mud-flats—an unusual occurrence. A few Little Terns were present, one or two with still squeaking young clamouring for young herrings, which the old birds occasionally placed in their mandibles, at other times gave them the added excitement of making them pick them up after dropping them. Hundreds of Gulls, including a considerable number of Common Gulls.

On the 31st I saw a Spotted Shank, in company with a Redshank. It was extremely restless. I pushed my punt's nose into the edge of the grass-clad "Lumps," the last portion of the flats left uncovered. Here several Turnstones, a few Knots, a Curlew, and a few Dunlins slept away the hour in which all the softer muds were submerged.

On the last afternoon of my holiday (Sept. 1st) I eschewed Breydon, where the gunners (mostly amateurs) were popping at everything that had not been frightened off the flats in the morning. I took my blind bird-chum (B. Dye) a long round

over the Bure-side marshes, also accompanied by a lady bird-lover. We tramped miles through the mist-dripping grasses that covered the river-wall sides and met at the apex, our boots and lower garments being saturated during our tramp. We put up a few Snipe from some moist corners, and startled a number of Common Sandpipers from the flints that margined the river-side of the wall (or embankment), and from muddy patches. But our quest—the Green Sandpiper—was sought in vain. We neither flushed one nor heard its shrill distinctive “tu-whit, tu-whit, tu-whit.” For some years past this bird, once a regular and constant early autumnal visitor, has been becoming rarer. Yet, strange to say, when a “ditch-fying” year obtains (when the vegetation and silt choking the ditches are “thrown” to the sides above them), one can almost always depend upon seeing odd birds in July and August. They have to my knowledge, although very solitary in habit, been seen to collect rarely to the number of half a score in such easily to be inspected situations, the exposed larvæ and the insect-life attracted thither evidently tempting them. It was a wet, dreary afternoon. The very slugs had been tempted to an early ramble up the rough stems of the thistles, and the *nemoralis* snails were out in numbers.

Inspector Donnison informs me that the Seals in the Wash had been seen to copulate, and young were frequently born. Soles were a favourite prey; and that the Seals often sleep under water (!).

September 4th.—A “wave” of small migrants. All round the neighbourhood Redstarts, Willow-Wrens, Redbreasts, Wheat-ears, and Pied Flycatchers were in evidence. Our little “Park” swarmed with them. A puppy bustling into a clump of shrubs and undergrowth turned out quite seventy birds.

Harvest-Mice are fairly plentiful in the north-east corner of Suffolk. I had a nest, well hidden in a clump of barley, brought me on Sept. 6th. It was made of rather coarse dry grass-bents, reminding me very much of a wisped-up ball of gardener’s “raffia.” It was as large as a duck’s egg, and apparently as innocent of a doorway.

7th.—Swarms of Common Sandpipers all round Breydon walls. Sitting down to watch a bird, I found ere long a colony of red ants objected to my near proximity. For an hour

afterwards I had the time of my life ! What irritating little beings !

Kingfishers catching large bluebottles from twigs overhanging a Belton ditch. They acted much after the fashion of a Spotted Flycatcher in springing off and returning again to the self-same perch.

Adult Gannet cast up on the beach on Sept. 8th.

One other Entry.—August 12th : The marshmen had been cutting down “rough stuff” (mostly reeds) on an extensive rond beside the Waveney. A northerly wind had driven up a big tide, and the stubbles stood in water, to the great discomfort of many insects thus left exposed to the mercy of the elements. Several Starlings that had been entomologising an hour before had retired to chatter upon the much verdure-splashed sails and railings. Their places were taken by a small flock of Black-headed Gulls, now wading after swimming and drowning insects ; whilst a hundred or more Sand-Martins were busily engaged snapping up their unhappy prey struggling for very life upon the surface of the water. Not a solitary Sand-Martin of all this congregation hunted in the air, but were hawking only a few inches above water, constantly stopping in their flight to dip at beetle or fly, scooping it up most adroitly, the lower mandible only being wetted by the action. A few House-Martins had joined themselves to this flock, and were also most industriously a-gleaning.

MIGRATORY AND OTHER ORNITHOLOGICAL NOTES
FROM LOWESTOFT.

By F. C. Cook.

THE following observations were made in the neighbourhood of Lowestoft from June, 1912, to June, 1913 :—

June 21st.—A nest of the Nightjar, containing one egg, was found on the Denes just north of the town.

August 10th.—Several large flocks of Sand-Martins flying along the shore southwards, and a flock of Tree-Sparrows was observed making southward, flying very high. Two Yellow Buntings were seen bullying an immature Red-backed Shrike.

12th.—A number of Pied Wagtails were observed.

17th.—A large number of Meadow-Pipits and four Wheatears appeared on the Denes ; numbers of Common and Lesser Terns seen along the shore.

20th.—An arrival of Yellow Wagtails ; over twenty seen on the Denes.

21st.—Most of the Yellow Wagtails have passed ; only six seen. Great increase was noted in the number of Wheatears, Willow-Wrens, and Terns.

22nd.—A Whinchat and a Spotted Flycatcher arrived ; also a large number of Meadow-Pipits. Twelve Wheatears seen.

25th.—Inrush of Pied and Yellow Wagtails ; two flocks of Yellow Wagtails seen to drop in from the north. A great number of Swifts, Swallows, Sand- and House-Martins seen. Flock of six Ringed Plovers flying south.

During the severe storm of August 26th large numbers of House-Martins were seen clinging to the walls of the highest buildings facing the sea, the wind being from the west.

28th. — Four Wrynecks and three Pied Flycatchers had arrived, along with several Willow-Wrens, Whitethroats, and Wheatears. On this date Dr. C. B. Ticehurst observed a Barred Warbler.

Pied Flycatchers and Garden Warblers had arrived in numbers on the 29th ; with them were two Red-backed Shrikes and a Wryneck. The number of these birds had decreased considerably on the 30th and 31st.

September 3rd.—A movement of Meadow-Pipits was noticed, several flocks being seen flying south, while a large number had dropped on to the Denes. Also on this date a flock of Goldcrests had arrived, and several flocks of Ringed Plovers were flying south along the shore.

4th.—Two Purple Sandpipers seen busily feeding on the weed-grown breakwaters. They were very tame and allowed a near approach; they stayed until the 9th.

7th.—A large flock of Mistle-Thrushes moving south, also a flock of Ringed Plovers. A large number of Meadow-Pipits and Pied Wagtails had dropped in, also a few Common Whitethroats, one Lesser Whitethroat, and a few Wheatears. An increase in the number of Song-Thrushes was noticed.

8th.—Large numbers of Swifts, Swallows, and House-Martins had gathered, and were hawking over the Denes. Linnets had increased considerably. Quite a number of Curlews were heard passing over the town at night.

12th.—Saw my first Snow-Bunting, which was very tame, feeding within a few inches of my feet. Meadow-Pipits, Larks, and Starlings had arrived in large numbers.

14th.—Still more Wheatears. The number of Sky-Larks had decreased, while Meadow-Pipits and Starlings were the same as on the 12th.

16th.—Mistle-Thrushes, Starlings, and Linnets were moving south in flocks. The majority of Wheatears had passed along. One Common Redstart seen. A flock of about one hundred Swallows and Martins wheeling over the Park. Greenfinches and Larks were seen moving south on 17th.

21st.—Cold east wind blowing; great decrease in number of birds. A large flock of House-Martins moving south, flying very high. Several Pied Wagtails moving south.

23rd.—Swallows, House-Martins, and Linnets moving south. Several Wheatears, a Lesser Whitethroat, and a Willow-Wren seen; also a few Greenfinches, Chaffinches, and Pied Wagtails.

24th.—A flock of Yellow Buntings moving south; also a flock of Greenfinches and several flocks of Linnets. A Grey Wagtail passed on the 25th.

28th.—A female Brambling, two Common Redstarts, two Willow-Wrens, a Lesser Whitethroat, and a few Wheatears seen

on the Denes. Two Grey Wagtails and four Golden Plovers seen in a field near the sea.

29th.—Saw a belated Swift flying south; also several Swallows and House-Martins.

October 1st.—Several Greenland Wheatears were seen amongst numbers of Common Wheatears on the Denes. Swallows and House-Martins, Sky-Larks and Linnets, moving south in flocks. A flock of Tree-Sparrows seen flying north.

2nd.—Two flocks of Greenfinches moving south; also several flocks of Linnets. Four Goldfinches and a number of Goldcrests seen, and an increase in number of Yellow Buntings was noticed.

3rd.—Large numbers of Larks, Linnets, and Greenfinches flying south in flocks; also a flock of Tree-Sparrows flying south, very high. One female Reed-Bunting was seen.

5th.—Two Swifts and one Swallow seen flying south. Flocks of Linnets, Greenfinches, and Yellow Buntings flying south, while a large number of Tree-Sparrows were seen moving north. Four Hooded Crows observed.

7th.—Large numbers of Linnets, a few Greenfinches and Chaffinches, several Larks and Tree-Sparrows, and a flock of Mistle-Thrushes flying south. The same species were seen moving south on the 8th and 9th; also on the 9th two flocks of Larks were seen flying in from over the sea. One Swallow and a female Brambling seen.

13th.—Great movement of Linnets, Greenfinches, and Tree-Sparrows working south. A flock of House-Sparrows seen flying south; also a flock of Mistle-Thrushes. An increase of Robins and Blue Tits noticed. Four Redwings seen flying south, as were also a few Rooks.

15th and 16th.—Linnets, Greenfinches, and Tree-Sparrows were coasting south; also on the 16th three flocks of Mistle-Thrushes and two Redwings were moving south. A flock of Hooded Crows were seen coasting north, while a migrant flock of Rooks, Jackdaws, and Hooded Crows was seen in a field overlooking the sea.

22nd.—Six small flocks of Larks arrived from over the sea. A passing increase of Goldcrests was noticed. Mistle-Thrushes two flocks of House-Sparrows, and one flock of Tree-Sparrows

moving south. Several Redwings were heard passing over the town at night, as they were also on the 23rd.

Half a gale of wind was blowing on the 28th, and no birds were moving. On the 29th and 30th the wind had eased, and Mistle-Thrushes, Linnets, Tree-Sparrows, Larks, and Greenfinches were coasting south. A large flock of Rooks and Jackdaws were seen passing south over the town.

November 3rd.—An immature Red-throated Diver was observed within a few yards of the shore. A flock of Starlings and a single Sky-Lark arrived in from sea. Linnets, Tree-Sparrows, and Starlings were moving south in small numbers on the 7th, 17th, and 27th; also on the 27th a flock of Lapwings came in from sea.

A Crab brought in by one of the Lowestoft trawlers on Dec. 21st was identified by Mr. Patterson as *Dromia vulgaris*. It had been taken in the vicinity of the Galloper Lightship.

During the heavy wind from W.N.W. on January 12th several flocks of Ducks and Waders were flying south along the shore, and a large flock of Starlings was observed passing over the town.

February 22nd.—I observed a flock of over forty Pied Wagtails feeding by the edge of a small piece of water at Covehithe.

25th.—A flock of Rooks flew steadily away out to sea, making south-east.

March 4th.—A single Rook was seen to fly quite away out to sea; a few minutes after two others followed; also a Hooded Crow, with two Rooks, flew away to sea for a short distance, but returned again. A movement of Finches was observed, several flocks coasting south, as they were also on the 16th.

8th.—Several Rooks were sitting on their nests at Reedham. Redwings and Waders were heard passing over the town at night.

11th.—A Wheatear was seen on the North Denes—an early arrival. Several flocks of Linnets and Chaffinches were moving south; Rooks and Hooded Crows were flying away to sea south-east in flocks, while several Hooded Crows were also leaving in ones and twos. For some time after these flocks of Corvines had departed and were quite out of sight, single birds kept returning to land again. It was invariably noticed that these shirkers had a feather or two missing from their wings, which

was undoubtedly responsible for their being unable to undertake the journey.

12th.—A flock of Lapwings seen coasting along south, as were also a few Rooks and Hooded Crows, and a flock of Chaffinches. A large flock of Starlings flew in a north-east direction over the sea.

13th.—A large flock of Jackdaws seen flying east; on reaching the sea they wheeled round confusedly for a time, then split up into two flocks, the larger returning inland again, while the rest departed over the sea. Large flocks of Starlings and a few Linnets and Chaffinches were seen coasting north, and a flock of Sky-Larks flew out to sea in a north-east direction.

15th.—An increase was noted in the number of Pied Wagtails. A small flock of Rooks flew over the sea north-east, while Linnets and Chaffinches were coasting north; several flocks of the latter were also noticed moving south.

17th.—A Grey Wagtail was observed passing.

20th.—A great movement of Finches south was noted; the majority were Linnets, with a few Chaffinches and Greenfinches. This movement was also noted on the 21st.

23rd.—An increase of Pied Wagtails and Goldcrests was noticed. Rooks, Jackdaws, and Hooded Crows were departing out to sea in a north-easterly direction, while Linnets and Chaffinches were coasting along south.

24th.—At Benacre, 6 a.m., the following birds were seen moving:—Several large flocks of Rooks, among which were a few Hooded Crows and Jackdaws, branched out to sea north-east; a large number of Starlings taking the same course as Rooks; a large number of Linnets, a few Chaffinches, Tree-Sparrows, and Larks, all of which were coasting north. A large number of Redshanks and Wigeon were seen about the marsh-pools. Eight male Wheatears seen.

26th.—No defined movement of Finches was noted, though there were a number of Linnets and a few Chaffinches on the Denes. A few Meadow-Pipits seen.

29th.—A great movement of Chaffinches south along the Denes; I watched this passing (which was almost incessant) from 6.15 a.m. till 7.15 a.m., when it practically ceased. Some of the flocks contained over a hundred birds; they were flying

very low. About this time large numbers of Chaffinches alighted on the fishing-boats out at sea, and several were brought into port. Stonechat's nest containing two eggs seen. Flock of Rooks flying south-east over sea; few Linnets coasting south; also two Ringed Dotterels.

30th.—Three Dunlins and two Ringed Plovers seen. Flocks of Chaffinches, Linnets, and Greenfinches coasting south, as were also several flocks of Rooks, Hooded Crows, and Jackdaws, several flocks of which were also flying out to sea; two flocks of Starlings flying east over the sea. Large numbers of Redwings and Curlews heard passing over town at night.

31st.—A Peregrine Falcon flying south. Movement of birds same as 30th. Redwings and Curlews were also heard at night.

April 1st.—Large numbers of Rooks and Jackdaws flying out to sea for a short distance, but returning again; there was a thick haze at the time. Starlings, Chaffinches, Linnets, Greenfinches, Tree-Sparrows, and Meadow-Pipits coasting south. A Ringed Plover on Denes. Large flock of Wood-Pigeons flying south.

2nd.—The movement of Rooks and Finches was a repetition of the 1st. A movement of Wood-Pigeons was noted; several flocks flying south, a few out to sea. Three flocks were seen flying north-west; these had apparently been coasting north, and had branched off north-west. Two Pied Wagtails flying south.

3rd.—A few Finches coasting south; few Starlings north.

5th.—Practically no movement of birds at all; the wind was north-east, very cold. I observed a Kestrel devouring its prey while hovering with its head to the wind; its prey was either small birds or field-mice.

8th.—A pair of Snow-Buntings which had frequented the Denes for some time had departed; the female had an injured leg. Three Wild Geese flying north. Few Linnets and Greenfinches coasting, some north and some south.

10th.—A Water-Rail brought to me, having struck the telegraph-wires. About this time one was taken on board a Lowestoft fishing-boat at sea, and Mr. Patterson records several at Yarmouth. Rooks and Finches were coasting north, as they were also on the 15th, when a Ring-Ouzel passed through.

17th.—Three Willow-Wrens and two Wheatears seen. Linnets and Chaffinches coasting south.

19th.—One Sand-Martin, one Swallow, and three Willow-Wrens seen.

20th.—Same Willow-Wrens seen. Large number of Linnets moving north.

21st.—A Cuckoo, one Swallow, and same Willow-Wrens seen. Several other Swallows also observed.

23rd.—A Black Redstart passed through; a few Wheatears and Swallows; same number of Willow-Wrens.

24th.—A Wryneck, one Common Whitethroat, one Nightingale (male) in breeding haunts, two Wheatears, and a few Swallows. There was no increase on the 25th, when a Cuckoo was seen going north.

28th.—Three House-Martins seen.

29th.—One Wood-Warbler, eight Common Whitethroats; Cuckoo heard; two Willow-Wrens, two Wheatears; few Swallows.

May 2nd.—Few Sand-Martins seen; same number of Whitethroats, Swallows, Willow-Wrens, Wheatears.

3rd.—A Cuckoo of the variety *C. rufus* was found on the roof of a house in the town; it had probably struck the telegraph-wires on the night previous, as it was still warm when found. The following birds I saw while cycling to Beccles:—Chiffchaff, Nightingale, Cuckoo, several Willow-Wrens; while on the river at Beccles I saw several Sedge-Warblers, few Ray's Wagtails, large number of Sand-Martins and Swallows; Snipe "drumming."

5th.—A male Red-backed Shrike, which when first seen was being bullied by two Willow-Wrens; nine Common Whitethroats; one Swallow and one House-Martin.

7th.—A slight decrease of Whitethroats. House-Martins building.

10th.—Four Swifts; two Lesser Whitethroats seen.

11th.—Large number of Swifts had arrived, and were circling round their old nesting places. Large number of Swallows seen.

12th.—Grasshopper-Warbler and Chiffchaff heard at Beccles.

16th.—A Hooded Crow seen going north along the shore. Red-backed Shrike seen.

18th.—Two Turtle-Doves flying north. No big increase of other migrants noticed during the remainder of the month.

NOTES ON RARE FISHES SOLD FOR FOOD IN EAST LONDON.

BY F. J. STUBBS.

DURING the rearrangement of the collections in the White-chapel Museum (one of the Stepney Borough Museums), I commenced to prepare and exhibit a series of the food fishes on sale in East London, and, as a result of the attention paid to the subject, I am able to offer the following notes on the rarer and more interesting species. At first we purchased the material haphazard, generally from the barrows in the streets, but when our plans became known many of the dealers were good enough to retain for us any out-of-the-way specimens coming into their hands. Most of the stuff was procured in Wentworth Street, a picturesque market lying between Aldgate and Bishopsgate; the inhabitants of this quarter are almost entirely aliens, chiefly Continental Jews, and the foodstuffs displayed in the street are often quite foreign to English eyes.

Freshwater fish of nearly all kinds (excepting such as Burbot, Eels, or Lampreys) are greatly esteemed, and are sold at high prices. Salmon is constantly on sale in its season, and species like Bream or Pike, which do not appeal to the average British palate, are here highly valued. Indeed, so far as coarse fish are concerned, the demand is far in advance of the supply. The freshwater fish are brought from the Continent, either alive or in ice. A certain amount is of British origin, but the supply is erratic, for pisciculture is not a business that has taken root here. Deep-sea trawlers unloading at Billingsgate from Norway, the White Sea, the "Rockall Depression," and the Bay of Biscay are the source of most of the salt-water material. It is, however, next to impossible to ascertain the place of capture of particular specimens, and one can only form an opinion by the general aspect of the barrows on any one day—for example, a display of Torsk, Norway Haddock, and Forkbeard would suggest

a northern origin, and a specimen of *Beryx* in this lot might be presumed to come from Norway rather than the coast of Portugal.

For a popular museum I hold coloured casts to be far preferable to either wet preparations or stuffed specimens. Described in a few words, our general method of preparation is as follows: The specimen is cleaned of mucus, and, if it has been gutted, stuffed with clay and sewn up. The fins are cut off and pinned out to dry, and the stripped body is covered with ordinary paraffin wax. Dental plaster is used for the cast. The expanded fins are carefully cemented in their exact positions, and appropriate glass eyes are fitted. Plaster, of course, will not take paint. Sometimes we impregnate with wax, but I prefer to "gild" with ordinary gold size and aluminium leaf.

At this stage the cast or model is an exact replica of the living fish, in bright aluminium, and it is then carefully coloured from a fresh specimen, or (in the case of rare species) from a drawing made before the cast was taken. I use ordinary best quality oil colours, and as little medium as possible; and it is sometimes not very difficult to colour a model so that it cannot be detected at a yard distance from a fresh specimen. Mr. A. J. Gear, who has always been most generous with advice, regularly turns out specimens that defy the most cautious visual scrutiny. He leans towards the use of *guanin* as a nacreous or silvery pigment, but it is a medium that I have not adequately tried.

It is, however, to my colleague, Mr. P. W. Horn, that we are most indebted, for his wide knowledge of fish and skilful handling in preparation have been invaluable in the building up of our curiously garnered collection. In the following notes I shall only treat of the more interesting species, and, except when the contrary is stated, the place of purchase will be understood to be Wentworth Street:—

PIKE PERCH (*Lucioperca sandra*).—This Continental fresh-water fish is on sale throughout the winter, and is very popular.

BASS (*Labrax lupus*).—March.

GREATER WEEVER (*Trachinus draco*).—January. The local name is "Beever" (a change that may be explained by "Grimm's Law"), and it has a high reputation. Day ('British Fishes,' i.

80) states that it was sold in Whitechapel under the name of "Spitalfields Weaver." A police regulation at Boulogne, and elsewhere, commands that the dangerous poison spines be removed before the fish is brought to market. This is not done here. The eye of this beautiful fish is not often described; it is of a fine and lustrous crimson colour.

PIPER (*Trigla lyra*).—Winter, but not common. The Red Gurnard (*T. cuculus*) and the Grey (*T. gurnardus*) are sold in great quantities.

BERGYLT (*Sebastes norvegicus*).—This interesting northern species is often on sale in winter.

BERYX (*Beryx decadactylus*).—Winter, occasionally in large numbers, but I cannot learn the exact sources. Specimens of these brilliant fishes are now exhibited in most museums, often under the name *Beryx splendens*. I use the former name, for the first one I bought in London agreed exactly with the description and figure in Fries, Ekström, and Sundevall's work on Scandinavian Fishes. Here Prof. Smitt (i. 68) suggests that the two species are identical. There is a good figure of this non-British fish in Günther's accessible 'Study of Fishes,' p. 422. The colour is a peculiar transparent or translucent vermilion, most difficult to reproduce, although Mr. Gear has been very successful by the use of coloured wax.

The Beryx is strictly a deep-sea fish, living below the hundred fathoms line, and is stated to be absent from British waters, although the fishermen say that it is extraordinarily abundant in the Rockall Depression. This fish occurs in many parts of the world where the sea has a sufficient depth.

BRAIZE (*Pagrus vulgaris*).—Another brilliantly coloured fish that occurs in December, March, and April. It is a southern fish, possibly from the Bay of Biscay.

SEA-BREAM (*Pagellus centrodonatus*).—I include this because it is the most popular fish in Wentworth Street. The name is "Bullseye," and the Bergylt, Beryx, and Braize, all red species with large eyes (the last has normal eyes), appear to be sold as Sea-Bream.

SCAD (*Caranx trachurus*).—Summer, but only in small numbers.

WOLF FISH (*Anarrhichas lupus*).—Largely sold in East

London, direct from the dealers to the fried-fish shops. It is rarely or never displayed whole.

ANGLER (*Lophius piscatorius*).—Sold in the same way as its unbeautiful predecessor. Small specimens are sometimes to be procured entire.

IDE (*Leuciscus idus*).—This interesting species is of Continental origin so far as Wentworth Street is concerned, although it is on the list of British fishes. It is often on sale. The albino variety, better known as the "Golden Orfe," has twice appeared in Wentworth Street.

NÆSLING (*Chondrostoma nasus*).—A non-British freshwater fish that appears not uncommonly in January and February.

GARPIKE (*Rhamphistoma belone*).—Frequently on sale in spring.

POLLAN (*Coregonus pollan*).—February. Of Irish origin.

GRAYLING (*Thymallus vulgaris*).—A specimen weighing about two pounds, purchased in October, and said to be from Wiltshire, contained a specimen of an uncommon water Hemipteron (*Aphelocheirus æstivalis*).

SILE SMELT (*Argentina silus*).—In April, 1913, Mr. Hotine, of Leadenhall Market, sent a fish that was new to me, but by the help of Smitt's useful book I soon recognized it. The specimen was almost entirely devoid of scales, but those remaining were distinctly spiny; and the large eyes and the number of gill-rakers, together with the shape of the posterior margin of the operculum, pointed to nothing but *A. silus*. It was a foot in length. The species has already been recorded for British seas (Holt, Journal Marine Biol. Assoc., v. 341), but is best known as a northern fish.

TORSK (*Brosmius brosme*).—An uncommon winter fish.

LESSER LING (*Molva dipterygia*).—Mr. Horn has found this species both in Wentworth Street and Watney Street. It agrees exactly with the figure and description in Smitt's 'Scandinavian Fishes'; indeed, the great eyes, almost eel-like body, short barbel, and peculiar translucent appearance separate it immediately from *Molva molva*. The date for this non-British species was June.

GREATER FORKBEARD (*Phycis blennioides*).—Not common.

Macrurus rupestris (*Coryphænoides rupestris* of Day) (vol. i. 335, pl. xciii).—A specimen procured from Leadenhall was presented to us by Mr. Gear. One found by Mr. Horn in Went-

worth Street seems to me to be *M. bairdii* (Goode and Bean, 'Oceanic Ichthyology,' 393, fig. 335).

Malacocephalus lævis (*Macrurus lævis*).—A specimen which I cannot trace was brought to the museum in 1907, and identified by the British Museum authorities. *M. cælorhyncus* and *M. fabricii*, which are described and figured in Fries, Ekström, and Sundevall's work, might well be looked for in English markets. The members of this family are now known to be common deep-sea fishes.

WHIFF (*Arnoglossus megastoma*).—December to March.

VARIEGATED SOLE (*Solea variegata*).—We have secured one or two examples of this very distinct species.

LUMPSUCKER (*Cyclopterus lumpus*).—This picturesque animal is sometimes displayed as a sort of ornament on fish-stalls in East London. A 6-inch specimen brought to me was marked with tints that I can only describe as *pure* Prussian blue and *pure* crimson lake: an embarrassing combination of colours.

THE PHARYNGEAL TEETH OF FISHES.

BY COLONEL C. E. SHEPHERD (Indian Army).

(Continued from p. 146.)

MULLIDÆ.

Mullus barbatus (the Red Mullet). There are fifteen horny gill-rakers on the first cerato-hypobranchial arch, the last three being very minute, and five along its epibranchial; they all carry teeth. The inside of the first arch, both sides of the second and third arches, and the outer side of the fourth arch bear tubercles, those on the outer sides being much larger than those on the inner sides; the tubercles have teeth on them. They leave openings between them for water to pass to the gills. The upper pharyngeal teeth on the patch attached to the second epibranchial are cardiform, and markedly more prominent than those attached to the shields on the third and fourth epibranchials, the teeth on these being concealed in the mucous membrane that surrounds them. The lower pharyngeal teeth have several prominent cardiform teeth on their hinder margin, the teeth in the forward part being embedded in mucous membrane. Fig. I., 1.

Mullus surmuletus (the Surmullet, Couch) has seventeen horny gill-rakers on the first cerato-hypobranchial, with five on the first epibranchial. There are tubercles on the other arches, including the outer side of the fourth arch. The inside of the horny gill-rakers bear teeth, but none could be made out on the tubercles. The teeth on the pharyngeal bone attached to the second epibranchial are cardiform and prominent; the other teeth in the upper pharyngeals are also cardiform, but more embedded in mucous membrane. The lower pharyngeal teeth are rather more conical than cardiform; the catch of these is not so pronounced in the backward direction as cardiform teeth would give if a finger were drawn against them.

TRACHINIDÆ.

Trachinus draco (the Greater Weever), on the outside of the first cerato-hypobranchial has fourteen horny gill-rakers, and

seven along its epibranchial. They have a number of fine teeth on their inner faces; on the inner side of this arch there are longish tubercles, also covered with teeth. The second arch has much the same horny gill-rakers on its outer edge with teeth on them, and toothed tubercles on the inner side. Both sides of the third and the outer side of the fourth have toothed tubercles. The upper pharyngeals bear cardiform teeth thickly planted together, the points showing at the surface of the mucous membrane they are embedded in. Those growing on the bone attached to the second epibranchial show up more distinctly

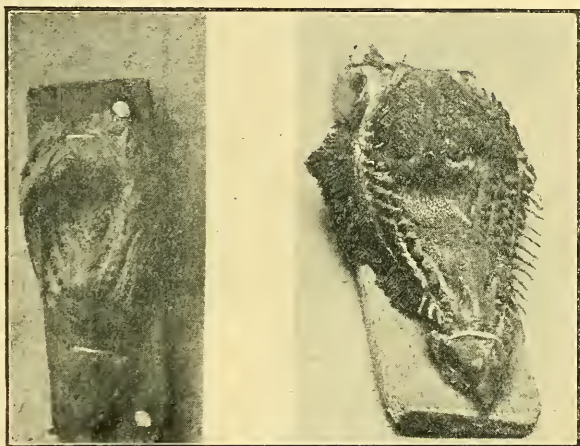


FIG. I.

1.—MULLUS BARBATUS.

2.—TRACHINUS DRACO.

than the others. The lower pharyngeal teeth show as one broad patch across the floor of the mouth of cardiform teeth thickly matted together. Fig. I., 2.

Trachinus radiatus, a Mediterranean fish, has flat tubercular gill-rakers on the outer sides of the inner arches covered with minute teeth. The upper pharyngeal teeth are in two separate plates on each side, the upper one long and narrow, the lower one of a long oval shape; its lower margin stands away from the mucous membrane below it. The lower pharyngeal teeth are on two broad triangular patches, close together at the anterior apex, but diverging very much at the posterior end.

URANOSCOPIDÆ.

Uranoscopus scaber, a Mediterranean fish. The upper and lower pharyngeal teeth are cardiform. The upper ones are in a circular patch, from which a few project very visibly; the remainder are embedded in mucous membrane, with the points showing. In the lower pharyngeal teeth, those near the middle of the mouth are more distinct along the middle line; the others are smaller, but a finger drawn against them gives a notion of the grip they would take of any food in the act of swallowing.

CALLIONYMIDÆ.

Callionymus lyra (the Skulpin, also Dragonet), has short, smooth, soft gill-rakers on each side of its branchial arches. The upper pharyngeal teeth are set on two round shields; the uppermost one attached to the head of the second epibranchial arch can be easily moved, showing their separate condition. The pharyngeal teeth are cardiform and rather sparsely sown over the upper and lower pharyngeal bones on which they are set. Crustaceans form a part of the diet of this fish; a sand-hopper, one of the Amphipoda, was taken out of the gullet of the specimen examined.

BLENNIDÆ.

Blennius gattorugine, the "Gattorugine," Couch, who also says it is known as "Tompot" by fishermen in the West of England. It has seven stunted horny gill-rakers on the first cerato-hypobranchial. The other arches have them on the inside and outside, but distantly placed from each other, so that the filter made is not a very good one. The upper pharyngeal teeth, which are cardiform, are set in two curved rows on each side attached to the upper part of the third and fourth epibranchials. The lower pharyngeal teeth are in a row, each side forming a V, with its apex directed forward.

Blennius ocellaris (the Butterfly Blenny) has nine soft gill-rakers on the cerato-hypobranchial of the first arch that have fine bristles at the extremities of several of them; there are two gill-rakers on the epibranchial. The gill-rakers of the other arches are tubercles. The upper pharyngeal teeth arranged in one patch on each side, the upper portion of which has cardiform teeth placed in a curved row and standing up distinctly. The

lower pharyngeal teeth are also cardiform; those along the forward end stand well up. Fig. II., 1.

Blennius sanguinolentus, a Mediterranean fish, has six up-standing but feeble-looking gill-rakers on the first cerato-hypobranchial arch. On the outer sides of the second, third, and fourth arches the gill-rakers look as if made of a fold of skin gathered into a series of pleats, but with a corner standing up. This seems to make a very efficient filter apparatus. The upper pharyngeal teeth consist of two rows of cardiform teeth, with the mucous membrane above them very prominent and soft and overlapping them.

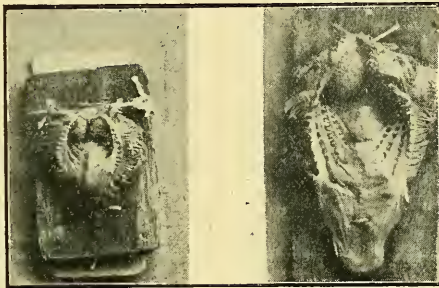


FIG. II.

1.—*BLENNIUS OCELLARIS*. 2.—*GOBIOUS CAPITO*.

Anarrhichas lupus, called the "Wolf-fish" by Couch, who also gives "Cat-fish" as a name; the fishermen on the East Coast and Billingsgate dealers call it the "Cat-fish," from the resemblance of its head to that of a cat. This fish has fourteen short, thick, horny gill-rakers on the first cerato-hypobranchial arch, that do not come to a point at the extremity but which have two shoulders with a broad point protruding above them. There are four gill-rakers on the first epibranchial. The longest gill-raker on the first arch is only in length about one-fourth of the depth of the gill-lamina below it. The inner side of the first and both of the three other branchial arches, bearing gills, have very short outstanding gill-rakers. None of these gill-rakers are toothed. The upper pharyngeal teeth consist of a row of blunt conical teeth, slightly curved at the points on the head of the second, with a double row on the heads of the third

and fourth epibranchials, which have also a half row on the lower portion. The lower pharyngeal teeth are also conical, stronger at the anterior end than at the posterior; they stand in three rows at the anterior, diminishing to two rows at the posterior end. The food of this fish consists of lobsters, crabs, and molluscs. The mouth was full of chewed-up food, and a small tooth-brush had to be used to clean the pharyngeal teeth before they could be well observed.

Gobiidæ.

Gobius capito has ten upstanding gill-rakers from the angle to the end of the first cerato-hypobranchial arch, with one only on its epibranchial. The inner side of the first arch has tubercle gill-rakers, as have also the other arches. Between the branchial arches these tubercles are alternate, but they do not make a very close filter. The upper pharyngeal teeth appear as one large circular patch of cardiform teeth, much embedded in mucous membrane so that only the points show; when felt with the finger they are very palpable. The lower pharyngeal teeth are also embedded in mucous membrane, and show even less than the upper ones do, but again they are very palpable to the finger. Fig. II., 2.

Gobius niger (the Rock Goby, Couch). The pharyngeal teeth in this fish are villiform.

Gobius microps and *G. minutus* (the Tail-Spotted Goby, Couch). Each of them has sharp little cardiform teeth for the upper and lower pharyngeal teeth. In the mouth of one of the latter a small Amphipod, generally known as a "sandhopper," was found.

Scorpenidæ.

Scorpena scrofa, a Mediterranean fish. The gill-rakers are very short and far apart, one on the first cerato-hypobranchial arch, with four on the epibranchial; these all bear small teeth. On the inner side of the first arch there are six tubercles with small teeth on their summits. On the second and third branchial arches there are eight tubercles of a flattened dome shape on the outer side, and eight upstanding tubercles on the inner side, with three tubercles on the second epibranchial. The fourth

arch has five flat dome-shaped tubercles. All these tubercles also are teeth-bearing. The upper pharyngeal teeth consist of a long narrow patch on the second epibranchial, an irregular oblong patch on the third epibranchial, with another narrow piece running down this epibranchial, and on the fourth epi-

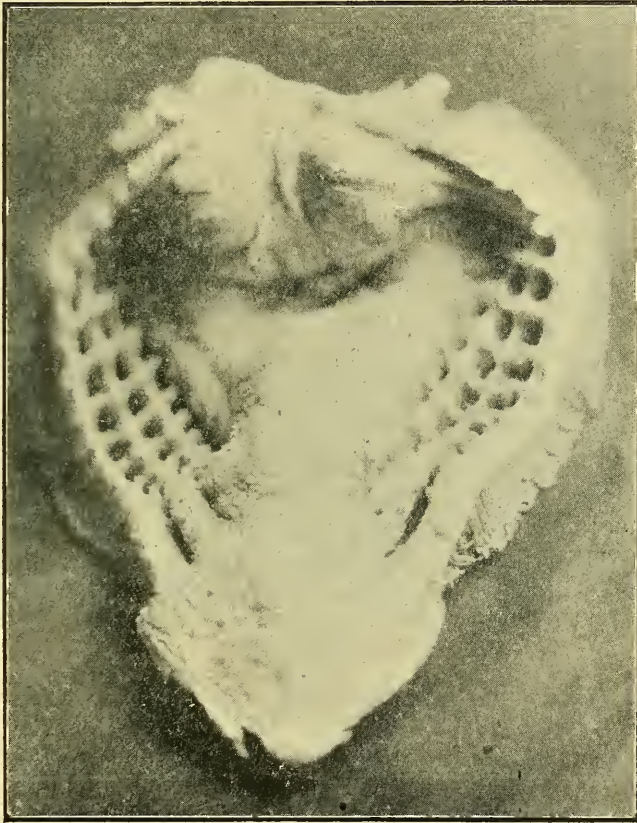


FIG. III.—SCORPÆNA SCROFA.

branchial a roughly circular patch that has its lower margin projecting from the mucous lining of the back of the mouth. The lower pharyngeal teeth are arranged in a roughly diagonal patch. All the pharyngeal teeth are cardiform. Fig. III.

Sebastes imperialis, a Mediterranean fish. The upper and lower pharyngeal teeth are minute cardiform teeth. Fig. IV., 1.

BALISTIDÆ.

Balistes capriscus (the File-fish, also called "Trigger-fish") occasionally found in the South of England, plentiful in the Mediterranean, has twenty-four horny gill-rakers on the first cerato-hypobranchial arch, with five on the epibranchial part; on the other arches there are tubercles. The upper pharyngeal teeth are cardiform, and set far back in the pharynx. The lower pharyngeal teeth are a few cardiform teeth in the middle line of the floor of the gullet. This fish feeds on the coral insects and on Mollusca, which its powerful front teeth enable it to do. Fig. IV., 2.

Balistes erythrodon, from the Indian Ocean, has twenty-six horny gill-rakers on the first branchial arch from the angle to the end of the hypobranchial, and six on the first epibranchial. The other gill-rakers consist of tubercles, but not quite such pointed ones as in the next to be described fish. The upper pharyngeal teeth are cardiform and not very numerous. The lower pharyngeal teeth are in two rows on the margins of the lower pharyngeal bone; they are small, and can be felt better than seen.

Balistes niger, from the Indian Ocean, has twenty fine horny gill-rakers along the first cerato-hypobranchial, with eight along its epibranchial; the other arches carry tubercle gill-rakers of an elongated pointed shape that fit in alternately and form a very close filter. The pharyngeal teeth are cardiform, and set far back in the gullet.

CICHLIDÆ.

Cichlosoma bimaculatum (called the "Putwa" at Demerara) has five short, upstanding gill-rakers, the longest about one-fourth the depth of the gill-lamina below it, on the first cerato-hypobranchial arch, with one on the first epibranchial. There are gill-rakers on each side of the other arches. The upper pharyngeal teeth are in two small patches, speckled over with little brown teeth, on the heads of the third and fourth epibranchials. There are minute brown teeth for the lower pharyngeals, speckled over a triangular patch.

Crenicichla saxatilis, from British Guiana, has on the first cerato-hypobranchial arch seven short upstanding gill-rakers which bear teeth, with two on its epibranchial. The other arches have gill-rakers inside and outside. The upper pharyngeal teeth consist of an elongated patch, on the third epibranchial, of small

teeth, and on the fourth a patch of strong conical teeth. The lower pharyngeals are in a triangular patch. The bones of the fifth arch are united.

Hemichromis bimaculatus, a Nile fish, has five gill-rakers on the first cerato-hypobranchial, with two on the epibranchial of the first arch. The upper and lower pharyngeal teeth are minute cardiform ones of a dark colour.

Tilapia nilotica, a Nile fish, has twenty-two soft but up-standing gill-rakers on the cerato-hypobranchial part of the first arch, with six on its epibranchial. The inside of the first arch and both sides of the other arches have gill-rakers that fit in

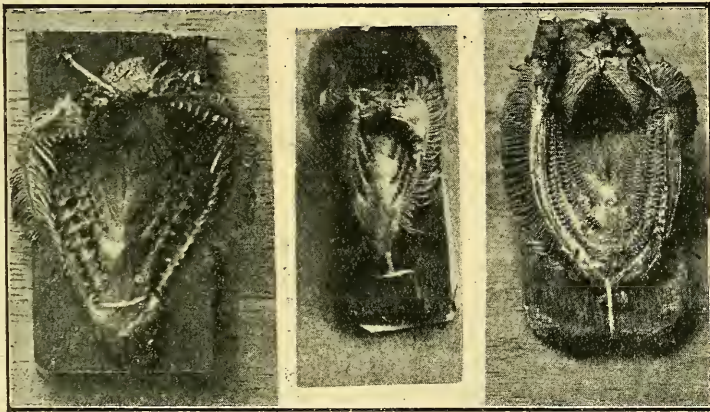


FIG. IV.

1.—SEBASTES IMPERIALIS. 2.—BALISTES CAPRISCUS. 3.—TILAPIA NILOTICA.

opposite to each other so closely as to make a very efficient filter. The upper pharyngeal teeth are placed in two oval-shaped shields on each side, and are cardiform teeth of a blackish brown colour, the multiplicity of fine points giving the whole shield of teeth a dusky hue. The lower pharyngeal teeth are in a triangular patch across the whole floor of the gullet just in front of the œsophagus, with no median division; the dark colour, however, is not so marked as in the upper pharyngeal teeth, those toward the forward apex merging into white. The base of the tongue and the mucous surface of the basibranchials is worked with corrugations in pattern like the veining of some leaf. Fig. IV., 3.

(To be continued.)

NOTES AND QUERIES.

MAMMALIA.

Rats and their Parasites.—I am trying to make a list of the parasitic Acari found on Rats (*Epimys norvegicus*, *E. rattus*, and *E. alexandrinus*) in this country, and would be very grateful for any specimens of these rodents for examination. If the bodies of Rats are placed in a tin with a closely fitting lid as soon as possible after death and sent at once by post their parasites will survive the journey. Even one or two specimens from a single locality are useful.—STANLEY HIRST (British Museum (Nat. Hist.), Cromwell Road, London, S.W.).

AVES.

Status of the Starling.—This year we have not had such vast flocks of young Starlings in June as compared with recent years, which is somewhat strange, as this species has multiplied enormously of late years. I had an old friend, who died recently, who used to tell me he remembered quite well the first pair of Starlings breeding in Wilsden; and, writing to Mr. Harvie Brown in 1894, the late Duke of Argyll said: "I never saw a Starling till I went to England in 1836. I still recollect the great interest with which I saw the bird for the first time at the posting inn at Northallerton, in Yorkshire." Yet Jenyns's 'Manual of British Vertebrate Animals,' which was published in 1835, states that this species was plentiful and widely dispersed. Since the sixties there is no doubt but that it has been steadily increasing in numbers. It would be interesting to have it established on incontestable evidence that the Starling was unknown in many parts of Yorkshire previous to 1830.—E. P. BUTTERFIELD (Wilsden).

The Grey Lag Goose in Cumberland.—In 'The Zoologist' (*ante*, p. 346) I was surprised to see Mr. Bolam's statement that "the occurrence of *Anser cinereus* in any of the northern counties of England is always sufficiently rare at any season to make it worth putting on record." On the Cumberland Solway Marshes this species is now plentiful throughout the winter months.—ERIC B. DUNLOP (The Howe, Troutbeck, Windermere).

Notes from Wilsden.—Recently a Cuckoo's egg was found in the nest of a Ring-Ouzel on the moor above Bingley, which is a very rare occurrence here. The only other instance I have known I reported over twenty years ago; in this case the egg was found by two of my sons in a nest on Harden Moor. Also the egg of the Cuckoo has been found in the nest of a Robin a few miles from this village—another rare occurrence in the North-west Riding of Yorkshire. A male Pied Flycatcher took up its quarters for a short time in May in a likely nesting part of Bingley Wood, but ultimately left, I presume for a more suitable breeding haunt; but a more ideal breeding place than one or two places in Bingley Wood, from the human standpoint, it would be difficult to find for this species. It is gratifying to report again the nesting of the Hawfinch.—E. P. BUTTERFIELD (Wilsden).

INSECTA.

A Little-known Dipterous Parasite.—On coming downstairs on Aug. 16th, I saw a small Dipteran (*Simulium ornatum*) on the window-pane, and this insect seemed to enjoy its usual activity until a drop of benzine proved fatal. I then mounted it on a slip of cardboard, when what seemed a huge cabbage-green snake-like creature suddenly crept forth from its abdomen. Its dorsal side was incised like that of a *Julus*, and its head had some resemblance to a finger-nail. I do not recall having seen any notice of this parasite, but someone may have been more fortunate. After much wriggling the parasite attacked the thorax of the dead insect.—A. H. SWINTON (Braishfield, Romsey, Hampshire).

[I procured the *Simulium* and parasite from Mr. Swinton, and took them to the British Museum, where I sought the advice of a well-known dipterist, Mr. F. W. Edwards, who has kindly contributed the following note. Mr. H. A. Baylis has written on the identity of the parasite.—ED.]

“The worm described by Mr. Swinton probably belongs to the Nematode family *Mermithidæ*, the members of which parasitise a great variety of insects both in the larval and imaginal stages. Siebold (Stett. entom. Zeit. 1848, p. 299) and Strickland (Biol. Bull. Woods Hole, Mass., 1911) record species of *Mermis* occurring in the larvæ of *Simulium reptans* and *S. hirtipes* respectively, but Strickland (p. 326, *op. cit.*) states that “the *Mermis* does not affect the larval development to any extent, except by slightly increasing its size, but it inhibits the development of the histoblasts to such an extent that pupation becomes impossible.” Some species of *Mermis*, however,

apparently attack all the stages of their host, *e. g.* *M. albicans*, which is said by Miall and Hammond ('The Harlequin-fly,' p. 6, 1900) to infest the larva, pupa, and imago of *Chironomus*. I have been unable to trace any reference to a species of *Mermis* or *Gordius* having been recorded from an adult *Simulium*, nor can I find that any of these worms have been described as being green, whitish being the usual colour."—F. W. EDWARDS (British Museum (Nat. Hist.)).

"The small Nematode from the body cavity of *Simulium* answers closely to the description given by Siebold (in Stett. entom. Zeit. 1848, p. 299) of a species from the larva of *Simulium reptans*. The description is very meagre, but I see no reason to think we have got a different species here. If this is correct, the species would be *Mermis Simulicæ reptantis*, Sieb."—H. A. BAYLIS (Brit. Mus.).

NOTICES OF NEW BOOKS.

The British Parasitic Copepoda. By THOMAS SCOTT, LL.D., F.L.S., and ANDREW SCOTT, A.L.S. 2 vols. Ray Society. Dulau & Co., Ltd.

'A Monograph of the Free and Semi-Parasitic Copepoda,' by Dr. G. S. Brady, was published by the Ray Society in 1878–1880, but from this work those found parasitic on fishes were expressly omitted. "The present Monograph is the result of an endeavour to enumerate and describe the species which Dr. Brady has excluded, and may therefore be regarded as supplementary to that author's work." Dr. Baird's work on 'The Natural History of the British Entomostraca,' published by the Ray Society in 1850, recorded thirty-four species of Copepoda as parasitic on British fishes; the number is now increased to one hundred and thirteen. The enumeration and descriptions are given in a very careful and thorough manner, while the second volume is devoted to illustrations, mostly coloured, which provide the material for no fewer than seventy-two plates. British naturalists may well welcome such a guide and addition to their scanty knowledge on these obscure and little-known creatures.

A Bibliography of the Tunicata, 1469-1910. By JOHN HOPKINSON, F.L.S., F.G.S., F.Z.S. Ray Society. Dulau & Co., Ltd.

A BIBLIOGRAPHY on a special branch of zoology is one of the most cherished possessions in a naturalist's library. It makes so much possible; it enables and incites us to study first hand many old and some more modern treatises which we scarcely retained in memory, so generously are we now provided with up-to-date publications. But scattered in these older writings are often to be found the germs of many modern theories and conclusions, as well as observations and facts which have not always filtered down in our modern literature, though sometimes well known, but scarcely attributed to their original promulgators. This Bibliography has evidently been a work of love to Mr. Hopkinson, for such a compilation can never be adequately made in a perfunctory manner; it is a labour only achieved by personal inspiration and impulse. Among students of the Tunicata this book will be what Hagen's 'Bibliotheca Entomologica' is to entomologists.

Pond Life. By Rev. CHARLES A. HALL, F.R.M.S. Adam & Charles Black.

A KNOWLEDGE of natural history often bears an inverse ratio to the extent of the area over which it is studied. Long journeys frequently only provide desultory study; one goes to find certain things and others are unnoticed. How few of us really know the flora and fauna of our own gardens? and it takes a good naturalist to do so. This little book confines its description to the plant and animal life to be found in and on the banks of a pond, accepting that word in its larger significance. Years of work and observation may be expended on such a quest, and many problems will have to be answered before we can pretend to know "pond-life"; nor could such a small book serve to be anything but an introduction to the subject. Volumes might be written on such an apparently small theme, for to know the great is to know the little. Mr. Hall has written an excellent and interesting book for the young student or general reader, and it may surprise many to learn the mass of living creatures, both plant and animal, that may be studied almost just outside their own doors.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF
SCIENCE, BIRMINGHAM, 1913.

ADDRESS TO THE ZOOLOGICAL SECTION.

BY H. F. GADOW, M.A., PH.D., F.R.S., *President of the Section.*

(Concluded from p. 360.)

CATEGORIES OF HOMOPLASY.

Isotely.—If the character, feature, or organ has been evolved out of homologous parts or material, as is most likely the case in closely related groups, and if the subsequent modifications proceed by close resemblance. *Iso-tely*: the same mark has been hit.

Homæotely.—Although the feature has been evolved from homologous parts or material, the subsequent modifications may proceed by similar stages and means, there is a fair probability or chance of very different stages and means, and the ultimate resemblance will be less close, and deficient in detail. Such cases are most likely to happen between groups of less close affinity, whether separated by distance or by time. *Homæo-tely*: the same end has been fairly well attained. The target has been hit, but not the mark.

Parately.—The feature has been evolved from parts and material so different that there is scarcely any or no relationship. The resulting resemblance will at best be more or less superficial; sometimes a sham, although appealing to our fancy. *Para-tely*: the neighbouring target has been hit.

EXAMPLES.

Isotely; Bill of the *Ardeidæ* *Balæniceps* (Africa) and *Cancroma* (Tropical America).

Zygodactyle foot of *Cuckoos*, *Parrots*, *Woodpeckers* ($\frac{2.3}{1.4}$).

Patterns and coloration of *Elaps* and other snakes.

Parachute of *Petaurus* (marsupial); *Pteromys* (rodent) and *Galeopithecus*.

Perissodactylism of *Litopterna* and Hippoids.

Bulla auris of *Plioplatecarpus* (*Pythonomorpha*) and certain Whales; if tympanic = quadrate.

Grasping instruments or nippers in Arthropods: pedipalps of *Phryne*; chelæ of Squill; first pair of Mantis' legs.

General appearance of Moles and *Notoryctes*, if both considered as mammals; of Gulls and Petrels, if considered as birds.

Homæotely: Heterodactyle foot of Trogons ($\frac{3.4}{2.1}$).

Jumping foot of *Macropus*, *Dipus*, *Tarsius*.

Intertarsal and cruro-tarsal joint.

Fusion and elongation of the three middle metatarsals of *Dipus* and *Rhea*.

Paddles of Ichthyosaurs. Turtles, Whales, Penguins.

“ Wings ” of Pterosaurs and Bats.

Long flexible bill of *Apteryx* and Snipes.

Proteroglyph dentition of Cobras and Solenoglyph dentition of Vipers.

Loss of the shell of *Limax* and *Aplysia*.

Complex molar pattern of Horse and Cow.

Parately: Bivalve shell of Brachiopods and Lamellibranchs.

Stretcher-sesamoid bone of Pterodactyls (radial carpal); of Flying Squirrels (on pisiform); of *Anomalurus* (on olecranon).

Bulla auris of Pythonomorph (quadrate) and Whale (tympanic); is *incus* = quadrate.

“ Wings ” of Pterosaurs, or Bats, and Birds.

The distinction between these three categories must be vague because that between homology and analogy is also arbitrary, depending upon the standpoint of comparison. As lateral outgrowths of vertebræ all ribs are homogenes, but if there are at least hæmal and pleural ribs then those organs are not homologous even within the class of fishes. If we trace a common origin far enough back we arrive near bedrock with the germinal layers. So there are specific, generic, ordinal, &c., homoplasies. The potentiality of resemblance increases with the kinship of the material.

Bateson, in his study of Homœosis, has rightly made the solemn quotation: “ There is the flesh of fishes . . . birds . . . beasts, &c.” Their flesh will not and cannot react in exactly the same way under otherwise precisely the same conditions, since each kind of flesh is already biased, encumbered by inheritances. If a certain resemblance between a reptile and mammal dates from Permian times, it may be homogenous, like the pentadactyle limb which as such has persisted: but if that resemblance has first appeared in the Cretaceous period it is Homoplastic, because it was brought about long after the class division. To cases within the same order we give the benefit of the doubt more readily than if the resemblance concerned members of two orders, and between the phyla we rightly seek no connection. However, so strongly is our mode of thinking influenced by the principle of descent that, if the same feature happen to crop up in more than two orders, we are biased against Homoplasia.

The readiness with which certain Homoplasies appear in related groups seems to be responsible for the confounding of the potentiality of convergent adaptation with a latent disposition, as if such cases of Homoplasia were a kind of temporarily deferred repetition, *i. e.* after all due to inheritance. This view instances certain recurring tooth patterns, which, developing in the embryonic teeth, are said not to be due to active adaptation or acquisition but to selection of accomplished variations, because it is held inconceivable that use, food, &c., should act upon a finished tooth. It is not so very difficult to approach the solution of this apparently contradictory problem. Teeth, like feathers, can be influenced long before they are ready by the life experiences of their predecessors. A very potent factor in the evolution of Homoplasies is correlation, which is sympathy, just as inheritance is reminiscence. The introduction of a single new feature may affect the whole organism profoundly, and one serious case of

Isotely may arouse unsuspected correlations and thus bring ever so many more homoplasies in its wake.

Function is always present in living matter; is its life. It is function which not only shapes but creates the organ or suppresses it, being indeed at bottom a kind of reaction upon some stimulus, which stimuli are ultimately all fundamental, elementary forces, therefore few in number. That is a reason why Nature seems to have but few resources for meeting given "requirements"—to use an everyday expression which really puts the cart before the horse. This paucity of resources shows itself in the repetition of the same organs in the most different phyla. The eye has been invented dozens of times. Light, a part of the environment, has been the first stimulus. The principle remains the same in the various eyes; where light found a suitably reacting material a particular evolution was set going, often round about, or topsy-turvy, implying amendments; still, the result was an eye. In advanced cases a scientifically constructed dark chamber with lens, screen, shutters, and other adjustments. The detail may be unimportant, since in the various eyes different contrivances are resorted to.

Provided the material is suitable, plastic, amenable to prevailing environmental or constitutional forces, it makes no difference what part of an organism is utilised to supply the requirements of function. You cannot make a silk purse out of a sow's ear, but you can make a purse, and that is the important point. The first and most obvious cause is function, which itself may arise as an incidental action due to the nature of the material. The oxydising of the blood is such a case, and respiratory organs have been made out of whatever parts invite osmotic contact of the blood with air or water. It does not matter whether respiration is carried on by ecto- or by endodermal epithelium. Thus are developed internal gills, or lungs, both of which may be considered as referable to pharyngeal pouches: but where the outer skin has become suitably osmotic, as in the naked Amphibia, it may evolve external gills. Nay, the whole surface of the body may become so osmotic that both lungs and gills are suppressed, and the creature breathes in a most pseudo-primitive fashion. This arrangement, more or less advanced, occurs in many Urodeles, both American and European, belonging to several sub-families, but not in every species of the various genera. It is therefore a case of apparently recent Isotely.

There is no prejudice in the making of a new organ except in so far that every organism is conservative, clinging to what it or its ancestors have learnt or acquired, which it therefore seeks to recapitulate. Thus in the vertebrata the customary place for respiratory organs is the pharyngeal region. Every organism, of course, has an enormous back history; it may have had to use every part in every conceivable way, and it may thereby have been trained to such an extent as to yield almost at once, like a bridle-wise horse, to some new stimulus, and thus initiate an organ straight to the point.

Considering that organs put to the same use are so very often the result of analogous adaptation, homoplasts with or without affinity of

descent, are we not justified in accusing morphology of having made rather too much of the organs as units, as if they were concrete instead of inducted abstract notions? An organ which changes its function may become a unit so different as to require a new definition. And two originally different organs may come to resemble each other so much in function and structure that they acquire the same definition as one new unit. To avoid this dilemma the morphologist has, of course, introduced the differential of descent, whether homologous or analogous, into his diagnoses of organs.

The same principles must apply to the classification of the animals. To group the various representative owners of cases of isotely together under one name, simply because they have lost those characters which distinguished their ancestors, would be subversive of phyletic research. It is of the utmost significance that such "convergences" (rather "mergers," to use an administrative term) do take place, but that is another question. If it could be shown that elephants in a restricted sense have been evolved independently from two stems of family rank, the convergent terminals must not be named *Elephantinae*, nor can the representatives of successive stages or horizons of a monophyletic family be designated and lumped together as subfamilies. And yet something like this practice has been adopted from Cope by experienced zoologists with a complete disregard of history, which is an inalienable and important element in our science.

This procedure is no sounder than would be the sorting of our Cartwrights, Smiths, and Bakers of sorts into as many natural families. It would be subversive of classification, the aim of which is the sorting of a chaos into order. We must not upset the well-defined relative meaning of the classificatory terms which have become well-established conceptions; but what such an assembly as the terminal elephants should be called is a new question, the urgency of which will soon become acute. It applies at least to assemblies of specific, generic, and family rank, for each of which grades a new term, implying the principle of convergence, will have to be invented. In some cases geographical terms may be an additional criterion. Such terms will be not only most convenient, but they will at once act as a warning not to use the component species for certain purposes. There is, for instance, the case of *Typhlops braminus*, mentioned at the beginning of this Address. Another case is the dog species, called *Canis familiaris*, about which it is now the opinion of the best authorities that the American dogs of sorts are the descendants of the Coyote, while some Indian dogs are descendants of a jackal, and others again are traceable to some wolf. The "dog," a definable conception, has been invented many times, and in different countries and out of different material. It is an association of converged heterogeneous units. We have but a smile for those who class whales with fishes, or the blindworm with the snakes; not to confound the Amphibian Cœcilians with Reptilian *Amphisbænas* requires some training; but what are we to do with creatures who have lost or assimilated all those differential characters which we have got used to rely upon?

In a homogeneous crowd of people we are attracted by their little differences, taking their really important agreements for granted; in a compound crowd we at once sort the people according to their really unimportant resemblances. That is human nature.

The terms "convergence" and "parallelism" are convenient if taken with a generous pinch of salt. Some authors hold that these terms are but imperfect similes, because two originally different organs can never converge into one identical point, still less can their owners whose acquired resemblance depresses the balance of all their other characters. For instance, no lizard can become a snake, in spite of ever so many additional snake-like acquisitions, each of which finds a parallel, an analogy in the snakes. Some zoologists therefore prefer contrasting only parallelism and divergence. A few examples may illustrate the justification of the three terms. If out of ten very similar black-haired people only two become white by the usual process, while the others retain their colour, then these two diverge from the rest; but they do not, by the acquisition of the same new feature, become more alike each other than they were before. Only with reference to the rest do they seem to liken as they pass from black through grey to white, our mental process being biased by the more and more emphasized difference from the majority.

10	Ax	Bx	Cx	D	E	F
9						
8						
7						
6						
5						
4						
3						
2	Ax	Bx				
1	A	B	C	D	E	F

Supposing A and B both acquire the character X and this continues through the next ten generations, while in the descendants of C the same character is invented in the tenth generation, and whilst the descendants of D, E, F still remain unaltered. Then we should be strongly inclined, not only to "key together" $C_{\frac{x}{10}}$ with $A_{\frac{x}{10}}$ and $B_{\frac{x}{10}}$, but take this case for one of convergence, although it is really one of parallelism. If it did not sound so contradictory, it might be called parallel divergence. The inventors diverge from the majority in the same direction: Isotely.

Third case.—Ten people, contemporaries, are alike but for the black or red hair. Black A turns white and Red E turns white, not through exactly identical stages, since E will pass through a reddish grey tinge. But the result is that A and E become actually more like each other than they were before. They *converge*, although they have gone in for exactly the same divergence with reference to the majority.

In all three cases the variations begin by divergence from the majority, but we can well imagine that all the members of a homo-

geneous lot change orthogenetically (this term has been translated into the far less expressive "rectigrade") in one direction, and if there be no lagging behind, they all reach precisely the same end. This would be a case of transmutation (true mutations in Waagen's and Scott's sense), producing new species without thereby increasing their number, whilst divergence always implies, at least potentially, increase of species, genera, families, &c.

If for argument's sake the mutations pass through the colours of the spectrum, and if each colour be deemed sufficient to designate a species, then, if all the tenth generations have changed from green to yellow and those of the twentieth generation from yellow to red, the final number of species would be the same. And even if some lagged behind, or remained stationary, these epistatic species (Eimer) are produced by a process which is not the same as that of divergence or variation in the usual sense.

The two primary factors of evolution are Environment and Heredity. Environment is absolutely inseparable from any existing organism, which therefore must react (Adaptation) and at least some of these results gain enough momentum to be carried into the next generation (Heredity).

The life of an organism, with all its experiments and doings, is its Ontogeny, which may therefore be called the subject of Evolution, but not a factor. Nor is Selection a primary and necessary factor, since, being destructive, it invents nothing. It accounts, for instance, for the composition of the present fauna, but has not made its components. A subtle scholastic insinuation lurks in the plain statement that by ruthless elimination a black flock of pigeons can be produced, even that thereby the individuals have been made black. (But of course the breeder has thereby not invented the black pigment.)

There can be no evolution, progress, without response to stimulus, be this environmental or constitutional, *i. e.* depending upon the composition and the correlated working of the various parts within the organism. Natural selection has but to favour this plasticity, by cutting out the non-yielding material, and through inheritance the adaptive material will be brought to such a state of plasticity that it is ready to yield to the spur of the moment, and the foundation of the same new organs will thereby be laid, whenever the same necessity calls for them. Here is a dilemma. On the one hand the organism benefits from the ancestral experience, on the other there applies to it de Rosa's law of the reduction of variability, which narrows the chances of change into fewer directions. But in these few the changes will proceed all the quicker and farther. Thus progress is assured, even Hypertely, which may be rendered by "over-doing a good thing."

Progress really proceeds by mutations, spoken of before, orthogenesis, and it would take place without selection and without necessarily benefiting the organism. It would be mere presumption that the seven-gilled shark is worse off than its six- or five-gilled relations; or to imagine that the newt with double trunk-veins suffers

from this arrangement, which morphologically is undoubtedly inferior to the unpaired, azygous, &c., modifications. The fact that newts exist is proof that they are efficient in their way. Such orthogenetic changes are as predictable in their results as the river which tends to shorten its course to the direct line from its head waters to the sea. That is the rivers Entelechy and no more due to purpose or design than is the series of improvements from the many gill-bearing partitions of a shark to the fewer, and more highly finished comb-shaped gills of a Teleostean fish.

The success of adaptation, as measured by the morphological grade of perfection reached by an organ, seems to depend upon the phyletic age of the animal when it was first subjected to these "temptations." The younger the group, the higher is likely to be the perfection of an organic system, organ, or detail. This is not a platitude. The perfection attained does not depend merely upon the length of time available for the evolution of an organ. A recent Teleostean has had an infinitely longer time as a fish than a reptile, and this had a longer time than a mammal, and yet the same problem is solved in a neater, we might say in a more scientifically correct, way by a mammal than by a reptile, and the reptile in turn shows an advance in every detail in comparison with an amphibian, and so forth.

A few examples will suffice:—

The claws of reptiles and those of mammals; there are none in the amphibians, although some seem to want them badly, like the African frog *Gampsosteonyx*, but its cat-like claws, instead of being horny sheaths, are made out of the sharpened phalangeal bones which perforate the skin.

The simple contrivance of the rhinocerotie horn, introduced in Oligocene times, compared with the antlers of Miocene *Cervicornia* and these with the response made by the latest of Ruminants, the hollow-horned antelopes and cattle. The heel-joint; unless still generalised, it tends to become intertarsal (attempted in some Lizards, pronounced in some Dinosaurs and in the Birds) by fusion of the bones of the tarsus with those above and below, so that the tarsals act like epiphysial pads. Only in mammals epiphyses are universal. Tibia and fibula having their own, the pronounced joint is cruro-tarsal and all the tarsals could be used for a very compact, yet non-rigid arrangement. The advantage of a cap, not merely the introduction of a separate pad, is well recognized in engineering.

Why is it that mammalian material can produce what is denied to the lower classes? In other words, why are there still lower and middle classes? Why have they not all by this time reached the same grade of perfection? Why not indeed, unless because every new group is less hampered by tradition, much of which must be discarded with the new departure; and some of its energy is set free to follow up this new course, straight, with ever growing results, until in its turn this becomes an old rut out of which a new jolt leads once more into fresh fields.

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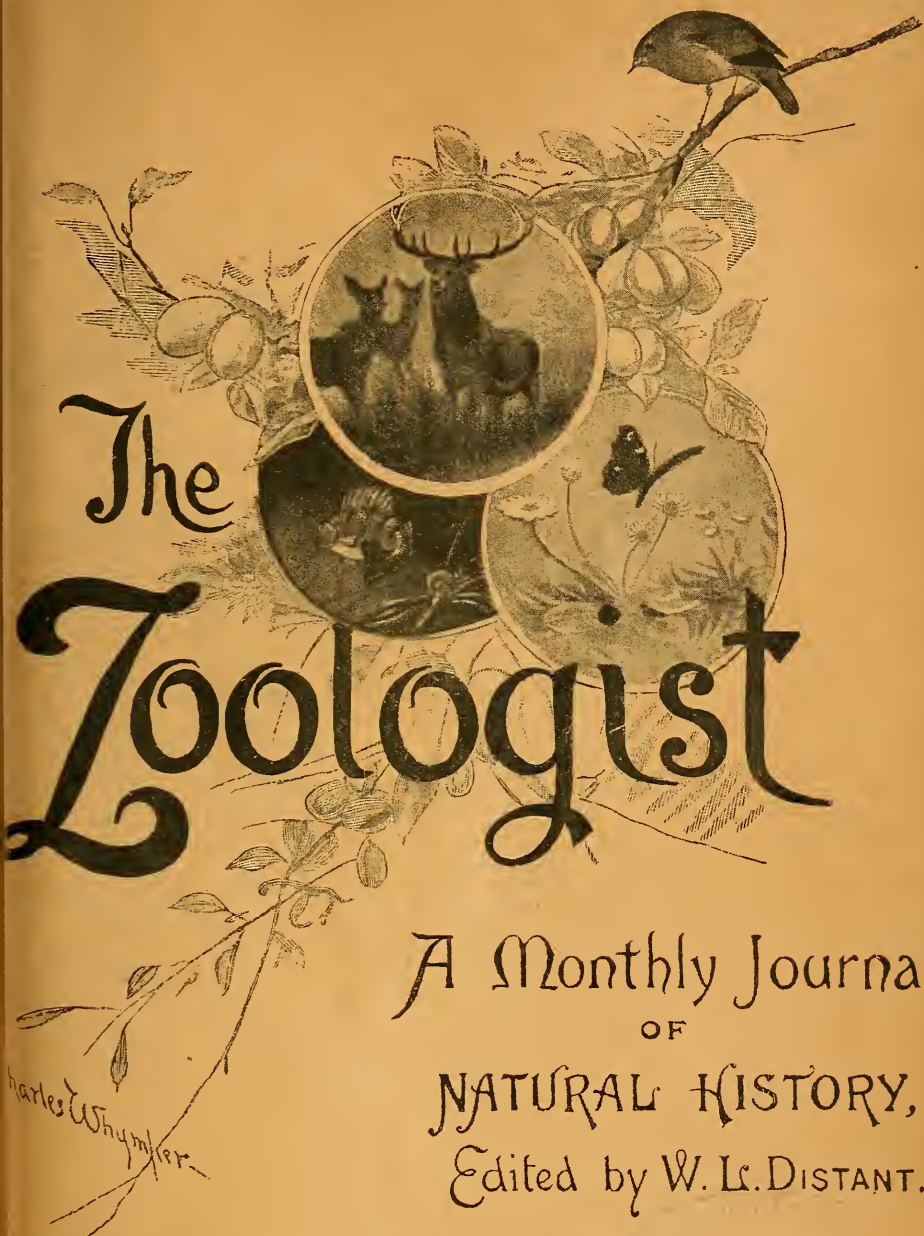
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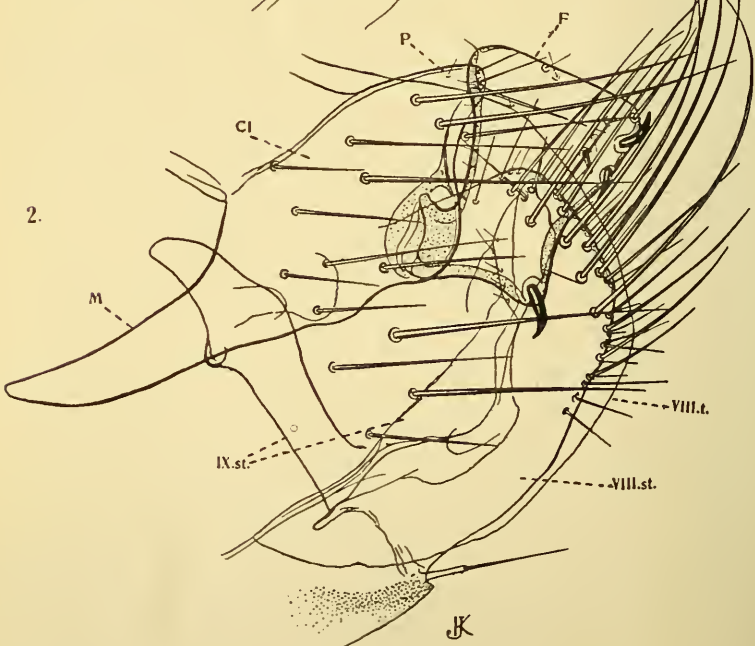
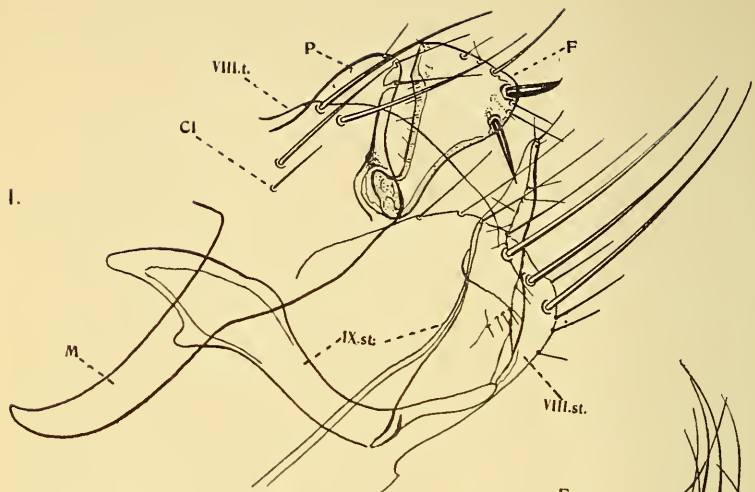
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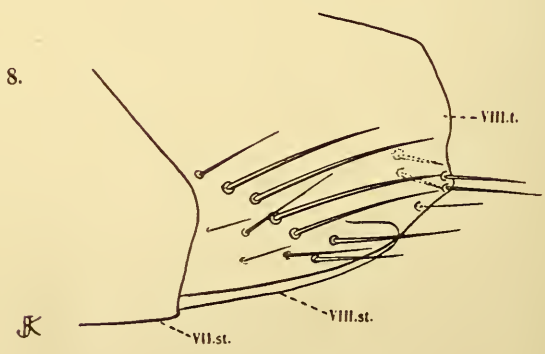
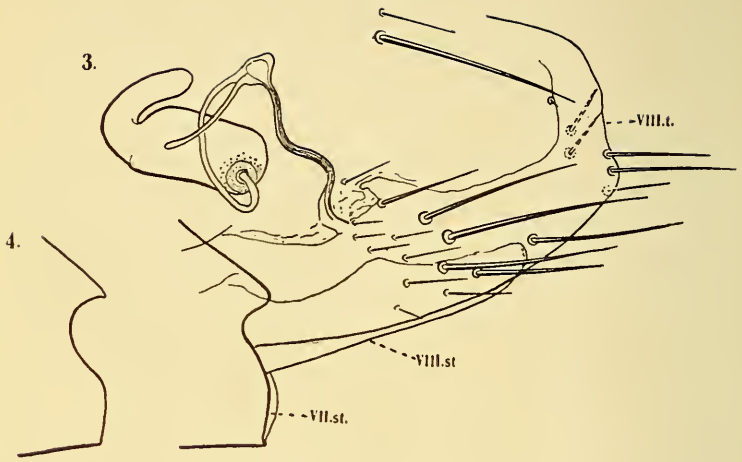
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AMPHIPSYLLA.



AMPHIPSYLLA.

THE ZOOLOGIST

No. 869.—November 15th, 1913.

ON THE GENUS *AMPHIPSYLLA*, WAGN. (1909).

BY K. JORDAN, Ph.D., AND THE HON. N. CHARLES ROTHSCHILD, M.A.

(PLATES II. & III.)

PROFESSOR WAGNER proposed *Amphipsylla* for two new species of Siphonaptera from Asiatic Russia, and gave a review in 1912 of the species known to him as belonging to this genus.

The species contained in *Amphipsylla* form a natural group, being all closely allied to one another, and we perfectly agree with Wagner that they should be placed together in a separate genus. The species mentioned by Wagner are *sibirica*, *shelkovnikovi*, *dæa*, *rossica*, and *kuznetzovi*. We add to this list five more species, two of which are here described for the first time. This considerable addition to the genus renders a slight modification of the diagnosis necessary, as some of the characters mentioned by Wagner do not hold good.

In his revised diagnosis (1912) Wagner states that both sexes have two antepygidial bristles. This is a pen-slip, all the species having three such bristles.

We consider *Amphipsylla* to be an offshoot from *Ceratophyllus*, from which it is distinguishable by the following combination of characters:—

Head with three rows of bristles across frons and occiput; frons strongly rounded. Eye reduced. Antennal groove open, in male continued on to the propleurum. Bristles of second antennal segment short in both sexes. Hind margin of pronotum

slightly incurved. First segment of maxillary palpus longer than the second. Fore femur with several small lateral bristles on outside, hind femur without a subventral row of bristles. Mid and hind tibiae with two to four single dorsal bristles in between the postmedian and subapical dorsal pairs. Bristles of tarsi short, fifth segment with the first pair of plantar bristles moved on to the ventral surface. In the male the eighth sternite is large; the movable process of the clasper armed with strong spiniform bristles; clasper without a bristle at the insertion of the movable process; ventral arm of ninth sternite without sinus. In the female the eighth tergite with an oblique vertical row of bristles on the side, proximally to the row some smaller bristles, and at the apex two bristles (rarely one), below which there is a small bristle on the inside; duct of receptaculum seminis short, head of same at least as long as the tail.

Genotype *shelkovnikovi*, Wagn. (1909).

Not any single one of the above-mentioned characters is restricted to *Amphipsylla*. The genus *Ceratophyllus* contains several species with reduced eyes or with one ventral and four lateral pairs of plantar bristles on the fifth tarsal segment, or with short bristles to the second antennal segment, &c., but a combination of all these characters is only met with in *Amphipsylla*.

Whereas the males of *Amphipsylla* are easily distinguished from one another by differences in the modified abdominal segments, the females are exceedingly difficult to separate, at any rate in some of the species. The number of bristles is not reliable, as Wagner has already pointed out, and even the posterior abdominal segments are in some cases of no assistance. For these reasons, therefore, it will be a difficult matter to identify those species which have been described from females only, viz. *shelkovnikovi*, *sibirica*, *rossica*, and *thoracicus*.

The males, apart from the genitalia, are likewise so much alike that the description of one species fits in almost every detail all the other species.

The seventh sternite of the female is truncate, rotundate, or slightly incurved in *shelkovnikovi*, *thoracicus*, *dæa*, *pollionis*, and *casis*; while this segment is obliquely sinuate with the upper angle distinctly produced as a lobe in the two new species here

described and presumably also in *kuznetzovi*. The seventh sternite of *rossica* and *sibirica* has not been described or figured.

The genus occurs from France to China, and is also represented in Canada.

1. AMPHIPSYLLA SHELKOVNIKOV, Wagn. (1909).

Amphipsylla shelkovnikovi, Wagner, Mitt. Kaukas. Mus. iv. 3, p. 197, fig. 2, and p. 201 (1909); id., Rév. Russe Ent. xii. p. 578, fig. 4 (1912).

Only the female is known.

The seventh abdominal sternite, according to Wagner's figure, is truncate and slightly incurved. The eighth tergite bears the usual 2 + 1 apical bristles, 2 or 3 submarginal ventral ones, and above them 4 to 6 (in Wagner's figure 3) lateral bristles, the oblique vertical bristles appearing to be much reduced.

Lenkoran, off *Cricetus phæus*.

2. AMPHIPSYLLA ROSSICA, Wagn. (1912).

Ctenopsylla sibirica, Wagner, Hor. Soc. Ent. Ross. xxxi. p. 578 (1898) (partim).

Amphipsylla sibirica, id., Mitt. Kaukas. Mus. iv. 3, pp. 197 and 201 (1909) (partim).

Amphipsylla rossica, id., Rév. Russe Ent. xii. p. 576, fig. 3 (1912).

Only the female is known.

The seventh sternite is not described. This is possibly the same species as *thoracicus*, or as the one described below from Bohemia and Turkestan.

Charkow, Russia, off *Putorius vulgaris* and a rodent.

3. AMPHIPSYLLA THORACICUS, Roths. (1911).

Palæopsylla sibirica, Rothschild (nec Wagn. 1898), Nov. Zool. xvi. p. 68, no. 10 (1909).

Ceratophyllus thoracicus, Rothschild, Ann. Sci. Nat. (9) xii. p. 210, fig. 3 (1911).

Only the female is known.

In the type specimen the eighth abdominal tergite bears on the outer surface only one apical bristle instead of two on both

sides of the body. The second specimen, a paratype, has two such bristles. Fig. 8 represents the seventh sternite and eighth segment of this example, whereas the figure of the receptaculum seminis (fig. 7) is taken from the type.

The bristles on the second segment of the antenna are shorter than one-third the length of the club.

The proportional width (measured near the base) and length of the stylet are 1 : 3.3.

Kirkenen, Finmark ; the host not known.

The species apparently also occurs in France, whence we have a female found at S. Paul, Basses Alpes, on *Evtomys nageri* by Monsieur A. Mottaz. The example was originally identified by us as *sibirica*, Wagn. (1898), but it agrees so well with *thoracicus*, particularly the paratype, that we must consider it to belong to that species. The male may possibly be different.

4. AMPHIPSYLLA DÆA, Dampf (1910).

Typhlopsylla sibirica, Wagner (nec Wagner, 1898), Hor. Soc. Ent. Ross. xxxv. p. 26, no. 8 (1900) (Transbaicalia).

Palæopsylla sibirica, Rothschild, Nov. Zool. xvi. p. 68 (1909).

Palæopsylla dæa, Dampf, Zool. Jahrb., Suppl. xii. 3, p. 633, fig. q-v (1910).

Mesopsylla dæa, Jordan & Rothschild, Nov. Zool. xviii. p. 79 (1911) (Turkestan).

Amphipsylla dæa, Jordan & Rothschild, Proc. Zool. Soc. Lond. p. 385 (1911); Wagn., Rév. Russe Ent. xii. p. 577, fig. 2 (1912).

Both sexes are known.

Wagner (1912) pointed out some differences between his *sibirica* of 1900 and *dæa*.

The lateral bristles of the eighth tergite of the female are very numerous, according to Dampf's figure. The movable process of the clasper of the male is elongate-triangular, being widest at the apex and having two black spiniform bristles. One of these bristles is pointed and placed below the middle of the posterior margin; the other spine is short and obtuse, and is situated at the posterior apical angle.

Turkestan and Transbaicalia (not "Transcaspia," as Wagner says in 1912, *l. c.*).

5. AMPHIPSYLLA SIBIRICA, Wagn. (1898).

Pulex penicilliger, Grube, Middendorf's Reise, ii. p. 500 (1852) (female nec male; Turuchansk).

Ctenopsylla sibirica, Wagner, Hor. Soc. Ent. Ross. xxxi. p. 578, t. 8, figs. 13, 14 (1898) (partim—Specimina ex Charkow = *rossica*).

Palaeopsylla sibirica, Rothschild, Nov. Zool. xvi. p. 68, no. 10 (1909) (partim); Dampf, Zool. Jahrb., Suppl. xii. 3, p. 633 (1910).

Amphipsylla sibirica, Wagner, Rév. Russe Ent. xii. p. 575 (1912) ("Turkestan" ex errore).

Only the female is known.

Turuchansk, Northern Siberia (Jenisseisk), not Turkestan as stated by Wagner in 1912; host *Putorius sibirica*.

6. AMPHIPSYLLA CASIS, Jord. & Roths. (1911).

Amphipsylla casis, Jordan & Rothschild, Proc. Zool. Soc. Lond. p. 385, no. 10, text-figs. 118, 119 (1911) (Shensi).

Both sexes are known.

The eye is very small. The movable process of the clasper (male) is narrowed at the apex, and the eighth sternite of the male is exceedingly hairy, the hairs being thin, and many of them very long. The seventh sternite of the female is slightly emarginate.

In the female the frons is but slightly rounded, the lower portion not being curved backwards. The bristles of the second antennal segment are at least half as long as the club. The proportional breadth and length of the stylet are 1:2.5.

Shensi, China, off *Myospalax fontainieri*.

7. AMPHIPSYLLA POLLIONIS, Roths. (1905).

Ceratophyllus pollionis, Rothschild, Nov. Zool. xii. p. 171, no. 15, t. 9, figs. 28, 31, 32 (1905) (Alberta).

Both sexes are known.

The movable process of the clasper of the male is triangular, being broadest at the apex, and bears two black spiniform bristles. The eighth sternite of the male bears about ten long bristles and a few short ones.

In the female the seventh sternite is rounded; the bristles of the second antennal segment are less than one-third the length of the club, and the proportional width and length of the stylet are 1 : 4.3.

Alberta, Canada, off *Microtus drummondi* and *Evotomys saturatus*.

8. AMPHIPSYLLA KUZNETZOVI, Wagn. (1912).

Amphipsylla kuznetzovi, Wagner, Rév. Russe Ent. xii. p. 579, fig. 5 (1912).

Only the male is known.

The movable exopodite of the clasper is rather abruptly widened in the apical half, bearing three black spiniform bristles, one of which is placed on the inner surface half-way between the anterior and posterior margins. The eighth and ninth sternites are not described or figured.

Ural Mts., off *Microtus middendorfi*.

9. AMPHIPSYLLA CONTIGUA, spec. nov. (Pl. II. and III., figs. 1, 5, and 6.)

Very close to *A. kuznetzovi*.

The hind tibia bears usually three, rarely two, bristles between the postmedian dorsal pair and the subapical pair.

♂. The eighth tergite has three long and one or two small bristles. The eighth sternite (Pl. II., fig. 1, VIII. st.) bears bristles only at and close to the margin, there being fourteen or sixteen bristles placed as shown in the figure. The process P of the clasper (Cl) is dorsally convex and distally concave. The movable process F resembles that of *kuznetzovi*, but is more gradually widened distally and bears only two black spiniform bristles. The upper one of these bristles is very stout and placed near the upper distal corner, while the lower one is longer, pointed, and situated near the posterior margin on the wide part of the process a short distance from the narrow portion. Between these two spines there are two bristles at the edge on the outer surface, and two more on the inner surface at some distance from the edge. The apical margin bears one fairly long thin bristle, and in addition on both the outer and inner surfaces a thin hair placed at about half-way from the long

bristle to the anterior apical angle. In the new species the apical spine is placed outside an imaginary line connecting the larger apical bristle with the lower spine, whereas in *kuznetzovi*, according to Wagner's figure, this spine is situated proximally to the line. The ninth sternite (ix. st.) resembles that of *A. casis*, with the apical portion of the horizontal arm narrow.

♀. The seventh sternite is sinuated, with the upper angle produced into a more or less pointed lobe. The eighth tergite bears thirteen to sixteen bristles inclusive of the apical ones. The proportional breadth and width of the stylet are 1:3. The head of the receptaculum seminis is as long as the tail (figs. 5 and 6).

Two pairs from Eger, Bohemia, January, 1912, off *Mustela erminea*, collected by E. Hentschel; also some specimens from the neighbourhood of Djarkent, in East Turkestan, off a white weasel, collected by W. Rückbeil.

10. AMPHIPSYLLA CERTA, spec. nov. (Pl. II. and III., figs. 2, 3, and 4.)

♂ ♀. The hind tibia has between the postmedian and sub-apical dorsal pairs of bristles usually three, seldom two or four bristles.

♂. The eighth tergite bears from the stigma downwards fifteen bristles in one specimen (type) and ten in another, these bristles being distributed from the dorsal margin to near the ventral one. The eighth sternite has about fifteen long or fairly long bristles at and near the edge, and about twenty small ones besides. A small ventral cone bearing a bristle from between the seventh and eighth sternite projects on each side. The process P of the clasper is essentially the same as in the preceding species, while the movable process is very different. This finger (F, Pl. II., fig. 1) is an oblong which widens apically, and of which the ventral distal angle projects downward. It bears at the posterior margin three black spiniform bristles, two below the upper distal angle (one curved upwards, the other downwards), and the third at the lower angle directed downwards. A fourth but smaller black bristle is placed on the inner surface at some distance from the edge. The apical edge

of the finger bears a fairly stout bristle at the posterior angle, and on both sides a small one almost in the centre. The ninth sternite is distally so obscured that the apical portion of the ventral arm cannot be made out clearly in specimens (ix. st.).

♀. The seventh sternite (Pl. III., figs. 3, 4, vii. st.) resembles that of the previous species, but the lobe above the sinus is sometimes shorter and more rounded. The eighth tergite has sixteen to eighteen bristles, inclusive of the apical ones. The proportional width and length of the stylet are 1:2.6. The head of the receptaculum seminis is slightly longer and narrower than in the previous species, but this is possibly due to the organ not being in exactly the same position in the specimens examined.

In *certa* and *contigua* the bristles of the second antennal segment of the female are less than one-fourth as long as the club.

Three males and five females from near Djarkent, Semitchenskoi, East Turkestan, February 11th and November 15th, 1912, off *Meriones tamaricinus*, collected by W. Rückbeil.

EXPLANATION OF PLATES II. & III.

- FIG. 1.—Clasping organs of male of *Amphipsylla contigua*: viii. t., eighth tergite; viii. st., eighth sternite; Cl., clasper; P, process of same; F, movable process; M, manubrium; ix. st., ninth sternite.
- „ 2.—Clasping organs of male of *Amphipsylla certa*.
- „ 3.—Seventh (vii. st.) and eighth (viii. t. and viii. st.) abdominal segments of female of *Amphipsylla certa*.
- „ 4.—Seventh abdominal sternite of another female of *Amphipsylla certa*.
- „ 5.—Receptaculum seminis of *Amphipsylla contigua*, subventral view.
- „ 6.—The same of another specimen, lateral view.
- „ 7.—The same of *Amphipsylla thoracicus* (type).
- „ 8.—Seventh (vii. st.) and eighth (viii. t. and viii. st.) abdominal segments of *Amphipsylla thoracicus* (paratype).

A DIARY OF ORNITHOLOGICAL OBSERVATION MADE
IN ICELAND DURING JUNE AND JULY, 1912.

BY EDMUND SELOUS.

(Continued from p. 313.)

June 14th.—Next day—that is to say, this morning—I started with Sigurdsson for another lake, on an island in which a pair of Great Northern Divers had made their nest. Of this my host had been advised by the occupant of the neighbouring farm, the wild bleak country, that is to say, stretched round about the lake in question, which, with all its seeming barrenness, has yet a good deal of grass, and supports both sheep and cows—in fact is not barren at all, but only looks it by virtue of its bleakness and wildness, and the black, stony hills and, farther off, mountains, that rear themselves out of it. It was six hours' journeying through this wilderness, much of the way being so swampy that every plod forward was a sinking down, as well—happily, however, not so deep as it gave me the sensation of being. At length we came to a row of small gables, the slopes of which descended to the level of the grass, with which they were largely covered, so that the horses, when we dismounted, began to graze upon them. Under one of these we were soon made welcome by the farmer and his wife, the latter of whom made and poured out coffee for us, to the pleasure of which that of biscuits, of no mean order, was soon added. Then the farmer, having mounted his own horse and we ours again, guided us to the place, and, in due course, my tent was set up and I left alone in it. The island, or rather islet, of which I have spoken, is a tiny little round, grassy hillock rising from a marginal circlet of stones and small rocks. Just at one point, the grass comes down to the water's edge or would do so, but for a steep bank, some six or nine inches in height, perhaps, which divides them, the stones running out from it, with a little channel of navigation in their midst. It is

just above this bank that the Divers have made their nest, which has but one egg in it, a fact which, as the proper complement is two, and the period of incubation now well advanced *donne furieusement à penser*. Still more is this the case in respect of another single egg lying in another nest—a Swan's namely—which crowns as with a huge, brown sombrero the little green islet-head, on which, since it is close to the shore, my tent looks directly down. This one egg had three fellows to it: where are they now? But not only that—another four that were never hatched, preceded them: where are *they* now? Gulls have been mentioned to me as a possible answer to this question. Great Black-backed Gulls certainly haunt these Iceland lakes, but they more affect the larger ones, on islands in which they even build. This, though it would be a large loch in the Shetlands, hardly falls under that category here, nor (anticipating) have I seen any either in it or in others adjoining to it, for several lie about, and are possibly connected with each other. It is the same where I have just come from. The great lake is uniformly tenanted by these Gulls—and these alone—at least during this season of the year, but in the lake-like expanses of the river though they are quite near to it and contain islands on which Swans build I have not seen any. But allowing their presence, what, one may well ask, are the Swans about that they should allow themselves to be thus caught napping, or braved with impunity?

“Is the chair empty? is the sword unswayed?”

Seldom, I think, if ever, is this the case. From what I have seen, both here and in the Swannery at Abbotsbury the “empire” whilst vulnerable is never “unpossessed.” In the Shetlands too I have seen the Red-throated Diver and Great Black-backed Gull breeding in close proximity, without paying any attention to one another, and particularly noted that whilst Ravens and Crows, when they flew over the breeding-loch of the former species, were pursued and driven away by the bird on duty, or by the pair of them, Gulls of any kind were not interfered with when they did so—as was far more frequently the case. True it is that there was never anything in their conduct, on these occasions, that had a suspicious appearance, which could,

by no means, equally be said of the other two—but this is also in their favour. No, when either Swans' eggs or Divers' eggs disappear in the above-recorded manner, Gulls may be blamed for it, and pass, with Gulls, as an apology, but for my part

“Timeo Danaos (et) dona ferentes.”

The two Swans, when we first came in view of them, sat one on the nest and the other on the grass, at about the same distance apart as the pair that I had first seen usually were. Our approach, of course, sent them both far afield, and the farmer then rowed us across to the islet, which he seemed to think an absolutely necessary preliminary to my watching any bird upon it. It enabled me, indeed, to locate the Diver's nest exactly, as well as to ascertain a few facts which I could not otherwise have been sure about, but my own methods would have inclined me to dispense with this, and trust entirely to the glasses. The voyage was a very short one, but the boat, as though determined that it should be no whit safer or more comfortable, on that account, leaked to an even more remarkable degree than the one that had previously conveyed me to the Eagles, when the distance had been greater, so that I was equally glad to get out of it, both going and returning.

After I had been about an hour in the tent, by myself, the two Swans came flying back to the islet. They alighted on the water, just in front of it, and a scene was then enacted between them of a very bizarre and quaint kind. Coming down one behind the other, they both held themselves rigidly upright, their long necks stretched straight up, and their wings, which were only partially spread, pointing a little forward, with their points just touching the water. Then they began to flap them, but constrainedly, as it were, raising them, each time, but very little from the surface of the water, and bringing them down upon it again; and thus, one behind the other and each the exact duplicate of the other, they flapped and cried in unison, always in the same odd, stiff pose, till, towards the last, before sinking down into usualness, the foremost one turned round, so as to front the other, and they continued thus to flap and cry, in this altered groupage—for there was the same musical note, but I thought it had a less joyful ring in it. It was the oddest

thing to see. Each of the two birds seemed possessed with the spirit of doing exactly the same as the other one did, and the whole was like a curious set form to which both seemed to attach great importance.

A spectacle such as this may perhaps give one some insight into the essential nature of an antic—of those formal and seemingly purposeless movements which yet play so large a part in bird life. They would seem to spring, primarily, out of excitement, and this must be of a joyous, or, at least, comfortable kind, for joy is most consistent with leisure, which is required for actions of no particular use in themselves—expatiatory actions, as one may call them; fear, for instance, would counsel escape, which would leave no time for such. Excitement naturally produces motion, motion must take some form, and if one bird caught it, whatever it was, from another, unconsciously imitating what it saw, and helped to do so by sensations similar in kind, the memory of what had been seen and joined in on former similar glad occasions would help in producing the same set of actions on subsequent ones, until they became a fixed habit. One has to imagine a readiness on the part of one bird to do what another that is with it does, when both are under the influence of similar excitement, and this, in birds that kept much together—that were social in their habits—might produce a quickness in seizing and following, practically amounting to simultaneousness of action. Whether this explanation is sufficient to account for uniform movements occurring, apparently, at the same actual instant of time, amongst a whole crowd of birds—for instance a flight of Starlings—so that all act together, through a wide space, in making any tilt, turn or sudden reversal of direction, though no individual can be supposed to see more than those of its fellows who immediately surround it, is a question which every observer must decide for himself. Personally I do not think that it is, and must suppose that there is some sense or faculty which aids birds, when thus acting collectively, the nature of which I am not acquainted with. But if so, the exercise of such a faculty need not be dependent on the numbers being very considerable, even though this had a stimulating effect upon it, but might help to explain uniformity and simultaneousness of

action on the part of any two birds—for instance of these two Swans, for they seemed to act exactly together, and to know, together, exactly what they both meant to do.*

The above remarks would apply more particularly, to the origin of what may be called social antics, of movements, that is to say, which do not apparently spring from any sexual stimulus, but seem rather the outcome of some state of excitement manifesting itself between two or more birds, which has nothing to do with this. I do indeed think that various antics which have become social have had a sexual origin, but that is no reason why others should not have originated spontaneously out of social conditions. It is possible, however, that in a wider and less specialised sense than that which I have been considering, the ultimate origin of all social antics may have been of a sexual nature. These Swans, for example, since they were incubating, probably acted in the way they did, under the influence of some kind of parental emotion, but the parental instinct is born out of the conjugal one—follows it, at any rate, by a fixed law of sequence—and though the very striking and pronounced autumnal antics of the Stone Curlew seem to be of a purely social character, yet the very fact of their manifesting themselves at that season only (as far as I know) might incline some to consider them as a sort of sequelæ of the state of sexual excitation belonging to the precedent breeding-time, which is but just over. It is not, one may almost say, till the winter, that the sex stimulus, in some shape or form, is quite dead, so that the question whether social antics depend ultimately upon sexual activity, in birds, could perhaps best be answered by an inquiry as to whether, or to what extent, they also cease at that period. Actions which do not stand in any relation to that factor ought not, one would think, to be governed by the seasons in any way which is at all correspondent to that in which it is.

Some time before this Swan episode, one of the pair of Great Northern Divers—that one probably that was on the nest when

* This is perhaps suggested by the fact that only one of the pair turned round, so as to front the one behind it. It would have been more in keeping with what had gone before if this one had turned round too. Had it done so, however, there would have been no confrontation scene, which seems thus to have been desired by both.

we came—had returned to the islet, and kept swimming just off it, often with its body almost submerged, which may have been for the sake of concealment. At last, about 7 p.m., it went on to the nest again. Being engaged with the tent, at the time, I did not myself see the landing, but afterwards I could watch its head, as it sat, with the glasses, and it continued so to sit till past 11, when I went to bed, and when I first looked out on the following morning—

June 15th—which was at a little past 6, there was the, or at least a, head still, for whether it belonged to the same bird or not I could not, of course, be certain, but I believe it did, and that it was the better of the two, *viz.*—but there is no need to specify further. The bird continued to sit for more than another hour, when her partner appeared, rounding a curve of the islet, and, on seeing him, she came off the nest into the water, sliding down the bank, as it appeared to me, and swam towards him. The two rounded the point in opposite directions, passing each other without any close approach or observable greeting, and the newcomer, after swimming in once or twice, under the bank, and then out again, at length took his place on the nest, appearing to force himself up the bank by a single powerful impetus, but more than this I could not make out from where I was. I now took down the tent and pitched it again right out of sight of the island, for it was better, I thought, that the birds should not see it, and I much preferred watching them *al fresco*. When I returned to my outlook at 10 a.m., the nest was still occupied, and, whilst watching it, the partner-bird reappeared near the islet, rounded it, then dived, and I saw it no more. It came up the lake in a very leisurely manner, frequently turning right on its side, with one leg stretched out behind it, above the water, so that almost the whole of the white ventral surface was visible. In this position it kept preening itself, when it would turn round and round in the water, not, it seemed, with any purpose of doing so, but by the laws of mechanics merely, probably because, through habit, it still kept paddling with the foot that was under water. Now imagine this rotary motion, added to the gleaming white breast and speckled back, and then let naturalists seriously ask themselves whether anything protective is to be made out of the result. I, at least,

was unable to do so. I can assure them that I saw the bird distinctly, and that it looked like nothing else but what it was. How then could any bird of prey—an Eagle, let us say, with the eye of one—be mistaken in the impression given it by something so salient and characteristic, having not only shape and colour, but a catherine-wheel-like gyration long, no doubt, associated in its mind with these, to aid or rather compel recognition? So, too, a man, I believe, not completely under the dominance of these ideas could not have seen in the defined shape and deep colouring of the head of the sitting bird, with the bright white patch on the throat, anything that specially harmonised with the light-brown rocks and green herbage which made the foreground and background of the nest. So dominated, I admit, he might have brought himself to think (being specially trained for it) that the first resembled a white spot on a stone, and the other a black one, or deeper-tinted grass-tuft.

Eagles and Falcons, however, know nothing of these theories, and their eye, with a life-long experience, must at once tell them what these two patches, with the dagger-like projection, are. I cannot doubt this, since mine told me without any. Still, even these keen-sighted watchers might see without noting, but that would only be because of the bird's sitting immobile on its nest. This habit which, to a certain degree, it possesses, may occasionally be of assistance even to so powerful a species as the Great Northern Diver, a bird as large as a Goose, with a bill like a dagger, or stout stiletto rather, which it must certainly know how to use, and building upon islands in lakes. Otherwise, I believe the sole but sufficient protection on which it is able to rely is its size, strength, and great powers of diving. Having seen a pair of Red-throated Divers on one of their small breeding lochs, in the presence of a large bird of prey, I can form some idea of how remote would be the chance of either Falcon or Eagle capturing one of these birds upon any wide space of its own element.

I had now to go back to my tent, to dress, both against cold and rain, for the latter was threatening. The first, alone, however, would have compelled me to endue myself with oilskin coat (or rather gabardine) and trousers, a very thick jersey (made specially for fishermen, I believe), a woollen face-protector and

gloves, to the boot of the motor suit and Shetland wool under-clothing which I already had on. Yet riding here, yesterday, I had worn only the motor suit—such is the difference between sunny and cloudy days in an Iceland summer. This change, or rather increase of attire, took me some little while, and on peering over the rise again, behind which I had been lying or crouching, I found the bird off the nest and in the water, though still close to the shore. I attribute this to my having assumed the upright attitude whilst still in its sight, when leaving, though at a considerable distance; for as long as one crouches, crawls, advances in a sitting attitude (like Irving in the play-scene in “Hamlet”), or even on one’s hands and knees, no alarm seems to be felt by the birds. Acting now more cautiously, the bird was soon back on the nest again. I assume it to have been the same one, though, of course, it is impossible to be sure that there had been no change upon it whilst I was away. If there had, then in all probability I had had nothing to do with it. I was now in a better position to see the bird get up the bank. It did so by a tremendous spring out of the water, which, either alone, or with a step or two afterwards, brought it not sliding on to its nest, but standing up over it, the body, however, bent forward at a considerable angle. In this position it bent down its head into the nest, touching the egg (as has been said there was only one) with the bill, as it seemed to me, before sinking down upon it. It must, I think, in making its spring, have placed its legs well forward under its body, and then leapt right upon the bank. It did not merely push itself up the slope, with its feet, from behind, according to the general statement—at least it did not seem to me to do so.

All at once I see the female bird, as I suppose her to be, quite close to the islet—she must, I think, have dived to it—and now just under the nest, towards which she seems to look with an anxious, half-timid glance, as if pleading with her mate to come off, and let her enter again on her duties. This is a pretty picture, and it continues for some while, for the male, having his own sense of duty, is not to be entreated, but sits obstinately on. Thus repulsed, she at length turns disconsolately away, and, diving, disappears for some while altogether. When I see her again she is a long way off, on the other side

of the islet, but soon it appears that she is returning to it—evidently she cannot keep away. Nearer she comes, stealing at first, then with the manner of one whose mind is fully made up, and having rounded the point from which she first becomes visible to the sitter, there is, all at once, a great splash amidst the little stony archipelago, just within which the nest is situated, and the next moment he appears, swimming out to her. Again they pass each other, without pause or demonstration, though only at the distance of a foot or so, and, at 2.10, the female (if it be really she) makes the same vigorous leap up the bank, and once more takes sweet possession of that little shallow cup of dark earth in which all her simple bird-soul is centred, the contents of which (“the pity of it, Iago!”) have probably been sold, long before, to some one who may be even now on his way out from England, to “obtain” them.

The bird now off duty rises in the water and flaps its wings several times, at short intervals. This is accompanied with some other little pleasurable actions, seeming to show appreciation of recovered freedom, and then it dives and is off. Some time afterwards I catch sight of it off the shore of a bay on the opposite side of the lake; but it dives again, after which I see it no more. These birds dive for great distances, and it is not easy to locate them on their re-emergence, if the waters of the lake are at all rough, as is the case to-day.

It is now 4.30, and there has been no further change on the nest. Neither has there yet, at nearly 9, when the cold and rain drive me, at last, into the tent. It rained most of the night, and the tent proved not to be waterproof—a heavy blow.

June 16th.—The first change on the nest observed by me to-day took place at about a quarter to 8 a.m., and the second at 8. The details were as follows. About 7.30 I saw the one bird swimming a little off the islet where the other sat on the nest. It would come up near the shore, and then swim out again, and again go in, peering up, each time, at the nest, in so wistful a manner that one seemed to see the actual expression in the eyes and countenance, though, in all probability, it was conveyed entirely through movement. Several times it went in between two large stones which stand right in front of the landing-place—for there is but one—and, in fact, showed every

possible sign of its strong wish to take its partner's place on the nest. All this while, however, the sitting bird sat on, and it was not till the petitioner had made several voyages right in to the bank, that it at last came off, and I saw it slide down the steep place, just pushing its body forward, to do so, without rising. After the slide both birds were, for a few moments, hidden behind the two large stones I have spoken of, then one swam out, and the other, shortly afterwards, leapt up the bank and took its place on the nest. I again noticed that it stood over the nest before sinking down on it, and it reached it, I am sure, in this attitude. The bird that had been relieved, or rather importuned into leaving, now swam out a little from the islet, and began to preen itself, flap its wings, and so on, before diving off (as I supposed it would do, after having sat all the night), when all at once, and to my great surprise, I saw the one that had but just commenced sitting, and had seemed so much to want to, swimming out from the stones, and keeping the pair, now carefully distinct, which was easy, I can say as a certainty, that when, in another few minutes, the nest was once more occupied, it was not by this same one again (as under the circumstances one might have expected it would be), but by its partner, whose place it had taken only for a quarter of an hour, or, to be accurate, seventeen minutes. I suppose it was the female, and that she can hardly keep away from an egg now well on towards hatching, but no one who had seen the male pleading, as it were, to be allowed to go on, could have thought that, of his own initiative, he would have come off again so soon. He did not go right away, however, but was still in evidence at 9, when I had to leave, though at some distance out in the lake. In spite of his short turn, it is plain that he, as well as the female, is very interested in the incubation. I have mentioned that, for a moment or two before the first change, both birds were out of view, so that it cannot be actually proved that the one who then came off the nest did not immediately go back on to it again, in which case there would not have been a change upon it at all. This introduces what may be called a scientific doubt, but, like a good many scientists now-a-days, I have disregarded even graver ones in more important matters—thought-transference, for instance, *und dergleichen*.

My reason for not staying and watching these Divers for, at least, another day, was that Sigurdsson had lately heard of a pair of Jer-Falcons—that splendid member of a high family, peculiar to Iceland, and soon to become extinct, even there, owing to every kind of persecution being ceaselessly practised against it, but chiefly there can be no doubt (since *qui facit per alium facit per se*) scientific collecting, both with gun and hands, on which, apparently, there is no check, and which falls, according to the particular kind of life-taking preferred by each class of collector, on the mature bird, the eggs, and the down-clothed young in the nest. Add to this, capture* for captivity, poison—whether put down for Foxes only, or on the “with-one-stone” principle—and the undisguised gunning barbarian, ready to supply all parties—as witness the shops in Reykjavik, now the bird’s principal *habitat*, at any rate in the south—and it becomes apparent that the end cannot be much longer delayed, unless some peculiarly energetic and quite unexpected effort is made by a Government which cares little or nothing for its bird-life, in general, or (when not on a banner or bank-note) for this, the chosen national emblem of the country which it represents. Yet in the eyes, at any rate, of the more tasteful part of the outside world, this very bird fauna, thus neglected and thrown to the Philistines, makes, with her unique scenery, one of the two great charms which that country possesses. These reflections (not national but only governmental) may be permitted to one whose own Parliament refuses to pass a law preventing the importation of bird plumage, though the most beautiful and interesting birds of the world are perishing (to the point of approaching extinction) in consequence of that refusal, by ways the most cruel and for purposes the most trivial and contemptible. With so chastened a consciousness, they can hardly be thought admonitorial.

The place where the Falcons of which Sigurdsson had received information were supposed to have nested was a long day’s journey from where we now were. The man on whose land the eyrie was situated was not known to him personally, and there were some other elements of uncertainty which grew,

* The inaccessibility of the nest is a myth. It is always accessible so long as a rope (wrongly used) and a purchaser is.

upon reflection, and made the quest a somewhat doubtful one ; but my imagination was fired with the idea of watching such birds amidst surroundings of utter and remote wildness. I had sighed for Peregrines, and here were greater than Peregrines, so I decided to make the expedition, thinking it would be worse to miss through not going than to go in vain. I struck my leaky tent, therefore, and, soon after 9, we started, the farmer, at whose house Sigurdsson had slept, accompanying us for a short distance to put us into the way. This, however, would have been but little use, had there not been a pretty fair general knowledge on the part of my guide. The greater and much the more enjoyable part of the way was without road and often without paths—meaning pony-paths—wild, waste, desolate country, much of it swampy—tussocks of long, wiry grass and grey moss, with soft, flat sponginesses between, that quaked as the ponies went over them. Sometimes they foundered—Sigurdsson had once to slide off and pull his out by the reins—but mine went no farther than giving me fearful sensations of something much more serious than this ; it seemed so bent upon sinking that I wondered continually to see it still under me. But in all this wildness and depopulation there was none of the dreariness of solitude, for the Whimbrel and Golden Plover haunted it everywhere, and with their flittings and cries, all in keeping, made it a pleasant desolation. Grass and grey moss clothed most of the country, but three out of every four blades, or rather strings, of the first were withered, which gave it a tawny coloration, with only “an eye of green in’t” as in Prospero’s island. Here and there, however, were some really green stretches of true turf, along the banks or in the bend of some rivulet, reminding one of common-land in England. Generally speaking, it was flat, sometimes rolling, not often steep except when one plunged down into watercourses ; but out of this general flatness there rose, all about, great stony hills or hid-mountains, that reared themselves suddenly up, and had usually the most salient and, as one may say, violent shapes. Some, that we passed quite close under, were nothing but enormous heaps of shattered fragments of the basic material—lava, namely—reduced wholly to this condition, and so like mere stone-heaps, made by man, that one almost accepted them as such, and wondered at their size ;

it seemed as if some giant had sat breaking stones on the highway, if highway there had been, but in others there frowned, above this chaos, the most awful black precipices, in whose scarred face was still to be traced that basaltic or columnar structure, due to the cooling of lava-streams, of which Fingal's Cave, in the Hebrides, and the Giants' Causeway, in Ireland, are the most perfect, or, at least, the most familiar examples.

As the prospect opened, mountains and chains of mountains rose gigantic on one another, their summits showing every variety of the steep, abrupt and irregular, varied, sometimes, by flat, round or conical, and their hues, except where snow lay on them, like those of night's kingdom. Some had their tops, as well as a considerable portion of their height, completely covered, amongst these being Hecla, whose great mass reared itself hugely and whitely above others near it, but in rounded proportions, without peak or pinnacle. Further off, but in the same line of elevation, another great snow-mountain, that rose with smoother sweeps, had its summit—higher even than that of Hecla—crowned with two almost perfectly conical Fusiyama-like peaks, one a good deal larger than the other, but both looking small against the great mass that they stood on. Both peaks, I suppose, are volcanoes, or rather the whole mountain is, and these are the funnels through which it may, at any time, break out into eruption, though, unlike many others, it has not, I believe, done so within the memory of man. We rode all day under the forehead of Hecla and of this other great mountain, and, towards evening, came to, or, rather, from precipitous heights, looked down upon a river, so gloomy, and flowing amidst such tremendous scenery that it might have been Styx itself. Black, beetling precipices rose almost sheer from its waters, but these were but the lower flanks of the mountain gorge that they flowed through, which, yawning upwards, and widening to the sky, towered far above them in a second line of escarpment, on the summits of which we now stood—we had been mounting gradually for a considerable time. This was scenery which stirred the blood and made the pulse of life beat quicker—dark, wild, mysterious, suggestive, stupendous in all its features, like a Salvator Rosa landscape or Doré's illustrations to Dante or Don Quixote. Thoughts of some days or a

week, perhaps, spent amongst these sublimities, the tiny tent fixed halfway up—suspended, as it were, between the black torrent and the frowning brink, “twixt upper, nether, and surrounding precipices”—began to take hold of me, for it was in some cleft of the heights on which we now stood that the Falcons should have had their eyrie. But all was nought, visions faded and high hopes were quenched very shortly, for all that the man whose statement—as we imagined—had brought us here had to say, after guiding us to the awful verge and leaning there familiarly on his stick, was that such a pair of birds had indeed nested just below that point for the last eight years, but that, contrary to expectation, and for some unexplained reason, they had not done so this year, that his son, when he said that they had spoke only from likelihood, but had not actually verified what he felt sure about; it was foolish of him, he had acted unadvisedly, he should have said nothing where there was no actual certainty,* and so on—it was all the son. “Ibi omnis effsuus labor.” It was a sad walk back to the little, lonely homestead where we had left horses and baggage—all in pouring rain which had lately come on—to be shown what there was no use in showing. When we got there, again, we were asked in to coffee, but I was less struck with its excellence and the hospitable ways of the country than I might have been on another occasion. Though it was now 10 p.m., we started back that same night, but only made a short march to a hostelry, or something which served as such, where Sigurdsson slept, whilst I, seeing no reason to increase travelling expenses, which are not light in Iceland, had recourse to my tent. Next day, towards evening, we got back to the place we had started from, and thus ended the quest of the Falcons.

* Not even that the four young Falcons had been sold at ten *kronen* apiece.

(To be continued.)

ON THE MARSH- AND WILLOW-TITS OF FRANCE.

BY COLLINGWOOD INGRAM.

OF the many difficult and complex groups that have arisen since the introduction of the trinomial system, that relating to the Marsh-Tit is probably the most perplexing. Certain races of this widely diffused species are admittedly distinct enough and have tolerably well-defined characteristics of their own, but others can only be distinguished with the greatest difficulty. If we were to compare these various forms with a single type only (as was formerly done), we might recognise some of these subspecies with comparative ease. But lately the species has been duplicated. The term "Marsh-Tit" has become less comprehensive, and is now restricted to the birds having a bluish metallic sheen on the black portion of their heads (*Parus palustris*, L.), while those with a dull, sooty-black crown are now known as the Willow-Tits, having for a type *Parus borealis*, Selys.*

So far so good, but when we attempt to further divide these two into numerous geographical forms our trouble commences, and it is not lessened by the fact that the immature *P. palustris* has more or less the same lustreless black pileum as the adult *P. borealis*!

Most field-naturalists maintain that the two birds differ slightly (though constantly) in their mode of nidification and in some of their notes. However interesting these differences may be, when one recollects how notoriously versatile are all the members of this family—and especially in regard to their song—we cannot lay much stress on these supposed peculiarities.

Although, as I have hinted, more convincing evidence would

* Dr. Hartert takes the American *P. atricapillus* for the type species in his 'Vögel der paläarktischen Fauna' (vol. i. pp. 376 *et seq.*).

be very welcome, in the meantime I certainly think it expedient to follow the younger school of ornithologists in separating these birds into two distinct groups, viz.:—(a) The Marsh-Tits (*P. palustris*), or those with a steely-blue sheen on their crowns; and (b) the Willow-Tits (*P. borealis*), or those with dull sooty- or brownish-black crowns. Each are represented in France; the former by *Parus palustris communis*, Baldenst (or *P. p. longirostris*, Kleinschm, by those who recognise this subspecies) and the Willow-Tits by *P. borealis montanus*, Baldenst, and possibly *P. b. rhenanus*, Kleinschm.

Under the name of *P. p. longirostris*, Dr. Hartert (Vog. pal. F. i. p. 373) separates the Marsh-Tit found in France, Belgium, and Holland from the one inhabiting Mid-Europe (*P. p. communis*), on the assumption that it has a slightly darker and more olive-coloured back and rump. In my collection I have a series of these Tits from various parts of France taken in the spring months. All have the upper parts greyer and lighter, if anything, than in specimens from Germany, &c.* The bill of the French bird is also supposed to be usually larger, but I have failed to detect an appreciable difference in any examples that have come under my notice, and Dr. Hartert admits that this is a variable feature. Under the circumstances, therefore, I am convinced that *P. p. longirostris* is an undesirable subspecies, and in my opinion the French bird should certainly be associated with *P. p. communis*.

If somewhat partially distributed, the Marsh-Tit appears to be nevertheless tolerably common in most parts of France with the exception of the south-eastern portions. In Provence, Languedoc, and Rousillon it seems to be an exceptional winter visitor, but west of the Cevennes one begins to meet with it in fair numbers. I found it by no means rare near Millau and on

* This paler coloration may, in part, be due to the season at which the birds were taken. Unfortunately I have not been able to compare a series of topotypical *P. p. communis* killed at a corresponding time of the year with my own French skins, nearly all of which were collected during the months of April or May. My conclusions are not, however, based on these specimens alone. Altogether I have examined upwards of sixty or seventy specimens from this country, including the French skins in the British Museum, obtained at other times of the year from the Vosges Mountains and north France.

the Plateau du Ségala in the spring of 1912, while it was quite common up the wooded valleys of the Basses- and Hautes-Pyrénées, and I shot specimens there practically on the Spanish frontier. It breeds and is, to a certain extent, sedentary throughout the rest of France, following the mountain systems down to at least as far south as Savoy (*cf.* Bailly, Ois. de la Savoie). At high elevations in these Alpine districts it is entirely replaced by *P. b. montanus*.

This latter bird, the large Alpine Willow-Tit, inhabits the upper forests of the Jura* and various Alpine systems, rarely descending below 3000 ft. In the summer its vertical range commences at about 4000 ft. and extends up to the limit of the forest growth. In the Alpes-Maritimes I have encountered it up to 6000 ft., frequenting the larch woods in preference to those composed of spruce and fir, which latter are always the favourite haunts of its allies, the Coal and Crested Tits.

The song of the Alpine Willow-Tit is a somewhat melancholy pipe—a single note repeated four or five times consecutively; while its cry of alarm is a deep, scolding *chooo, chooo, chooo*, more prolonged and delivered in a rather lower key than that of a Marsh-Tit. Both birds possess variations of this, one might almost call it, the “family” note. In *P. p. communis* it resembles the syllables *wee-choo, choo, choo*. The song of the latter bird, by the way, seems to vary in different districts, and when I was collecting in the Pyrenees, at first I was much puzzled by its voice. In this locality the males uttered a clear *chai, chai, chai*, sounding to me more like part of a Tree Pipit’s song than that of a Titmouse.

The claim of the Rhenish Willow-Tit (*P. b. rhenanus* Kleinschm) to be included in the avifauna of France rests, first, on the slender evidence of two questionable specimens having been bought in the markets of Paris and, secondly, upon two sooty-crowned birds from the Vosges Mountains now in the British Museum. These latter certainly appear to be referable

* Personally I have not met with it in this range, but Fatio (*cf.* Cat. Ois. de la Suisse) says it is sedentary in the Upper Jura from the French frontier to the Jura Neuchatelois.

to the Willow-Tit groups, but other examples from the same source are undeniable Marsh-Tits.

Another allied form alleged to have been taken in France is the Sombre Titmouse (*Parus lugubris lugubris*), a bird whose habitat lies in south-eastern Europe. Ogerien (His. Nat. du Jura) includes this species in his list of the birds of Jura, but he has in all probability confused it with *P. b. montanus*, a species somewhat surprisingly omitted from his book. There is, according to Arrigoni (Man. Orn. It. p. 194), an example of the Sombre Tit in the Florence Museum, labelled "Nice, February 2nd, 1878," but its authenticity is open to question.

A CASE OF PARASITISM OF *MELECTA ARMATA*
ON *ANTHOPHORA ACERVORUM*.

By J. CHARLES JOHNSON, M.A., M.Sc., M.B.

THE genus *Anthophora* is of world-wide distribution, and contains about one hundred and thirty species, of which four are native to Great Britain. It is a somewhat plump, hairy bee, and, like all the Scopulipedes, possesses the necessary apparatus for gathering and storing pollen for its young, so that the larva on emerging from the egg has an ample store of food. It is a commonplace in the animal kingdom that such parental assiduity should invite the intrusion of a new organism whose offspring would have the advantages that its young host should enjoy, and cause the death of the latter in various ways.

The insect kingdom so obviously teems with such examples that it has been said that insects may be divided into two great armies, one of which tries to destroy the other, often by intricate relations of parasitism and hyperparasitism. Very frequently the parasite will confine its attentions to one genus or even one species. The latter is well exemplified in the case of *Melecta* and *Anthophora*.

Melecta belongs to the subfamily *Cuculinæ*, familiarly called "cuckoo-bees" from their propensity to lay eggs in the nests of other bees, and in them the pollen-collecting brush, so characteristic of the legs of the Scopulipedes, is absent. They are obligate parasites on that account, since they must place their eggs near a store of pollen which they are unable to collect for themselves.

Anthophora is colonial only in the sense that it is of a gregarious disposition. Their cells are open, and absolutely independent. Each bee constructs its own nest and accumulates pollen for its own young only, so that there is no division of labour as in the truly colonial hive-bees.

An excellent opportunity of studying the habits of *Anthophora*

acervorum was afforded at Cottenham, a few miles from Cambridge. The bees had made their habitat in the front wall of a cottage with an eastern aspect. This wall was plastered with a clayey material, rather friable to the fingers, and roughly "dashed" with small flints. The bees reached a maximum about two years ago, when they had excavated over two hundred cells. Their constant coming and going made a continuous hum, and occasionally they formed such a cloud as to remind one of Gilbert White's account of this "wild bee" which appeared in great numbers on Mount Carbon, near Lewes, and dashed "round the heads of intruders with a sharp and hostile sound."

The manipulations of the bee on making its burrow were most interesting; the mouth-parts were used to remove the plaster, the resulting fine *debris* was then kicked out with the middle and third pairs of legs. Smooth tunnels were thus patiently made, many were very tortuous and pierced the wall for about three inches, probably ending between the bricks or stones behind the plaster. The nucleus of some was formed by the dislodging of a flint.

The parasite of *A. acervorum* is *Melecta armata*. The latter is a handsome bee in a quiet way, being of a shining black varied with spots of white pubescence. *Melecta* is an interesting exception to Shuckard's contention that the parasitism of a bee is proportionate to high coloration, "great decoration being in our native genera of bees the badge of parasitism."* Shuckard has also described the fierce pugnacity with which *Anthophora* attacks the invader of its nest.† Friese's observations tend to show that the relations between the two are not friendly. He says that *Melecta* gets out of the way of the homecoming host. D. Sharp‡ doubts whether this can be construed as fear, and thinks it more likely that the intruder would find it more discreet to avoid disturbing *Anthophora* as "it is the interest of the parasite to avoid annoyance and to be well-mannered in its approaches."

During the many opportunities I had of observing the attitude of the insects to one another, I failed to note any

* Shuckard, 'British Bees,' p. 66.

† *Ibid.*, p. 240.

‡ Sharp, 'Cambridge Natural History,' vol. vi. p. 32.

marked antagonism or bellicosity. The attitude might truly be described as neutral. I cannot vouch for the behaviour of the host to the parasite actually detected in its burrow, but I observed several occasions on which *Melecta* was quite near the entrance of the tunnel of an entering pollen-laden *Anthophora*. In such cases the host entered and left its nest without any evident notice of the parasite which seemed to stroll nonchalantly into various burrows and select one at leisure. Sometimes a *Melecta* would pass near an *Anthophora*, busily engaged in smoothing the inside of its nest with its mouth-parts, and here also both insects evidently ignored one another. In no case did I see any combats such as Shuckard describes.

The *Anthophora* showed a considerable decrease in number last year, while in the early summer of this year the reduction was still more marked. Although the inhabitants of the cottage had made an abortive attempt to get rid of the pest when it was at its maximum by plastering up some of the burrows, it seemed clear that the progressive decrease was mostly due to the parasitic action of *Melecta*, which could easily be collected in some quantity at breeding time. In this case other parasites of *Anthophora*, such as the genus *Anthophorabia*, *Monodontomerus*, and *Heteropus*, were not observed.

St. John's College, Cambridge.

NOTES AND QUERIES.

A V E S.

Birds Rearing Broods in Old Nests.—Since my garden has contained sufficient cover to induce the birds to build in it, I have discovered it not very unusual for the Blackbird to lay a second time in the same nest from which the first brood had flown—this occurred in 1905, 1909, 1910, and 1911. I have never known the Thrush to do this, but have known it to take possession of a nest in which a brood had been reared the previous year. In 1911 Thrushes built in a gorse bush near my small fish pond, where I discovered the nest on March 1st; the brood left on April 4th, and every member of it perished during the several days of bitter cold and snow we were then having. These birds then possessed themselves of a Thrush's nest in which a brood was reared the previous year, situate in a laurel six yards distant, and had commenced to sit by the 17th. This is the only instance of the Thrush using an old nest that has come under my notice, but it may occur more often than one might suppose. With the Hedge-Sparrow I find it will sometimes pull an old nest to pieces and use the materials in the construction of a new one, and on one occasion, in my garden, a "last year's" nest was actually used and a brood reared in it, very little renovation being considered necessary. This year Wrens have for the fourth year in succession brought off a brood in the same nest, but the situation of this nest must be taken into consideration—it is built inside a small rustic summer-house, unaffected by meteorological conditions. In 1910 Pied Wagtails reared a brood in a Robin's nest from which the young had recently flown, this nest being built on an ivy-clad wall; and last year (1912) Robins hatched off a second brood in the same nest they had used for the first, which was in an old canister which I had placed in a hedge for the purpose. Great Tits occupied one of my nest boxes and successfully brought off the young, when another pair immediately took possession of it, and likewise reared a brood—this being the only occasion upon which this has taken place in my garden, though I should suppose it to be a common occurrence. My Wrynecks will evict the Great Tit when a pair has taken possession of their favourite box, but I cannot say the nest itself

has actually been used, as the Wrynecks have entirely removed that, together with the eggs it has contained. I remember, about forty years ago, seeing Wryneck's eggs taken from a Wren's nest in an orchard at Owsbury, in the adjoining parish of Little Horsted. I am afraid the Wryneck is less common now than it was in those days, though I should not like to suggest that it was so numerously represented as to have any difficulty in finding suitable holes in which to lay. Of course we know some of the larger birds will make use of an old nest of their own species, or otherwise, but I should suppose it far less common with our smaller birds.—ROBERT MORRIS (Uckfield, Sussex).

Ornithological Notes from Yorkshire.—A good many—if not most—writers on British birds state that the Blackcap (*Sylvia atricapilla*) is much commoner and more local than its congener the Garden-Warbler (*Sylvia hortensis*). The relative status of these two species does not apply to this district nor to many, if not most, other parts of Yorkshire; more particularly is this the case in the north and north-west Yorkshire. Both species vary in numbers within certain limit every year, but I have never known a year in which the Garden-Warbler has been scarcer than the Blackcap. In many districts I have visited the Blackcap is a general term applied indiscriminately to any bird with a black head, such, for instance, as the Marsh and Cole Tits, and even the Great Tit; and this confusion, I fear, has often given rise to the idea that the Blackcap is much more common and generally distributed than is actually the case. Judging from my own observations there must be many districts other than in Yorkshire where the Blackcap is much less common than the Garden-Warbler, and I should be very pleased to have any notes from readers of the 'Zoologist' regarding the relative status of these species. Has there been any change observable in the relative numbers of these species of late years? The Garden-Warbler is not usually regarded as such a hardy bird as the Blackcap, and at first sight it would appear that the latter species would be much more at home in north-west Yorkshire, but such is not the case.

On October 16th I saw a party of small birds at a distance beside the stream which runs near this village. On my approach they flew off a short distance near a poultry cote, around which I cautiously crept, and had a very fine view of a cock Mealy Redpoll (*Linota linaria*) feeding very greedily upon the seeds of Meadow Sweet (*Ulmaria*). The other birds had evidently flown away. It permitted

me to approach within a few feet without manifesting the slightest fear. This species is a very irregular winter visitant, and visits at wide intervals—as in the years 1878–79—this district in considerable numbers, since which years it has been very scarce. Recently I was passing near a garden when my attention was attracted to a bird at a distance feeding on the seeds of soft grass (*Holcus*), which I identified as a Twite (*Linota flavirostris*). I often see this species here in autumn feeding on various seeds of wayside plants, but I do not remember seeing it before feeding upon the seeds of grasses.

Recently (October) I saw another Mealy Redpoll feeding upon the seeds of the Meadow Sweet in the same place I saw the other, which I have previously mentioned. This time a few Chaffinches were amongst them, all male birds, the females having left here a fortnight ago. The first migration of House-Martins left here on August 27th, all, or nearly all, of which were young birds—this was fully a month before the old birds left. A friend of mine has been describing a bird which I think can be no other than a Golden Oriole, which he has seen with some Thrushes in a plantation about a mile east of this village. My son Rosse states he found last summer a Cuckoo's egg in the nest of a Tree-Pipit near Keighley, which is quite an uncommon occurrence here; the Cuckoo much prefers the Meadow-Pipit as a fosterer. It is often said that the Cuckoo's eggs vary more than any other British bird, but the Tree-Pipit's eggs vary much more in this locality. Indeed, Cuckoo's eggs keep fairly well to one type, which is very similar to the Skylark's egg in size and coloration in this neighbourhood, so much so that I have often wondered why the Cuckoo does not much more often lay its egg in the nest of the Skylark, since there would be no difficulty in finding nests with fresh eggs during the whole time the Cuckoo is with us, for I consider the Lark our most abundant species. Is this similarity of the eggs of the Cuckoo and Skylark a mere coincidence, or does this fact stand in some vital relationship in the past history of the Cuckoo? Our son Rosse records the Goldfinch near Keighley, and it has appeared this autumn in one of our neighbouring dales. It is some years since I saw this species. I heard the Mistle-Thrush singing as late as June 21st near Grasmere, and it was singing here in the garden about the beginning of the new year. Whilst in Derbyshire I saw a male Spotted Flycatcher feeding a female several times in the kitchen garden of one of the lodges leading into Chatsworth Park. I saw a Sandpiper in Chatsworth Park beside the river, which kept flying into a plane tree, not merely perching on the lower branches,

as I have seen them before, but this bird flew right up and perched on the higher branches of the tree, and did so almost with the facility of a Wagtail. The Ray's Wagtail was very abundant in Chatsworth Park. I also saw a Greater Spotted Woodpecker in the woods behind Chatsworth House. Rooks this summer have established a small colony of nests, and brought off their young successfully near my residence. The oldest inhabitant does not remember the Rook nesting previously in this locality. The Greenshank, Oystercatcher, Pochard and Golden-Eye, have also been seen in one of the adjoining dales. It is well known that much migratory movements exist even among what are called our resident birds, so I have kept my eye on a Dunnock * which has one half of its tail quite white. It was here all last winter, and has bred this summer, and still it is here. Has the Yellow Bunting larger clutches in some parts of its British range than here? It is exceptional to find a clutch in this neighbourhood of four eggs, the more usual number being three. I am sure I have found larger clutches in other parts of England.—E. P. BUTTERFIELD (Wilsden, Yorkshire).

CRUSTACEA.

Thia residuus, Herbst. (*polita*, Leach) in North Wales.—This interesting crab was first taken by Dr. Melville in Galway, Ireland, as recorded by Bell in 1853—one male and two females with spawn. A further specimen was recorded from Wales by Mr. A. O. Walker in 1885, when one specimen was dredged near Llandudno, and again in 1890. It therefore occasioned me great surprise to find one when digging for shells with my nephew on a small sandbank at Abersoch in August last. The tide was a very low one for that time of year and just on the turn, so we had to work hard at that tide and the following low tides, with the result that we found twenty-six fairly large specimens, and some smaller ones which we did not keep. The largest specimens measure just under three-quarters of an inch in length and a full three-quarters in breadth. The colour was ivory white in all cases, and the two spots when present bright orange. The majority were females, but with no spawn. The species is evidently gregarious, as twice we discovered two close together, but of the same sex, and though we worked the adjoining sandbanks we failed to find any more. It is possible they came in from deeper water to change their shells, as one was found with the new carapace developed.—E. B. NEVINSON (Morland, Cobham, Surrey)

* Hedge-Sparrow.

OBITUARY.

RICHARD J. USSHER, D.L.

WE have to record with the greatest regret the death of this well-known Irish ornithologist, who passed away on October 12th. The following notice is taken largely from the Dublin 'Express' of October 16th, forwarded to us by the kindness of Mr. C. B. Moffat:—

Not since the lamented death of Alexander Goodman More in 1895 have Irish naturalists sustained a loss that will be so poignantly felt as that of Mr. R. J. Ussher, D.L., of Cappagh House, County Waterford, whose remains were interred at Whitechurch, Cappagh, on October 15th, in the presence of a large number of mourners. Mr. Ussher's many excellent qualities both of head and heart endeared him to a wide circle, and he had for a long time occupied a prominent place in the local public life of his county.

He will, of course, be chiefly remembered as an ornithologist, and in a country in which the study of birds has had so many votaries since William Thompson published his celebrated three volumes on the birds of Ireland in the first half of the nineteenth century, it is no small tribute to Mr. Ussher's real genius as an ornithologist that he should have been by common consent elevated to the leading place amongst them, and induced by the unanimous wish of his brother naturalists to undertake the writing of the new standard work on Irish birds, which had become a necessity in consequence of the large amount of new matter that had accumulated since Thompson's death. That task had originally been placed in the hands of four leading Irish naturalists—the late A. G. More, Mr. Ussher, Mr. R. M. Barrington, and Mr. Robert Warren. But Mr. Ussher's peculiar fitness for it so deeply impressed itself on his colleagues that it was soon decided to place the writing of the book almost entirely in his hands; and rarely has a task so committed been discharged with greater thoroughness and more inexhaustible patience.*

Mr. Ussher's correspondence with the bird-lovers and bird-students of every Irish county, extending as it did over the long series of years in which he was collecting material for his principal book, would fill many volumes, and the pains he took to elicit and

* 'The Birds of Ireland,' by R. J. Ussher and Robert Warren (1900).

tabulate information from every source was simply astonishing. At the same time no man was ever further from the ideal of the mere cabinet naturalist. There was hardly a mile of rocky or precipitous coast-line girding either the Irish mainland or any of the outlying islands which Mr. Ussher had not personally explored in his ceaseless search for the breeding haunts of the rarer Irish birds. There was scarcely a lake or a marsh of any extent throughout all the midland counties which he had not explored with equal zeal. A fearless swimmer and climber, he penetrated the least accessible haunts of the various Falcons, Petrels, and Divers whose habits he had made it his vocation to study. His famous collection of birds' eggs—a collection originally begun, we understand, on the suggestion of the late Mr. Howard Saunders—was one of the fruits of his untiring activity as an explorer and climber. It was an education to be shown through even a small portion of it. After the publication of his fine volume, 'The Birds of Ireland,' which appeared in 1900, Mr. Ussher parted with his great collection of eggs, the major portion of which was acquired by the Dublin National Museum; and it is hardly an exaggeration to say that these are now amongst the most valuable possessions in the Natural History Department. The Museum also owes to Mr. Ussher that most excellent guide to its ornithological collection, the 'List of Irish Birds,' which he drew up with the utmost care in 1908 to bring up to date the information published in the similar list drawn up in 1890 by A. G. More. Mr. Ussher's list, like Mr. More's before it, is now the inseparable *vade mecum* of every Irish ornithologist when he visits unfamiliar ground. The amount of information compressed within its fifty-four pages seems almost miraculous.

Of late years Mr. Ussher's indomitable energy found vent in investigations bearing on the prehistoric fauna of the country—a source of study he had hardly ventured to tap while absorbed in the preparation of his chief ornithological work. Perhaps he was largely stimulated to the cave-digging explorations that resulted in such important finds by his remarkable discovery of numerous remains of the extinct Great Auk in "kitchen-middens" on the coast of Waterford, and subsequently in a few other localities. Be this as it may, his zeal for cave research quickly became a passion, and resulted in most important additions to our knowledge of the animal life of Ireland in the dim and distant past. Summer after summer—in company with Dr. Scharff, and sometimes with other devoted zoologists—Mr. Ussher would shift his quarters to the vicinity of some unexplored Irish cavern and spend weeks in superintending

the work that laid bare the bones of Mammoths, Hyenas, Arctic Lemmings, and African Wild Cats. Whilst thus intent on facilitating the study of the past, Mr. Ussher was far indeed from slackening in his interest in the present day fauna. Few took so active a part as he in the promotion of the cause of bird-protection, and the Irish Society for the Protection of Birds has special cause to deplore his loss as that of one of its most efficient and whole-hearted members. Nothing ever gave him greater delight than the discovery of some hitherto unknown nesting-place of a rare bird, where it could hope to escape detection or molestation. It is some satisfaction to his friends to know that at least one such discovery was brought to his knowledge during the present year, and afforded him the utmost pleasure. Another of his most conspicuous traits was that love for encouraging the study of nature—especially among the young—which had also been so prominent a feature in the character of A. G. More.

NOTICES OF NEW BOOKS.

The Peregrine Falcon at the Eyrrie. By FRANCIS HEATHERLEY,
F.R.C.S. George Newnes, Ltd.

THIS is a beautiful publication, both in letterpress and illustration, and marks another advance in the annals of bird watching. Dr. Heatherley distinctly and perhaps rather too modestly defines his position as that of simply "bird-lover," and expresses himself very candidly on the subjects of egg-collecting, skin-collecting, and modern changes in nomenclature. His facts are all the results of personal observations, he has "no exaggerated veneration for the printed word," which he too often finds "is copied from one text-book to another, in default of original observations," and he therefore watches without preconceived ideas. He has thus come to the conclusion that the Falcon is bigger than the Tiercel, and states "if that is wrong, then all my observations of the inverted rôle of the sexes in their care of the young goes by the board." Of the Peregrine

language he only learned three phrases, "but the use of a hiding contrivance greatly enlarges one's appreciation of bird-language, a rich field awaiting investigation by ornithologists." This is really encouraging and advanced reading, and one of the very few recognitions of the vast revolution in evolutionary and zoological conceptions which will ensue when the language of other animals than ourselves has been studied and understood; this has now ceased to be regarded as quixotic, though too frequently relegated to the region of the unlikely. That professional egg-collectors are an absolute danger to the survival of many rare birds is apparent by the wise withholding of the locality where Dr. Heatherley and his friends made their important observations on living Peregrine Falcons.

The numerous illustrations show what photography is doing for ornithology, and the method will undoubtedly be applied to other animals by other students and lovers of Nature. In his introduction we are glad indeed to read that "The full notes will, I hope, appear later in the 'Zoologist.'"

Evolution by Co-operation; a Study in Bio-economics. By
HERMANN REINHEIMER. Kegan Paul, Trench, Trübner
& Co., Ltd.

THIS book is largely a disputation. It is strongly anti-Darwinian, especially so far as Natural Selection is discussed, but it leaves the problem very much where the author found it. The recognition of Darwin's theory of Natural Selection as a great but not sole factor in evolution is one thing, the acceptance of the "all-sufficiency" of Natural Selection in our conceptions of evolution is another. Many naturalists hold fast to the first without subscribing to the second and more recent formula. There is great truth in the prophecy of Huxley—quoted by Mr. Reinheimer—that "The new generation educated under the influences of the present day will be in danger of accepting the main doctrines of the 'Origin of Species' with as little reflection, and it may be with as little justification, as so many of our contemporaries rejected them." In fact, this has come to pass. But the method of Darwin was built on observation and reflection, rhetoric is absent in his deductions, and he who would be a

successful antagonist to his views must pursue the same careful and persistent marshalling of facts and observations ; logomachy is a useless weapon.

Robert Chamber's ' Vestiges of Creation ' is the first book mentioned in the Preface, and we find many almost forgotten opponents resuscitated in these pages. Mr. Reinheimer's attitude on the question may be represented by the following quotation:— "The question may be asked: How is it that the hold of the Natural Selection theory upon many is such as to cause them to remain satisfied with the theory? I can explain it only by the supposition that, in spite of their protestations to the contrary, the idea of Providence as a compensatory law (of their principle of mere expediency) lurks in the minds of these thinkers." Again, the author declares that the non-consideration of certain processes which he deems essential confirms him in the view "that Natural Selection acts mainly by making sophists of otherwise able and learned, though not always too amiable, men." Had Darwin lived to the present day he would have been the foremost to examine with candour and attention the views of Mendel and de Vries, and he would have been the last to disregard or ignore them ; we can also feel assured that many other theories and facts would have been gathered in his web of contemplation ; with what effect we know not? But to very many who accept Natural Selection as a great evolutionary factor, but not as an "all-sufficient" revelation once delivered to the Saints, mere disputation will not be recognized as an argument either one way or the other. The ' Origin of Species ' was the greatest book of the nineteenth century, whether its teachings are accepted or denied ; to attack it, the same method of reasoned fact and quiet argument must be employed—Disputation pure and simple is not sufficiently convincing.

EDITORIAL GLEANINGS.

RATS AND RED CURRANTS.—The Rev. W. A. M'Gonigle, of Ellingham Vicarage, writing in a recent issue of the 'Newcastle Daily Journal,' relates the following curious experience relative to the loss of wall-trained red currants: "These particular currants," he writes, "grew in bushes trained up the side wall of a 'hemel,' and were a fairly good crop. As they were intended for later use they were carefully netted, and not closely watched. One day the startling discovery was made that the bulk of them had disappeared. On closer examination it was seen that neither bird nor wasp nor human hands had carried them off. All of these have their own peculiar trade-marks which cannot be mistaken. A new agent was at work. What, none could say. Still the currants went, and that rapidly. At length the marauders were discovered in the very act. A colony of rats had their home in the 'hemel.' A hole under the eave permitted access to the bushes, and climbing down and up they had neatly and with care eaten off practically the whole crop. Such an experience can hardly be unique, but it is so singular, as far as I am aware, as to make it worth recording."

"THE Forest Service of the United States Department of Agriculture reports that during the past fiscal year 4686 predatory animals were killed by Federal officers on the National forests. According to an actual count of carcasses, the rangers' bag of beasts of prey this year was made up of 206 bears, 3541 coyotes, 133 pumas, or mountain lions, 62 lynx, 583 wild cats, 64 wolves, and 97 wolf pups."—('Pall Mall Gazette,' Sept. 30th, 1913.)

"MR. JAMES PARKER, of Burnham, shot a Flamingo on the evening of Sept. 23rd. The bird, which is a splendid specimen of its species, measures 5 ft. 8 in. across the outstretched wings. When shot it was swimming on the Crouch off Bridgemarsh Island."—('The Essex Weekly News,' Sept. 26th, 1913.)

A **SPLENDID** specimen of a Salmon Trout in fine condition was caught in the Mill Pool, Dedham, on Wednesday at midnight, measuring 2 ft. 9 in. in length and drawing the scale at 10 lbs.— ('East Anglian Daily Times,' Oct. 11th, 1913.)

INFORMATION of a remarkable freak of Nature comes from Port Alfred (Cape Colony), where, in the nest of a pair of Ostriches, belonging to Mr. D. Aitchison, a chick having four legs, four wings, two tails, and one head, was hatched. The feet and other parts of the bird are perfectly formed. This extraordinary specimen has been forwarded to the Director of the Albany Museum, Grahamstown.— ('The African World,' Oct. 18th, 1913.)

NEWS has been received in London of the death at Loanda, Angola, Portuguese West Africa, on October 31st last, of Dr. William John Ansorge, the famous traveller and explorer. Dr. Ansorge was educated at Cambridge, and afterwards went to Mauritius, where he became Professor at the Royal College, and also did a great deal of private tutoring. Subsequently he returned from Mauritius, and at the age of forty began the full medical course at St. Bartholomew's Hospital, and qualified as a doctor. He did not practise in England, but went straight out to Africa, where he became district medical officer in Uganda and Southern Nigeria. After retiring from Government service he continued his scientific and exploration work, and specialized in West African birds and fishes. He made new discoveries in nearly every department of the animal kingdom, and sent specimens to the British Museum and the Belgium Museum at Brussels. He also used to collect specimens for the Hon. Walter Rothschild.— ('Evening News.')

Dr. Ansorge's principal publication was 'Under the African Sun' (1899), in which a number of new zoological species were described by various specialists. Many of these descriptions, however, had been published in advance in 1898.

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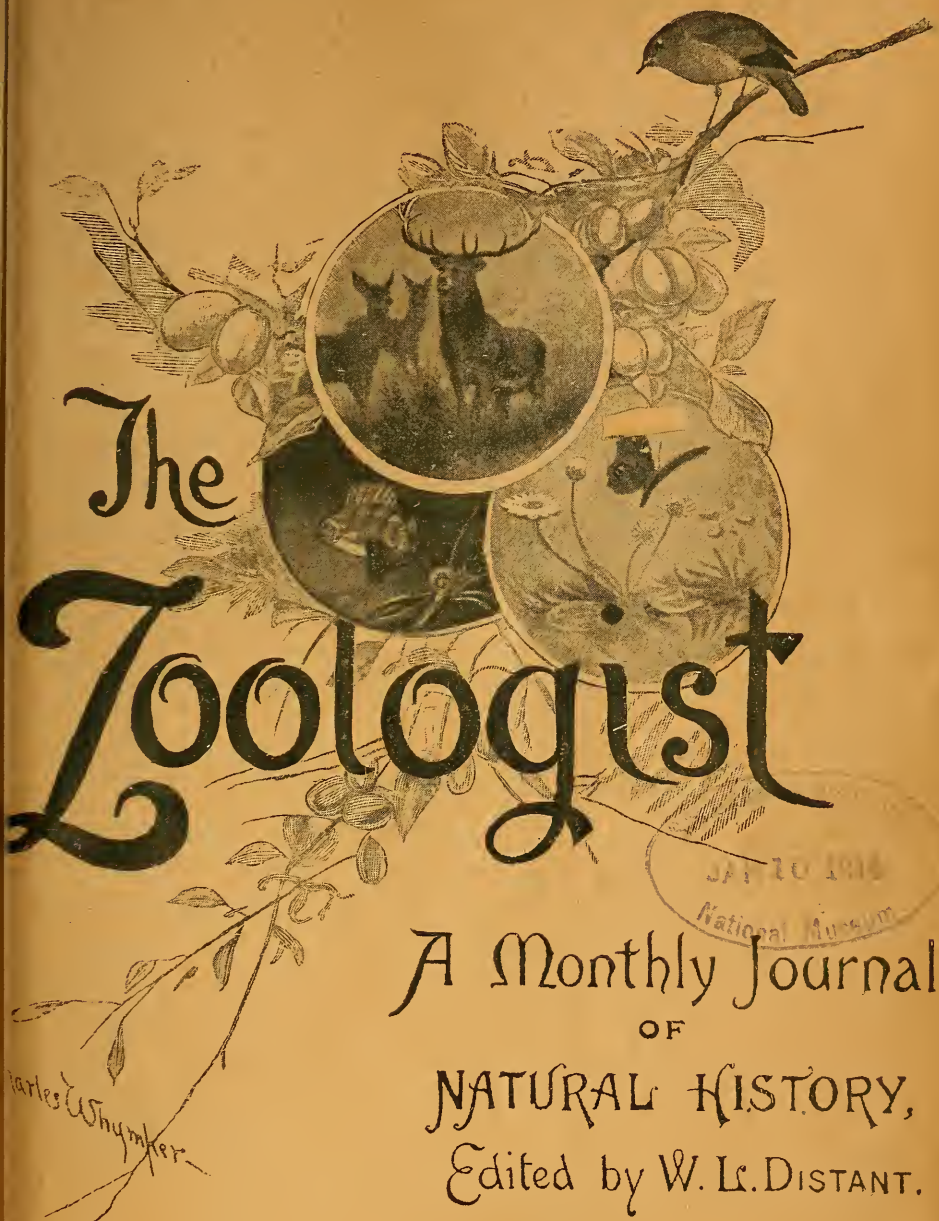
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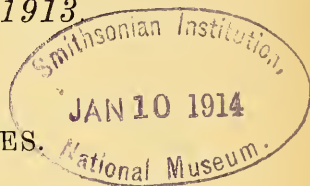
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THE ZOOLOGIST

No. 870.—December 15th, 1913

RELATIONSHIP OF SPECIES.

By H. PANTON.



It often happens in the observations of the field naturalist or zoologist that a certain curious and typical action or habit of some special animal or group of animals will be noted, and will give to the animals in question a certain individuality. There may even be nothing very definite in this special action, perhaps only some certain mode of carriage or bearing, which can no more be described than the somewhat subtle difference that is very generally apparent to a close observer in what might be termed the typical walking action of the white man and the black.

Any special attitudes, habits and bearings which appear to be commonly inherent in members of a species, or members of closely allied species, the interested observer comes in time to regard as affinitative, indeed inseparable to these members (perhaps I should confine these remarks to my own personal feelings), and in the surmises and theses that revolve in one's imagination as to the relationships and evolutions of various types one may come to rely, perhaps with too much weight, on these distinctions and similarities as a valuable help in deciding the nearness or divergence of closely connected groups, and one feels tempted, or rather forced, to make especial use of them as indicating those closer relationships not always demonstrable by the usual anatomical tests, and which are therefore chiefly undefinable by tests other than those of congeneric habits.

General observers who desire to study these peculiarities will, however, look to a great extent in vain for much direction or information on these somewhat obscure points in those popular treatises on zoology which are in more general use, and which are very largely the only ones available to the less advanced thinkers and members of the general public.

I feel, therefore, that there is some excuse if, in drawing attention to the particular attitudes and habits of animals, I venture to suggest that this subject has not been given the attention it deserves, chiefly perhaps through want of opportunity of watching animals in their native haunts. This facility is vouchsafed to few of us, and although available to the general sporting traveller or explorer, it by no means follows that the latter, even if a naturalist, is invariably a person wont to or even desirous of noting and chronicling minor observations.

Many even of our best authorities who have made a life's study of animal anatomy have, apparently, perhaps on account of the arduous and complicated nature of their researches, had little time to devote to these lesser (or shall we say less definable?) matters, even if they have had the opportunity; and this at times causes one to think that they give less heed to this subject than it appears to merit.

Habits of animals appear to be of value in classification, and should the reader dissent or question the accuracy of this statement, one has only to point to the very great similarity of action and habit that exists in animals of closely connected species. There is, therefore, some reason to believe that classification might, in certain directions, be somewhat modified by giving careful attention to these points.

To a certain extent the inability, except on the part of a favoured few, to visit and make observations on animals in their native haunts might be remedied by study of animals in suitable, large, adaptive enclosures, wherein the calls, actions, dispositions and habits of the various groups might be carefully noted. And further, as regards the grouping of the more nearly related species, we might receive, if we took more trouble in experimenting, much valuable evidence from the results of hybridization. The experiments which have been made are singularly few, and are often referred to in a somewhat loose manner.

Darwin held, and this view is often quoted, that the results of hybridization depended on "chance resemblances in the reproductive organs." This has always struck me as a very unsatisfactory explanation of phenomena we evidently know little about; and which probably are governed, like others, by some natural law. I should have imagined that the reproductive organs were the bedrock of relationship, and that it would be the other similarities or dissimilarities due to evolution, through environment and habitat, that might be more correctly held to be "chance ones."

It would indeed seem that anatomical tests, as used to demonstrate the divergences of the larger groups and families, may not be always sufficiently evident or stable enough to be depended on to differentiate between some of the more closely allied species. It would seem feasible to assume that before there is any change in structure there may occur a certain invisible change, or tendency to change, in the general essences (*φύσις*) of individual branches of a group; brought about perhaps by changes of environment and food during longer or shorter periods of separation; and which after a time might or might not become observable in changes of structure. I am of opinion that this change of essence is, in the latter case, only observable to man in change of habits and actions. Animals themselves, who unlike man cannot apparently observe, discern these changes by, probably, the sense of smell; while man, who to a great extent has lost this power but gained that of observation, might, if so minded, find in this latter some compensation. As suggested above, may not a blood change take place without any structural change, and equally may not this latter eventuate without any inward change of what the old naturalists styled "essence," and which we generally term "germ plasm"?

Without wishing in this article to enter, especially dogmatically, into any unduly controversial matter, and mindful of the fact that, not being an anatomist or scientific authority, it may appear presumptuous on my part to even discuss these matters, I think one might expect that, had more attention been given to these points, such anomalies in classification, or what appear to be such, would not have existed without comment as long as they have, or perhaps even have been made at all; and which in

certain ways seem to suggest that we have retrograded instead of progressed.

It seems obvious, if only from noting domestic varieties, that animals of very different appearance may be allied and have similar characteristics; and further, that animals of very close resemblance may be of remote relationship; in short, that too little allowance has been made for such possibilities as parallelism and convergence.

It would appear that we have not far to seek for the first example in incorrect grouping, for it can be found in certain birds, common even in the outskirts of our towns, and which we might expect, from the endless number of papers and notes published concerning them, would at least have been correctly classified. They have been treated of by fanciers, aviculturists, field naturalists, compilers of monographs, writers on county, country and continental groups, systematists and scientists. I am referring to such common species as the Greenfinch, Linnet, and Chaffinch.

If the reader will turn to any work on birds treating of classification, such as the 'British Museum Catalogue,' he will find the Greenfinch (*Ligurinus*) placed in the first subfamily of the *Fringillidæ*, while the Linnet (*Acanthis*) is placed close to the Chaffinch (*Fringilla*) in the second subfamily. If classification is indeed an indication of relationship, we might expect to find the two last-mentioned species more closely connected to each other than either to *Ligurinus*. The results of interbreeding, however, do not bear out this view; *Ligurinus* hybridizing with *Acanthis*, and both of these readily interbreed with *Serinus canarius*, although all these hybrids are sterile. *Fringilla*, on the other hand, has, as far as I know, never been satisfactorily proved to have produced young with any of the above, or with the birds that appear nearest to them, although copulation takes place.

To persons who have noted the peculiarities of these birds in captivity or at large, this result, though contrary to the usual classification, is by no means surprising. In fact, the unlearned birdcatcher shows a better appreciation of the affinities of these birds when he styles *Ligurinus chloris* the "Green Linnet." I have spent a considerable time in observations on these birds, and it

is easy for anyone to note in far less the different habits of *Ligurinus* and *Acanthis* on the one hand to those of *Fringilla* on the other.

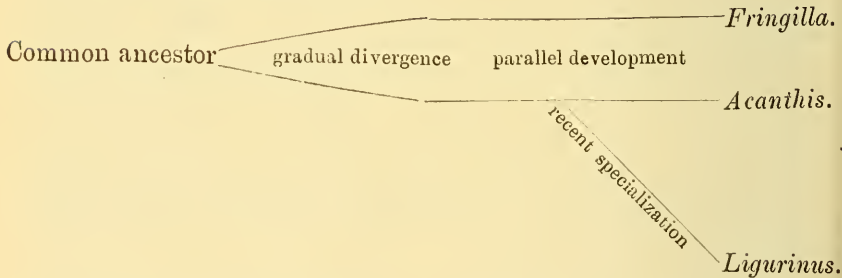
For instance, the two former fly in family parties or combinations of family parties; while *Fringilla* proceeds in large scattered hosts, each bird flying more or less individually; and what combination is present amongst them appears to result more from their gathering promiscuously together on some spot that affords the food desired. These remarks apply to winter time when these distinctions are best noted. The demeanour of *Fringilla* (as can be observed in captivity) is also at variance with that of the others. It is a bird of far more insectivorous tendencies, and from this cause has developed a prying, investigating demeanour. It also makes use of a sidling mode of progression to one side when on a twig that I have not noticed in the other forms. *F. cœlebs* and its kin (*F. montifringilla*, at any rate) also have an unpleasant attribute in confinement of hunting down and murdering other birds. To anyone who has time and who will take the trouble to observe these birds with something more than a mere superficial glance, these differences will soon become apparent.

As before stated, the tests of interbreeding which I have made myself, and I believe those of all others, bear out these deductions. It has always seemed to me that *Fringilla* is a more generalized form, from which many other closely connected forms capable of producing hybrids *inter se*, such as *Carduelis*, *Alario*, *Serinus* (some), *Acanthis*, *Pyrrhula*, *Ligurinus*, &c., have differentiated; the two latter being apparently specialized to a higher degree, but, contrary to the text-books, *Ligurinus* less so, I should imagine, than *Pyrrhula*.

Serinus also seems an ill-assorted group. Some of this genus at least having a curious action after copulation, pointing bill and tail in the air, and proving quite barren with *S. canarius*. No doubt some of these Serins should come out and be placed in a genus *Crithagra* (seed-eaters), but whether these differences should be founded on the size of the bill, as has been proposed, does not seem to me necessarily of consequence.

I think that the result of all this may be summed up as follows:—

That the two groups of birds comprising *Fringilla* (Chaffinches, Bramblings, &c.), and probably some others, on the one hand, and the various and akin genera (Linnets, Canaries, &c.) mentioned above on the other, having progressed along more or less parallel lines and retaining similar structural form, are classed as equal genera amongst the *Fringillinæ*; but that one at least of the latter group, *Ligurinus* (Greenfinches), having through evolutionary processes, perhaps somewhat recently, developed a specialized powerful beak, has been erroneously separated from its relatives and classed with others in a separate subfamily (*Coccothraustinæ*). The genealogical tree being presumably something like the following:—



The question that occurs to my mind is, Are we to base our classification on visible structural similarities, or invisible germ relationship? Until I can find any reason at present unknown to me, it appears to me preferable to hold to the latter alternative.

In the genus *Francolinus*, again, we have another very diversiform group; although split by some naturalists into different genera, they are generally, and probably incorrectly, classed as one. It seems to contain forms which, from what I could observe of their natural habits, appear to approximate, some to *Perdix*, some to *Caccabis*, and some superficially to *Gallus*. While some of the forms more resemble in their habits our Partridge (*Perdix*), others as *F. adspersus* (*Scleroptera* of Gurney) approach in this respect the French Red-legged *Caccabis*, of which they seem to be the trans-Saharal representative; they have the build and robust shape of this genus, and their carriage in running is similar. *F. pileatus*, on the other hand,

has walk and attitudes so different to the others that it reminds one strongly of *Gallus*, or even *Euplocamus*, although I do not suggest any relationship to these genera. *F. pileatus*, by the way, would seem to correspond from descriptions to Hume's *Ortygornis pondiceriana*, but as I have not seen this latter I cannot say more than that it would seem worth while to investigate this. Nicholls and Eglington* state that *F. pileatus* is somewhat suggestive of the French Red-legged Partridge. This may mean little or much, but excepting a bright coloration and red legs, I could see no resemblance, and one has only to handle the two birds to note the wide difference in their form.

I unfortunately had only opportunities of becoming acquainted with a few forms, but from what I saw of these, it appeared likely that three genera might be formed; while to combine in one all these highly divergent types would appear to me to be very inaccurate. Without, however, seeing the birds under natural surroundings and handling them in the flesh, I cannot see how they could be correctly classified, and it is worth noting that those naturalists who had this advantage classed them as different genera.

To turn to quadrupeds. Some years ago I procured, while in the interior of Africa, a pair of Hunting Dogs (*Lycaon pictus*). I had thus every opportunity of becoming familiar with the peculiarities of this species. *Lycaon* was generally held, it seemed to me, on very flimsy evidence, to be one of the most aberrant of the *Canidæ*. These differences are, I believe, the loss of one (functionless) toe, a somewhat aberrant coloration, and a slight dental dissimilarity.

On reading an account of the Indian Dhole (*Cuon dukkunensis*), it struck me very forcibly that the account of the habits of one species would equally well fit the other. This seemed so curious that I sought for further evidence to strengthen my suspicion of their closer relationship.

The Dhole was then generally included amongst the *Canidæ*, although it had lost the last lower molar (a small useless tooth, by the way), and this was not considered (probably rightly, as far as this feature was concerned) a sufficient reason for separating this species from the typical dogs. It therefore appeared

* 'The Sportsman in South Africa,' p. 103.

that, while one small dissimilarity did not lead naturalists to class this animal apart from the dogs, three small dissimilarities in the case of the *Lycaon* had this effect, while the very evident likeness in the habits of the two beasts appeared to have entirely escaped notice.

Some little time after I became interested in this question there arrived two species or varieties of Dholes at the Zoological Gardens, Regent's Park. I therefore took the opportunity on several occasions of visiting them and comparing them with a Hunting Dog that was also domiciled there. The appearance of the Dholes and Hunting Dog was dissimilar, the former being short-legged, foxy-looking animals and the latter of long-legged, hyæna-looking type. Not being able to gain much intimate knowledge of the Dholes during my short and superficial visits, I felt much puzzled about them. In a letter to 'Land and Water' I drew attention to these points, and asked for information likely to confirm my surmise, without, however, eliciting any reply. Meeting one day, at the cages in the Gardens, a well-known authority and writer on zoological matters, I was pleased to get the opportunity of asking him if he thought these animals related, and, if not, how he could account for the close resemblance in their habits. After considering the question, he informed me that he could not say. It was therefore with considerable satisfaction, as tending to show the use of observations of special habits, that I have since seen that certain similarities have been discovered in the skull of the two animals, and that these forms, formerly considerably separated in classification, are considered now to be, perhaps, closely allied. And, as bearing on the importance of congeneric habits, it is interesting to note that this probable kinship, which had apparently escaped the notice of zoologists, had suggested itself to at least one field naturalist besides myself (and maybe to numbers of others), for recently, in reading an old sporting book by the Old Shekari (H. A. L.),* I noticed that this writer very excusably referred to the Hunting Dog as the Dhole.

To gain a proper knowledge of the peculiarities of disposition and of the general idiosyncrasies of any animal in confinement, it is important to have it in one's personal charge,

* H. A. Leveson, 'Sport in Many Lands.'

if possible, night and day. Without this, however much one may see the animal in collections, one cannot often form any but a very superficial idea of the above qualities of the animal in question. Being subjected so long to the sight and blandishments of visitors, it unfortunately often refuses to bestir itself sufficiently to enable much of interest to be noted.

Some years ago the chief members of the subfamily *Bovinae* were made the type of as many different genera; while later all these genera were merged into one. About that time I suggested that this appeared unnatural, as seeming to imply that there was no more difference between the Buffalo and the Ox than there was between the Ox and the Bison. When one remembers that the two latter animals readily interbreed and that the hybrid is quite a fertile one, and that the two former animals are said to show such aversion to each other that they never even herd together, the idea this arrangement gives of the kinship of these species seems singularly inexpressive. Although I have seen attempts at copulation, I am not aware that any hybrid between the Buffalo group and the Ox group has ever been produced, and it is quite probable that, even if the above act took place, reproduction would be an impossibility. From this cause alone there is probably a considerable amount of remoteness in the Buffalo and Ox groups as compared with those of the Bison and Ox, and this is again borne out by the divergence of habits. Our classifications explain nothing of this, and we have to go back to the times of the older naturalists, with their "animals of the Cow kind" and "animals of the Buffalo kind," to get this brought out at all prominently to our notice.

Again, it is only quite recently that any attempt has been made to class the *Equidae* other than by the somewhat obvious one of colour alone. In a recent publication* there appear some remarks (Pocock) which would seem to be the first available to the general public of any change in the old order of grouping. Mr. Pocock designates the various varieties of the Zebras of the plains as "Quacchas," † as distinct from the two remaining forms of Zebra (Grevy's and the Mountain Zebra). There would appear to be much reason for this, and it is

* Harmsworth's Natural History.

† A phonetic variant for "Quaggas."

amusing to note how some writers lament that several travellers refer to Burchell's and Chapman's Zebras as "Quaggas." The Boers (whose naming of various animals is about as bad as that of most settlers) are also blamed for this, whereas it would appear that for once they have perhaps hit the right nail on the head.

There is reference in a recent treatise* to the Pencyuick experiments, which are referred to as indicating the "near relationship of the Zebras to the Horses"; this may be, but I believe these investigations prove little more of the relationship of the various existing groups of the *Equidæ* than what we have known for years. It is some time since I read these interesting experiments, but, if I remember, they appear to be more connected with telegony and the hypothetical ancestral forms. Commenting on this family in 'The Field' some years ago, I stated then what still appears to me to be more valuable evidence of relationship of present forms, *viz.*, that in the Knowsley menagerie† there was a fertile hybrid bred between the Mountain Zebra and a Domestic Ass, which bore a foal to a horse, and up till now, as far as I can find out, there has been no fertile hybrid bred between any of the *Equidæ* except the above cross. This point, taken with the great resemblance in form, a certain asinine quality of restlessness in the Mountain Zebra, together with the reports of this animal joining troops of asses, points to the fact, bluntly put, that *E. zebra* is nothing but a striped donkey.

I have never seen any account of any of the Quaggas thus associating with asses; and although I travelled in company with both the latter animals, I never saw them evince the slightest desire for each other's company. I cannot definitely affirm that they do not, but I never myself detected any evidence of this.

There is, however, at last an interesting hybrid between Chapman's Quagga and the Common Ass at Regent's Park, and it is to be hoped steps will be taken to test its fertility; and from the result of this test would seem to depend valuable evidence as to the connections of these groups of *Equidæ*. (I hear

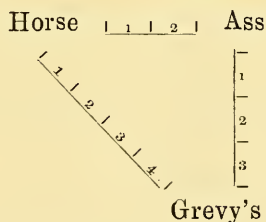
* G. H. F. Nuttall, 'Blood Immunity and Blood Relationship,' p. 197.

† 'Gleanings from the Menagerie and Aviary at Knowsley Hall.'

this animal is dead.) From what little I have been able to note of hybridization and the bearing of habits in connection therewith I should rather expect this cross to be sterile. (I have just received information, which is I believe reliable, to this effect.)

Beyond the fact that the Horse is apparently at one end of the Equine line and the Ass and Zebra (*Equus asinus* and *E. zebra*) at the other, nothing definite appears to be known about the position of the remainder, viz., the various Quaggas and the Asiatic species which might very well be more generally referred to as Onagers.

As regards that distinctive equine Grevy's Zebra (which compares with the Mountain Zebra superficially, somewhat as a Poitou Ass compares with our English donkey), some interesting blood experiments have been made by Nuttall.* According to these experiments, the blood relationship (in the majority of these tests) appeared to be somewhat greater between Horse and Ass than between Ass and Grevy's, and least between Grevy's and Horse. Taking the very divergent results obtained by many of these blood tests, it is perhaps unwise to attach too much importance to them until thoroughly confirmed, but if correct, the relationship of these forms might be written down as—



Again, take the case of the two English Rats (*Mus rattus* and *M. decumanus*), classed as species of one genus: these have few special habits congeneric or common to both.

I have been unable to breed any hybrid between these two species, neither do I think they will copulate. Should they do so and any produce result (which I should imagine unlikely, even if they did copulate), it is probable the young would be sterile.

As I am still experimenting with these animals, it is not at present advisable to go further into the matter.

* 'Blood Immunity and Blood Relationship.'

The whole question of the relationship of close species in the various groups of animals would seem to be one of considerable interest. One hears little of it, however; minute details of how the local race of one species differs from another local race of the same seeming to absorb much of the attention of field naturalists, and of that of the big game hunters who perchance record scientific notes, and very greatly that of many of the more scientific authorities. We have accumulated much knowledge about these differences, but little or none of the degree of relationship of less closely related forms. Much valuable information arrives promiscuously, by chance. We know now that the hybrid Polar and Brown Bear is fertile, and that the hybrid Lion and Tiger is sterile, and the results are what we might very feasibly have expected. The Lion one can hardly deny is an aberrant Cat, and one that seems to have specialised back to a more generalised form; compared to the typical Cats he is a degenerate, weaker clawed type, perhaps even slacker muscled, noisy and blundering, roaming the open plains in troops, even at times, one might almost say, in packs.

One might suppose, indeed, that the Lion was the ancestral and not the specialised type, and that this latter is represented by the more proficient members of the family, as Leopards and Jaguars; but when we remember the Lion's unique appearance, his specialised teeth, and his retention, though in waning degree, of the chief Cat attributes, it is probably likely that the former view is the correct one, otherwise one would naturally look for more generalised civet-like attributes.

Although all the larger Cats (and this has indeed been the case with nearly every family besides) have been kept in close proximity in many collections for many years, there has been no systematic attempt (or it is not deemed worth mentioning, if there has) to determine their relationship by cross-breeding experiments. Hybrids have been produced between Lion and Tiger, Lion and Leopard, Tiger and Leopard, Puma and Leopard, and Jaguar and Leopard; and that the first is, so far, sterile and the last fertile is all, I believe, we at present know, and while one may have one's own opinion as to these matters, so much surmise is unsatisfactory.

It is very interesting to know how the Lion of Somaliland

differs from the Lion of the Cape, but it is equally interesting, if not more so, to know whether the Tiger is more closely connected to the Lion or to the Leopard, and if anyone can give me any definite information on this point I shall feel very grateful to him.

If, however, those writers are correct who hold that the results of hybridization are only governed by chance, most of the above remarks will be evidently of no value. In spite of the very curious results arrived at in the cross-breeding of plants, and which, I believe, give rise to this theory of chance resemblance, I have always felt far from convinced that this view is the correct one.

It will be observed above that I have spoken about the various results of hybridization (as to whether the young is fertile or not) as being "what we might expect." These expectations I have based not on the text-book classification, but (when-ever possible) on observations of certain characteristic actions of the animals, and as to whether they were congeneric or aberrant.

I have rarely seen in any of the general results of hybridization (in animals at least) anything that appeared particularly extraordinary in these results; allowing that these may seem extraordinary to the systematist, they appear, if one bases classification on a comparison of habits, to be eminently in agreement with these latter. It is rarely we get any information on these points. In an article that I read on this subject some years ago, entitled "Can Mules Breed?"* I noticed that the writer (F. Finn), amongst other things, stated: "Amongst beasts the American Bison produces a hybrid with the common Cow, and this hybrid is fertile; no one will pretend that these two creatures are not as distinct as the Horse and Ass, if not much more so. . . . In the Zoo can be seen at present a hybrid between a Polar Bear and a Brown Bear, and a three-quarters bred animal from this beast mated to a pure Polar Bear. These Bear mules have also bred between themselves, and the two parent species again are more different than Horses and Asses are."

I believe the view above expressed is the one very generally

* 'The Feathered World.'

held, but one might ask in what way are these members of the *Ursidæ* and *Bovidæ*, above mentioned, "more different" respectively from each other than the Horse and the Ass? The only reply that I should expect to this question would be that they are considered by some authorities to be structurally so, and that by some naturalists they have even been placed in different genera. We have thus, on the one hand, this somewhat dogmatic assertion: first, that the difference between two carnivores of similar gait, fish-eating and climbing propensities, and both omnivorous; and, secondly, that the difference between two plain-haunting, grass-eating members of the family *Bovidæ* (Bison and Cattle) is greater than that between the plain-haunting, broad-hoofed Horse (a blundering galloper through shallow pools, with an eleven months' gestation) and the desert and mountain-loving, small-hoofed, dust-rolling, thick-skinned Ass, whom one can hardly force across the shallowest streams, and whose gestation extends to thirteen months. Well, it may be so!

Besides all the above points, however, there appears to me a certain possession of habits and individuality which the Bison and Cow possess in common, and which the two Bears likewise possess, and which seems to be quite wanting in the two above-mentioned members of the *Equidæ*. There is also in the latter a difference that can be observed in the actions attendant upon copulation. Further, there is also this difference between the latter, which I do not think exists in the two former groups (I certainly cannot detect it). It will not be found mentioned in popular writings or in the text-books, but it may be one of some importance for all that. It is a difference one can detect without any post-mortem examinations of the animals, without touching them, without looking at them, without even going near them.

If the reader will go into any stable where Donkeys are kept, and into one where Horses are kept, he will immediately perceive this difference, for he will smell it. Our human sense of smell is a very poor one, and we therefore seem to neglect this mode of classification, which is perhaps the only one animals know of, and which it is possible is better than all ours put together. We can certainly detect the difference between a he-Goat and she-Goat a furlong away if we are to leeward, and the difference

between Boar and Sow is far less noticeable; while the difference in other animals, such as Bull and Cow, Stallion and Mare, is only readily discernible in the more concentrated effluvia of their stables.

I am, of course, aware of the oft-quoted characteristic difference in the smell of the Caucasian and the Negro (which are relatively distasteful to the senses of these races) who *do* produce fertile offspring, and this may seem to contradict the importance of any difference existing in this manner between Horse and Ass, in so far as suggesting infertility, and thus being of value as indicating increased variation.

If we look further into this, however, it is possible this human hybrid approaches perilously near the Horse and Ass mule, being classed by Broca* as "paragenetic" (of low fertility); though whether this latter view is correct or not is difficult to prove. Anyhow, may not this difference in smell precede and not follow, or arise with, the "agenetic" or entirely infertile stage?

If it does precede this stage, then it does assist in producing this stage, by causing distaste, and consequent segregation.

Finally, the difference in smell in the two above examples may not be connected with the same organs, and thus the comparison is perhaps valueless.

Further on in his article, after instancing the results quoted above, and certain others obtained from birds, Mr. Finn asks: "What is the reason of these discrepancies?" I cannot perceive that in his instances there are any discrepancies, although, as it is difficult to avoid being influenced by the general teachings of our schemes of classification (which vary quite frequently, by the way), these results may appear to be discrepancies. Judged by congeneric actions the results seem very fairly regular, and I should imagine that, when blood tests are better perfected, these will again bear out these deductions. Mr. Finn himself states further on in his paper that "we can say that the fertility of a hybrid does depend to some extent, *amongst birds, at any rate, on the nearness of the species crossed.*"

* 'On the Phenomena of Hybridity in the Genus *Homo*.'

SOME JERSEY OLIGOCHÆTS.

BY THE REV. HILDERIC FRIEND, F.L.S., F.R.M.S.

UP till the present time only eleven species of *Oligochæta* have been known to me from Jersey, and these were all Earth-worms or *Lumbricidæ*. Little if any attention has been paid by naturalists to the other groups of terrestrial or freshwater Annelids hitherto, and no one could give the vaguest guess as to their nature or number. It was, therefore, exceedingly gratifying to receive at the beginning of July a large and typical collection made by my indefatigable friend and most expert investigator, Mr. H. Hillman, of Nottingham, ably assisted by Mr. Abbot, of Jersey. Mr. Hillman spent some days on the island during the month of June, and devoted many hours to a systematic search for the smaller species of Annelids, with results which abundantly justified and rewarded his exertions. In the letter which accompanied the gleanings, Mr. Hillman remarks that he captured something every day he was in Jersey. One box contained "collections of all kinds [except cash], mainly from places in the south and east of the island, and up valleys running northwards from the south coast and south-west. They come from broodsides, roadside banks where damp oozes out, gutters in similar places, half rotted heaps of potato haulms (what an odour these possess!), heaps of manure, of dead leaves, amongst roots of plants, moss, pot-plants in a vinery, the manure heap outside the vinery in which vines are growing, amongst algæ around roadside drinking troughs, and in a rotted elm. Some of the larger worms I got a friend (Mr. Abbot) to dig for in his garden. In this connection it should be added that the soil of Jersey is very light, full of moles, and, at the present time, desiccated and powdery, so that we dug in several places without finding anything at all, even where the ground was covered with weeds. The other tin box contains a collection of algæ, moss, &c., from many places. Some came

from just the border of the beach where fresh water was dripping ; some from a cave in Devil's Hole. The match-box contains a collection from the shore of the lake, the west and north generally, and the banks of a small stream running into Devil's Hole. I spent a whole day on this run on a cycle, and sorted out the worms as I got them, instead of waiting until I got back, and am under the impression there is a big number in the small space."

The surmise proved to be correct, as the following notes will show :—

GENERAL RESULTS.—Seeing that this is the first attempt to deal in a systematic way with the Annelid fauna of any of our islands,* the results are of peculiar interest. Nearly fifty different species of Annelids reached me in Mr. Hillman's collection, and, when these are added to the species already known, we obtain the ensuing :—

Family.					No. of Species.
<i>Lumbriculidæ</i> ...	...	....	...	...	1
<i>Enchytræidæ</i> ...	...	....	...	...	31
<i>Megascolecidæ</i>	....	....	...	...	1
<i>Lumbricidæ</i> ...	...	...	....	...	17

If we analyse the Enchytræids, we find their number represented thus :—

Genus.	No. of Sp.	Genus.	No. of Sp.
<i>Buchholzia</i> ...	1	<i>Chamædrilus</i> ...	1
<i>Mesenchytræus</i>	2	<i>Pachydrilus</i> ...	2
<i>Henlea</i> ...	4	<i>Enchytræus</i> ...	4

while the species of *Fridericia* numbered sixteen at least. Though a strict account was not kept from the very beginning of each specimen of Enchytræid examined and identified, the figures which follow give a good idea of the relative frequency of the different species.

Buchholzia was represented by three specimens, all immature, and *Chamædrilus* by five, also in an immature condition.

* Mr. Southern has dealt with Clare Island for the Irish students of Nature in a similar way. See Bibliography.

Mesenchytræus setosus was adult, three specimens being found; while only two were discovered of *M. oligosetosus* sp. nov. The Pachydrilids were *Marionina crassa* (?) represented by eight specimens, and one or two other species not yet diagnosed. Four species of *Henlea* totalled twenty specimens, there being one to credit to *H. insulæ* sp. nov., two to *H. parva* (?), four to *H. hibernica*, and thirteen to *H. rhætica*. Similarly the four species of *Enchytræus* were represented by thirty-four specimens. Of these *E. nigrinus* had one, *E. buchholzi* one, *E. minimus* six, and *E. albidus* twenty-six.

The Fridericias are everywhere in Britain the dominant genus of Enchytræid. As already stated, the number of species collected in Jersey by Mr. Hillman reached sixteen or more. Of these *F. helvetica*, *F. galba* and *F. bretscheri*, were represented by one apiece; *F. ratzeli* and *F. leydigi* by two each; *F. michælseni* and *F. glandifera* by three; *F. connata* by four; *F. polychæta* and *F. ulmicola* each by eight; *F. bulbosa* and *F. perrieri* by eleven.

The *Lumbricidæ* were well represented, *Allurus* and the Brandling (*Eisenia fetida*) being by far the most numerous.

CURIOUS LACUNÆ.—Not a single specimen of any of the genera belonging to the *Æolosomatidæ*, *Naididæ* or *Tubificidæ* was to be found, and only one specimen representing the family *Lumbriculidæ*. This seemed so anomalous that I wrote to Mr. Hillman expressing my surprise. A quotation from his reply may throw some light on the matter. It may be premised that when the consignment reached me it was accompanied by a note saying that the water containing weeds and algæ had gone putrid. "The absence of freshwater worms is remarkable, and yet cannot be attributed to the loss of the bottle of water; because if they had been present in the water, the wet moss and algæ would surely have contained them also. I particularly regret the loss of the water, because I had the peculiar conditions of Jersey in view when I got it. There are not six ponds in the whole island, I am told. All the streams are, of course, spring water, plus surface ooings, and the springs must surely be fed by Continental sources? They run directly into the sea down valleys more or less straight. It is quite possible what ponds there are may be seasonal, but the

'lake' and an old water supply reservoir, from both of which the contents of the bottle came, are constant. It is also to be noted that the main manure on the land is seaweed. I do not know if this may affect the types to be found, especially where used wet, and thus full of marine life."

When this fact about the manure is kept in mind, it is surprising that only two red-blooded Enechytræids or Pachydrilids occurred; the total number of specimens not reaching a dozen. There is, therefore, evidently room for further research and discovery.

EXTENSION OF RANGE.—Some very interesting facts have come to light in the course of this research. I begin with *Lumbricus papillosus*, Friend (= *L. friendi*, Cognetti), which was first discovered by me in Ireland, then found in the Pyrenees and Switzerland. Although searched for throughout England, Scotland and Wales for twenty years, it has never yet been found in the British Isles except in the south of Ireland. Its appearance, therefore, in Jersey is very instructive. Next in point of interest comes *Helodrilus oculatus*, Hoffm., whose known range is being constantly extended. To the Continental localities Germany, Switzerland and Italy, given by Michaelsen, we may add Holland (the Hague); and for Great Britain, London, Hastings, Malvern, Nottingham, Edinburgh, Dublin, and other localities. Now we have Jersey as a further habitat.

Frequent allusions have been made in former years to phosphorescent worms in England and Ireland, while specimens are still preserved in the Museum at Worcester of a species discovered some years ago in that city. But reliable records respecting the species are rare. This year, however, Mr. Hillman sent me worms from a market garden near Nottingham, which included specimens of *Microdrilus phosphoreus*, Dugès. Among the material collected in Jersey were five specimens of the same Annelid, while a further specimen, no larger than a well-formed *Henlea*, with hair-like processes in the mouth, may possibly be referred to this species.

While the typical form of *Allurus* was abundant, a very beautiful specimen of var. *luteus* was found in the adult stage with a few immature forms. So with the common Green Worm

(*A. chlorotica*); while some were of a brilliant green, others were yellow or golden. The remaining *Lumbricidæ* offer few subjects for special remark, except that certain species of the *Dendrobæna* group seem to be abundant.

It is among the Enchytræids that the most important discoveries have been made. The new species will be mentioned later. Meanwhile, a few remarks respecting those already known as British may not be out of place. Mr. Hillman took some specimens from "a rotted elm, a piece of which is enclosed on the chance that the worms peculiar to this may remain in it." This accounts for my finding no fewer than eight specimens of *F. ulmicola*, while only three of *F. michælseni* were present. The specimens were adult, and have enabled me to confirm and extend my original diagnosis. *Fridericia perrieri* was plentiful, but one specimen seemed to be clearly referable to *F. agricola*. While there were seven specimens of *F. polychæta* all closely resembling the type, there was one specimen which differed so widely from the rest that I have for the present given it place as a distinct variety. Similarly, there were two specimens of *F. leydigi*, and three others closely allied thereto, which have puzzled me greatly. About a dozen species are typical British and European, but some of the rest are critical, and one must hope for a further opportunity of examining new material in order to solve the problems which they present.

NEW RECORDS.—The family of Enchytræids is the only one which has supplied material new to Britain or to science. Here one new *Mesenchytræus*, two new Henleas, and certain new or little known *Fridericias* claim attention. As already stated, *Henlea* was represented by four species. Eleven specimens of *H. rhætica*, our best known species, perhaps, were collected with four *H. hibernica*. The others have not been found in Britain before.

1. HENLEA INSULÆ, sp. nov.

Description.—Length, when alive, 12–14 mm. Segments 50–65. Setæ usually 8 in front, gradually diminishing from 6 to 4 behind. No œsophageal glands, therefore falling into the author's *Henleanella* division; no bulb, but œsophagus going gradually into the intestine as in *Fridericia* and *Enchytræus*. Dorsal vessel arising behind the clitellum in 17/18 or 19/20 segments.

Salivaries slender and forked like certain species of *Fridericia*. Girdle from 12 to $1\frac{1}{2}$ 13 with dense gland cells rendering it opaque. Septal glands of three pairs not of the normal shape. Two kinds of cœlomic corpuscles. Brain convex behind as in *Fridericia*. Spermathecæ with duct longer than bulb and ampulla, and possessing a pair of large glands at the $\frac{4}{5}$ opening. Ampullæ fairly large, about 3×1 with long irregularly coiled duct, and considerable atrial gland and large male pores. Nerve enlarged somewhat in segments 2-3. Nephridia with long duct from near the septum.

It will be seen that some of the characters are decidedly Friderician, while in some respects the creature resembles *H. multispinosa*. It is distinguished from all other British forms by the position of the dorsal vessel; while the setæ, spermathecæ, salivaries, brain and other characters serve to separate it from others. Now described for the first time. The trivial name is in allusion to the habitat.

2. HENLEA PARVA (?), Friend.

Description.—Length about 6-8 mm. Segments 35-40. Setæ 5-7, shortest in the middle of the bundle. Bulb in segment 8, dorsal vessel arising in the middle of segment 9. No œsophageal glands or salivaries. Brain not deeply incised, but slightly concave behind. Girdle 12 to $1\frac{1}{2}$ 13. Spermathecæ short, simple ducts gradually narrowing towards the intestine. Ampullæ small, about 2×1 . Nephridia with small anteseptal and large postseptal, but origin of duct could not be discovered. Three pairs of septals and cœlomic corpuscles like those of *Fridericia*.

This comes very near *H. parva*, Friend, and I have therefore refrained from giving it a separate name. More material is needed before a final decision can be reached. See Trans. Notts. Nat. Soc., 1911-12, p. 60.

The genus *Mesenchytræus* is but poorly represented with us. In Jersey two species occur. *M. setosus* has already been reported for other localities. The following paragraph refers to a species not found previously in Great Britain, and, so far as I can judge, equally new to science.

3. MESENCHYTRÆUS OLIGOSETOSUS, sp. nov.

Description.—Length 5–6 mm. Segments 35. Setæ 1–3 per set, never exceeding 3, usually 2 dorsal and 3 ventral. The enlarged setæ in segments 5 and 6, two in each lateral bundle. Dorsal vessel arises apparently about 13/14. Nephridia with small ante and large postseptal, the duct being about the same length as the latter and arising near the septum. Brain incised behind. Three pairs of septal glands. Girdle with large gland cells on 12–1/2 13; moderately large ampulla for the size of the worm, with large atrial gland and male pores, and long coiled duct. No salivaries seen. Cœlomic corpuscles oval or ovoid, some with processes at the two ends. The spermathecae were not observed.

The species has fewer setæ than any whose descriptions I am familiar with, hence the trivial name. Now described for the first time.

No genus is more perplexing than *Fridericia*. I have already described a good many new species (see Bibliography), and hesitate to multiply the number. Some of the Jersey forms are very perplexing, and two at least are new to Britain. One of them belongs to the group containing species with two setæ in each bundle throughout. The other merits separate description, and is named after the discoverer.

4. FRIDERICIA HILLMANI, sp. nov.

Description.—Length 10–12 mm. Slender. Segments 50. A second specimen was smaller than the type, but the characters were the same. Setæ 4 dorsally, 5–6 ventrally in front segments, 4 in segments 13–25, and 2 in posterior part of body. Spermathecae with fairly large ampulla, duct two or three times as long, and about 5 sessile diverticula. No 4/5 glands. Salivaries stout, ends simple, but processes near the proximal end. Septals three pairs. Girdle on 12–1/2 13, with roundish gland cells, long slender coiled duct, and ampulla about 3 × 1. Dorsal vessel arises about 18/19. Brain of normal shape and size with convex posterior. Transparent between 9/10 and 13/14, clearly showing the internal organs; while the chloragogen cells in front are large and brown. Nephridia of front segments with somewhat globular anteseptal, and postseptal about three times as large.

LIST OF KNOWN FORMS.—It is now possible for us to take a survey of the whole field. The gap remains. No species of *Æolosomatidæ*, *Naididæ*, or *Tubificidæ* is on record.

LUMBRICULIDÆ.

1. *Lumbriculus variegatus*, Müller.—One immature specimen.

ENCHYTRÆIDÆ.

2. *Henlea rhætica*, Bret.—Common.
3. *H. hibernica*, Southern.—Less frequent.
4. *H. parva*?, Friend.—Rare.
5. *H. insulæ*, sp. nov.—Rare.
6. *Buchholzia (fallax?* immature).—Three specimens.
7. *Marionina crassa*, Clap.?
8. *M.* or *Lumbricillus*, sp. (possibly two kinds).
9. *Mesenchytræus setosus*, Mich.—Three specimens.
10. *M. oligosetosus*, sp. nov.—Two specimens.
11. *Enchytræus albidus*, Henle.—Common.
12. *E. buchholzi*, Vejd.—Rare.
13. *E. minimus*, Bret.—Not uncommon.
14. *E. nigrinus*, Bret.—Rare.
15. *Fridericia ulmicola*, Friend.—Eight specimens.
16. *F. michælseni*, Bret.—Three specimens.
17. *F. perrieri*, Vejd.—Common.
18. *F. agricola*, Moore.—Rare.
19. *F. leydigi*, Vejd.—With variety or new form, fine specimens.
20. *F. bulbosa*, Rosa.—Typical form. Ten or more specimens.
21. *F. connata*, Bret.—Four specimens.
22. *F. polychæta*, Bret.—Fairly common.
23. *F. polychæta* var. *robusta*, Friend.—One specimen.
24. *F. bretscheri*, Southern.—One specimen.
25. *F. glandifera?* Friend.—Three specimens.
26. *F. galba*, Hoffm.—One specimen.
27. *F. bulbifera*, Friend.—Three varying forms.
28. *F. ratzeli*, Eisen.—Rare.
29. *F. helvetica*, Bret.—Rare.
30. *F. hillmani*, sp. nov.—Rare.
31. *F.* (bisetose species not yet identified).
32. *Chamædrilus chlorophilus*, Friend.—Five specimens.

MEGASCOLICIDÆ.

33. *Microscolex phosphoreus*, Dugès. Five specimens. Also a young (doubtful) form with hair-like processes from buccal cavity.

LUMBRICIDÆ.

34. *Allurus (Eiseniella) tetrædrus*, Sav.—Type very common.
 35. *A. (Eiseniella) tetrædrus* var. *luteus*, Friend.
 *36. *Eisenia fœtida*, Savigny.—Common; dark.
 *37. *E. rosea*, Sav.
 *38. *Allolobophora trapezoides*, Dugès.
 *39. *A. turgida*, Eisen.
 *40. *A. longa*, Ude.
 *41. *Aporrectodea chlorotica*, Sav.
 *42. *Dendrobæna subrubicunda*, Eisen.—Common.
 43. *D. arborea*, Eisen.
 44. *Helodrilus oculatus*, Hoffm.
 45. *Bimastus constrictus*, Rosa.
 *46. *Octolasion cyaneum*, Sav.
 *47. *Lumbricus rubellus*, Hoffm.
 *48. *L. castaneus*, Sav.
 *49. *L. terrestris*, Linn.
 50. *L. papillosus*, Friend (= *L. friendi*, Cognetti).

I gratefully acknowledge the aid of a Government grant, by means of which these researches are prosecuted.

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Pocklington, York.

* Those marked with an asterisk had already been reported.

NOTES AND QUERIES.

MAMMALIA.

Scarcity of the Squirrel in Somerset.—*Sciurus vulgaris* has been gradually decreasing in numbers in this county for the past eight or nine years. I remember when they were abundant in the woods around here, especially in those on the southern slopes of the Mendips where oak and hazel were, and are now, plentiful. A noticeable feature is, but of course it may merely be a coincidence, that the Tawny Owl has during the past few years become commoner, and one may almost say abundant, while certainly with truth in some districts the Squirrel has gradually become scarcer, until at the present day I believe it to be totally extinct in the Wells district of Somerset. The Tawny Owl was formerly rare, but has become abundant owing to the fact that gamekeepers and gunners have been educated to the truth respecting the food of this nocturnal species.—STANLEY LEWIS (Wells, Somerset).

AVES.

Hobby in Buckinghamshire.—An adult Hobby (*Falco subbuteo*) which, from its plumage, is probably a bird of the previous year, was killed on August 23rd last at Lavendon. I could not learn from the gamekeeper who shot it that he had ever seen this species previously, but at that time of the year I hardly think it would be a "passage" bird.—J. STEELE-ELLIOTT (Dowles Manor, Salop).

Baer's Pochard (*Nyroca baeri*) in Notts.—About the middle of April, 1911, a man saw three Ducks on the Trent and killed them with one shot. He took them to a taxidermist of Nottingham, who gave him sixpence each for them; taking one to be a variety of the Tufted Duck, he preserved it for me, eating the others which were Tufted Ducks. When I saw it I said it was a Ferruginous Pochard. He cased it and I placed it in my collection where several visitors saw it, but it was not till one day in July last that the Hon. Gerald Legge (a great authority on Ducks) informed me it was a very rare bird (Baer's Pochard), only one other having been killed, and that at

Tring, where it is preserved in the wonderful museum there. I naturally was delighted to have obtained so rare a Duck and a new Notts bird.—J. WHITAKER (Rainworth Lodge, Notts).

Notes from Hadley Wood, Middlesex.—The corner of Middlesex in which Hadley Wood lies, although but eleven miles from the City, seems to have almost escaped notice by ornithologists. Mr. Harting ('Birds of Middlesex,' 1866) seems not to mention it, and I am unaware of any article or books on the locality except my own 'Birds of London' (1893). During recent visits I have noted that the Jays seem rather more common than they were years ago, but they are still wary and keep to the Beech Hill Park side, for which reason I have always supposed they breed chiefly in the latter place. The Nuthatch is also still fairly common, and I recently saw a nesting-hole, evidently of last season, with a very good "wall." To-day (November 23rd) a large flock of very wild Ring-Doves were in the woods, I also met with a small party of Golden-crested Wrens. Redbreasts were unusually numerous, but all were of the British race, and I noted various species of *Paridæ*. Several parties of Coal-Titmice and Marsh-Titmice appeared during the last week of October. There were also a few Tree-Creepers, which are resident here. The Green Woodpecker seems to be still found, as some nesting-holes are to be seen, and I have observed the bird on former occasions. I have formerly noted among other forest birds the Wryneck, the Magpie (probably breeding), the Tawny Owl, the Kestrel, and, on one occasion, the Woodcock. The Nightingale nests here, as well as many of the Warblers, the Spotted Flycatcher, the Bullfinch, and other common species hardly worthy of mention. The Cuckoo is common, and I have several times come across the eggs. The Lapwing, Coot, Moorhen, &c., frequent the neighbouring fields and ponds. In the public wood itself, needless to say, no shooting takes place, hence its advantages as an observation ground and sanctuary.—H. KIRKE SWANN (Finchley).

Bird Migrations and Direction of Winds.—I was interested in reading Mr. Stubbs's article (*ante*, p. 241) regarding migrants flying in the teeth of the wind, and would like to state a few points on this interesting subject, although we know practically very little about the movements of our migratory birds. The great majority of those coming to Australia to nest from New Guinea, and also from other Pacific islands, do so during the months of September and October, and at that time of the year the south-east trade winds are blowing, often very strongly during the day, but not so much at night;

therefore these birds have to fly against the wind to reach the land they are making for, and at the time of the year they return the north-west trades will probably be blowing, and they again would have the wind against them. Various birds do their migrating in different ways; for instance, Nutmeg Pigeons (*Myristocibora spilorrhoea*) fly fast and just above the tops of the waves, whilst Bee-Eaters (*Merops ornatus*), fly higher, with their undulating motion. As far as I can judge few fly very high, most of the waders averaging from 10 to 30 ft. above the sea-level; still the main fact is that these birds have to fly against the wind. Then, again, the Spine-tailed (*Chætura caudacuta*) and Pacific (*Micropus pacificus*) Swifts, when arriving in Victoria from Tasmania, appear almost invariably on a day when a northerly wind is blowing; I have noticed this fact on many occasions, and so they have to fly against the wind. With regard to other migrants from Tasmania, I cannot state definitely how the wind might be on their crossing Bass Straits. I do not think for a moment that these migratory birds fly against the wind from choice, but have to take whatever the wind may be during the time of the year they migrate. With regard to Spine-tailed and Pacific Swifts the matter seems different, there being no trade winds in Bass Straits, and the wind varying from day to day, and one would think that these birds could just as easily cross the Straits in a southerly or west wind as in a northerly; but, anyhow, we shall have to learn more on the subject before we can give definite statements.—D. LE SOUËF (Director, Zoological Gardens, Melbourne).

Birds Rearing Broods in Old Nests.—Referring to Mr. Morris's communication on this subject (*ante*, p. 430), it is not often that the Thrush (*Turdus musicus*) rears a second brood in the same nest, but such a case occurred here recently; the nest being built in a garden, and two broods brought off in the old nest. It is not an uncommon occurrence for the Wren to rear a succession of broods in the same nest when built on an outhouse or shed if thatched with straw or heather. Cock nests are sometimes utilised for late broods, but more frequently used as dormitories for fledged young.—E. P. BUTTERFIELD (Wilsden, Yorkshire).

Starlings on Sheep's Back.—Referring to Mr. Stubbs's communication ('Zoologist,' 1912, p. 281), it is a very rare occurrence to see a Starling in this district perched on the back of a Sheep or any other animal; in fact, I cannot be quite certain whether I have ever witnessed such a sight in the immediate neighbourhood of Wilsden.

In other districts I have seen both the Starling and Pied Wagtail; the last time I saw the Starling in such a situation, I think, was when on my way to Chesterfield. It is a curious fact that this habit of the Starling should vary so much in different districts; but somehow, when seen on the back of Sheep, I think it is sometimes collecting wool for lining its nest; or when the grass is not short where the sheep are grazing, it often uses the back as a perching place for catching insects which have been disturbed. It may feed occasionally on ticks, but this, I think, will not be a common habit. Is not this habit of Starlings more common in the nesting season than at any other period?—E. P. BUTTERFIELD (Wilsden, Yorkshire).

O B I T U A R Y.

ALFRED RUSSEL WALLACE.

So much has been written about this illustrious man, both before and after his death on November 7th, that it is difficult to say anything fresh or arresting. Looking back over a warm friendship of more than twenty-five years, and reading again the numerous letters received from him, I do however recall memories and find striking statements which help to create a picture of the great personality now lost to the world. Some of these have been recorded elsewhere ('Nature,' November 20th, pp. 347-9); others appear in the following pages.

The curious misconception about the date of Wallace's birth has often been referred to, but it is of interest to quote his own words on the subject. He wrote, February 23rd, 1903:—

"Up to about fifteen years ago I thought I was born in 1822. I suppose I had been told so. But I *then* came into possession of an old Prayer Book in which the date of birth of my father is given by his father, and of all my brothers and sisters in my father's handwriting, and there I am put down as born on January 8th, 1823, and the date is repeated for my baptism, February 16th, 1823. I, therefore, found myself then a year younger than I had supposed. . . ."

Although Wallace was eminently sociable and delighted in converse with his friends, he was strongly averse to publicity and ceremony of every kind; and I think that his appearance at the Linnean Society's celebrations in 1908 was due to a sense of duty,

and not from pleasure. He felt that it was a unique opportunity of paying homage to the mighty genius whose name had been, and will ever be, associated with his own.

In the summer of 1889 the Hebdomadal Council of Oxford University invited him to receive the hon. degree of D.C.L. at the Encænia. Professor Bartholomew Price wrote to inform Wallace of the decision. He wrote to me on May 28th:—

“You will probably be surprised and *disgusted* to hear that I have declined it. . . . I have at all times a profound distaste for *all* public ceremonials, and at this particular time that distaste is stronger than ever.” After referring to the amount of work he had to do, the letter continues: “Under these circumstances it would be almost impossible for me to rush away to Oxford, except under absolute compulsion; and to do so would be to render a ceremony, which at any time would be a trial, a positive punishment.

“Really the greatest kindness my friends can do me is to leave me in peaceful obscurity, for I have lived so secluded a life that I am more and more disinclined to crowds of any kind.”

A few years later he refused, for the same reason, to unveil a statue of Darwin in the Oxford University Museum, and I well remember the sly humour with which he hinted that Sir Joseph Hooker would be a far more appropriate central figure at the ceremony.

Ten years ago the Hon. John Collier generously offered to paint a portrait of Wallace. If the offer had been accepted we should have had a noble presentation of one of the greatest men of the last century—a splendid companion to the Darwin and Huxley we all know and love so well. But nothing would induce Wallace to sit. “My portrait is just appearing in ‘Black and White,’” he said, “and I am sure nothing could be better than that.” About ten weeks ago Wallace gave up his old objection, and was willing to sit for his portrait: arrangements were actually being made at the time of his death. It is still hoped that, with the help of photographs, a portrait, to be presented to the Royal Society, may be one of the memorials of this great man.

Although Wallace avoided humanity in the mass, he resembled Darwin in the breadth of his interest in mankind. The older naturalist, although he quoted Cobbett and spoke of the “bloody old *Times*,” still said that he could not do without it, and that it was “meat and drink” to him. Just a year before his death Wallace wrote, November 12th, 1912:—

“I am—for me—very busy now with two small books in hand, one semi-philosophical—on *Environment and Morality*—promised these two years—and the other on the *Labour Problem*. But I now have to work very slowly, and the *war-news* every day must be read.”

I recall with the utmost pleasure a breakfast at Professor Meldola's the morning after the meeting of the Linnean Society on June 18th, 1896, when Wallace read his last paper before a scientific Society. The party, which also included Mr. (now Sir) Francis Darwin, sat and talked until far into the morning. Finally, as Wallace rose, he said “Well, I should like to go on in this way all day!”

Another marked characteristic of Wallace was his keen and generous appreciation of the work and successes of other men. I well remember the enthusiasm with which he read in 1889 of Stanley's journey across Africa. “He certainly is the prince of African travellers,” he said. Again, he wrote on June 13th, 1897:—

“I was *delighted* with your account of Prichard's wonderful anticipation of Galton and Weismann! It is so perfect and complete. . . . His facts and arguments are really useful now, and I should think Weismann must be delighted to have such a supporter come from the grave; . . . had he been a *zoologist* and *traveller* he might have anticipated the work of both Darwin and Weismann!”

The last letter but one I received from Wallace, dated June 3rd of the present year, contains a generous if somewhat uncritical defence of the authenticity of G. W. Sleeper's “Recent Lectures,” dated 1849 (*Proc. Linn. Soc. Lond.*, 1912-13, pp. 26-45). Alluding to the possibility of fraud, he said:—

“The writer was too earnest and too clear a thinker to descend to any such trick, and for what? ‘Agnostic’ is not in Shakespeare, but it may well have been used by some one before Huxley.”

It is impossible on this occasion to speak of Wallace's scientific work, and even less possible to dwell upon the other subjects on which his eager intellect occupied itself. But a very interesting letter proves—as many must have suspected—that his mind was a continuous whole, whose varied activities influenced one another. He had asked me to read the proof-sheets of “Darwinism,” and I finally came to the concluding parts which deal with the evolution of man. He replied to my criticisms Feb. 22nd, 1889:—

“Many thanks for your kindness in looking over my proofs. I will not trouble you with the last sheet, which would only horrify you still more. I am quite aware my views as to Man will be—as they have been—criticized. I have referred to Weismann's opinion

further on ; but I doubt if his view or yours will really account for the facts. Of course we look at the question from different stand-points. I (think I) *know* that non-human intelligences exist—that there are *minds* disconnected from a physical brain—that there *is*, therefore, a *spiritual world*. This is not, for me, a *belief* merely, but *knowledge* founded on the long-continued observation of facts—and such *knowledge* must modify my views as to the origin and nature of human faculty.”

Thinking of Wallace’s happy, strenuous life, we are led to realize man’s independence of wealth and circumstance, to know by his example that, if it be great enough, “the mind is its own placé,” and is “not to be changed by place or time.” And looking back on his ninety years of strength and many-sided activity we recall other words written by the same great master of thought and language :—

“ Nothing is here for tears, nothing to wail
Or knock the breast, no weakness, no contempt,
Dispraise, or blame, nothing but well and fair.”

E. B. POULTON.

NOTICES OF NEW BOOKS.

The British Bird Book; an Account of all the Birds, Nests, and Eggs found in the British Isles. Edited by F. B. KIRKMAN, B.A. Oxon. Section XII. T. C. & E. C. Jack.

A NOTICE of the first volume or section of this really great book on British birds appeared in the 'Zoologist' for 1910. Section XII., completing the work, has now been published, and it may be claimed that all the editor's promises, as well as the reader's anticipations, have been fulfilled, while Mr. Kirkman and his contributors have produced a work which not only supplies the information desired for public or private museums, but describes the birds also as sentient creatures. It is this treatment which is now so much desiderated in all descriptive works on animals, it is what Darwin could not sufficiently find in his day, and is the material that will inspire the conclusions of future evolutionists. What we require are more observers, trained ones if possible, but the real observer has to be discovered before he can be trained. This axiom is sometimes overlooked. For the purposes of this book all British records seem to have been consulted, and yet observational facts are none too numerous. Mr. Kirkman's contribution on the "Study of Bird Behaviour" is worth careful reading; it is a subject which is coveted and nourished in the pages of the 'Zoologist.'

To compare this work with standard ones of twenty years ago—we are not referring to sporadic compilations—is a study which gives heart and courage; the scientific evangel of the nineteenth century has not been in vain, other animals than man are now being studied with a new recognition and by a new method. Even our British birds have not yet told their tale; they have been described, named, and located; figured, listed, and monographed; their structure, flight, and migration described; their nests, eggs, and breeding localities recorded; but the study of their "behaviour" is of very recent date, and their recognition as sentient animals still remains almost a human phenomenon. It is for this, not its only merit among many others, that Kirkman's bird book is to be recognized as a notable publication, at least, so it seems to the present writer. In many respects it pursues the method of Fabre in entomology.

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