

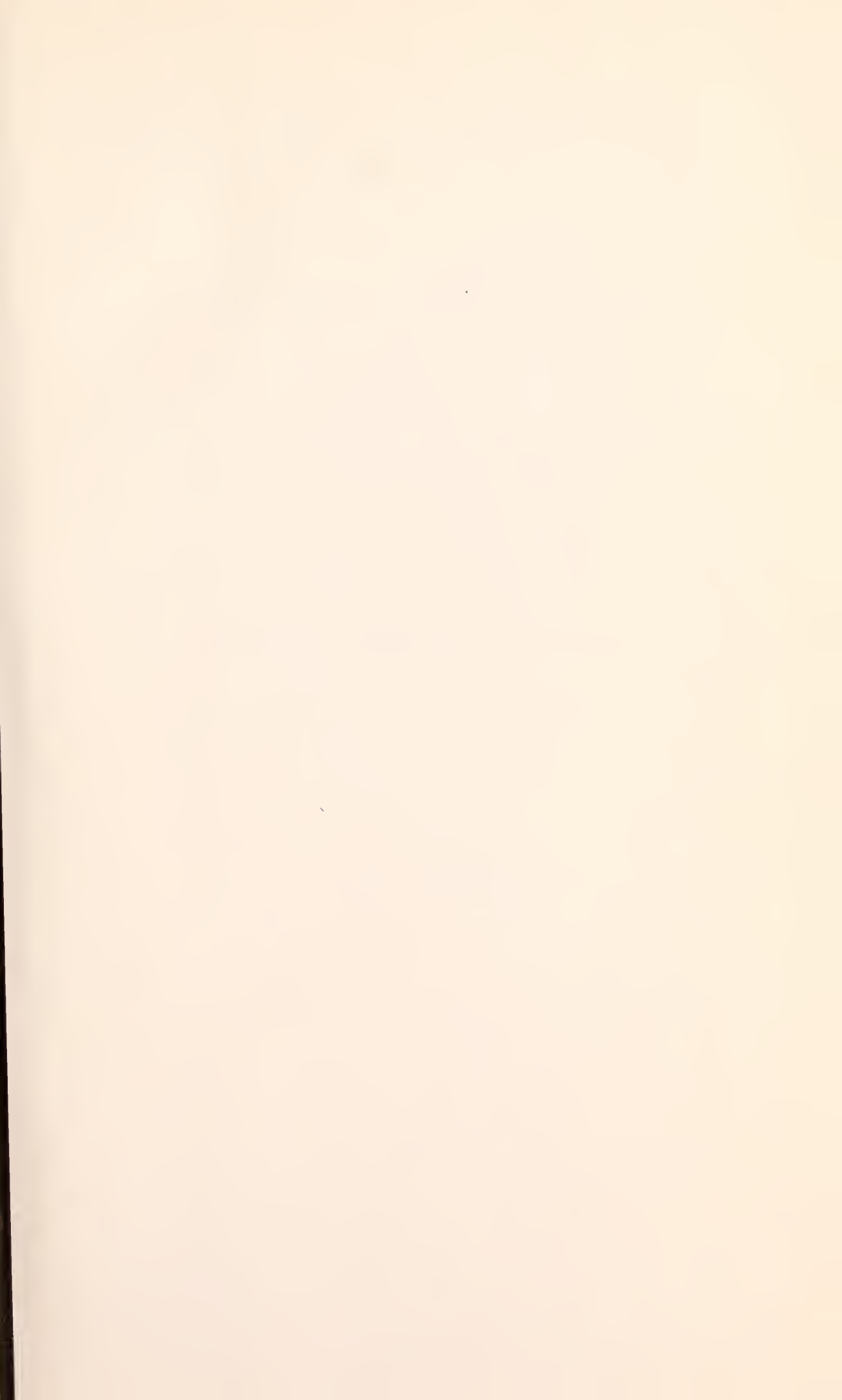
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THE ZOOLOGIST:

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P R E F A C E.

THE present volume is of a more general zoological character than any of its immediate predecessors, and if some subjects are less represented, that omission marks the varied studies of its contributors rather than any editorial direction. That 'THE ZOOLOGIST' is taking a wide view of animal life is a subject for congratulation; it is characteristic of its title, and is a fulfilment of its function. The faunal descriptions and lists are an important feature, and in this volume alone we can, among other communications, refer to Dr. Clark's "Notes on Cornish Crustacea," Mr. Patterson's "Rough Notes on the Fish and Fisheries of East Suffolk," Mr. Cummings's "Notes on the Fauna of Lundy Island," Mr. Arnold's investigations on the Eastbourne Crumbles, and Mr. Harcourt-Bath's memoir "On the Vertical and Bathymetrical Distribution of the British non-Marine Mollusca, with Special Reference to the Cotteswold Fauna." This work is of the greatest importance in British Zoology, and can be, and we trust will be, largely increased in the future.

In Ornithology, during what may be called the "Crossbill year," our "Notes and Queries" contain many valuable records; in annual reports are continued those of Mr. Gurney on Norfolk and Mr. Aplin on Oxford; while Messrs. Thorpe and Hope have commenced their digest of the Natural History Record Bureau at Carlisle. In the bionomical pursuit of bird-watching, so pregnant with fresh facts in animal psychology, Mr. Selous

has turned his attention to the "Nuptial Habits of the Black-cock," while in another ornithological byway Dr. Leiper has described a new species of parasitic *Filaria* in the Thrush. Mr. Dewar's "Notes on the Feeding-habits of the Dunlin" are of the greatest interest; Mr. Blathwayt has brought up to date an account of the Lincolnshire Gulleries, and Mr. Boyd Watt has compiled a good "Bibliography of London Birds."

In Philosophical Zoology, Prof. McIntosh has contributed a learned and judicious pronouncement on "The Darwinian Theory in 1867 and Now"; the "List of the Zoological Gardens of the World," by Capt. Stanley Flower, is a thorough and complete treatment of the subject; Mr. Elmhirst's "Notes from Millport Marine Biological Station," we hope, will be continued, and mention must be made of the lengthy and complete enumeration, with bibliographical references, of the "Hymenopterous Parasites of Rhynchota," by Mr. Claude Morley.

In conclusion, the thought must be driven home to all of us, by the perusal of a single volume of this publication, how much can and is still to be done in British Zoology alone. A competent zoologist could devote his life's work to studying the animal life—in all its phases—of his own garden; he could soon compile a list of names, but a complete knowledge of the life-histories of these species is known to few indeed, while the bionomics of the whole of the living creatures to be found on a half-acre patch may be safely said to be at present outside the mental recognition of any one naturalist.

THE ZOOLOGIST

No. 811.—January, 1909.

NOTES ON THE FEEDING-HABITS OF THE DUNLIN (*TRINGA ALPINA*).

BY J. M. DEWAR.

WHAT follows is mainly a record of a certain phase of the Dunlin's active life, from direct observation and from a study of the imprints left on the feeding-grounds. Its relations with other birds and with its own kind are bound up so intimately with its feeding-habits that no apology is needed for dealing with them now.

Several species are named in the books as associates of the Dunlin, and the information is sufficient to indicate that the smaller waders are its most intimate companions. The Dunlins feed alongside of the larger waders, and pass through their flocks as a body, but as a general rule they do not mingle freely with birds much larger than themselves. When they fly along the coast in search of a feeding-place the Dunlins are likely to pitch beside any species of wader, and they may not stay if it is taking food which does not suit them. I have seen a party alight beside Knots which were devouring small mussels, and after a momentary glance take to flight. Common in winter is the sight of a party of Dunlins tripping along in the wake of a Ringed Plover. They follow the long runs of the Plover, and probe eagerly close to it at each halt. At least one of them is sure to examine the place from which the Plover extracted something at the end of its run. They probe a little on the way, and

occasionally the Ringed Plover doubles back in an attempt to secure whatever a Dunlin is on the point of taking. Sometimes Dunlins working independently of other species alight to probe for a short time, and fly away without having found anything of value as food. This is true especially of smooth stretches of sand. At the same time, they are quite able to find their own food, and a large part of their feeding is done in the absence of other species, or in places where the mingling of species is a coincidence.

The relation of this species to others may be regarded from a different point of view. Dunlins in search of food are remarkably easy of approach; at rest and in the company of other waders they are not so confiding. Their absorption in the work of finding food is apparently complete until the cries of the other species, most of them alert to a degree, warn the Dunlins to beware. When Ringed Plovers give the warning I find usually that the Plovers alight first and the Dunlins later. Where Dunlins are asleep, a few Ringed Plovers may be standing wide-awake or running about amongst the sleeping birds, ready to call at the approach of danger. It is not that the Dunlins need the warning, for they are less approachable when they are sleeping than when they are feeding actively.

I am inclined to believe that Dunlins are more partial to the company of other waders as the shooting season advances, especially in districts where they are harassed severely. In spring and autumn they are seen more often alone. On one occasion I witnessed a peculiar action by two members of a party of Dunlins and Ringed Plovers which were resting on the high-water mark—the Plovers watchful as usual, the Dunlins apparently asleep. About an hour after the time of full tide, when the latter were waking up and stretching their wings, an individual of each species detached itself from the flock and ran some fifty yards over the sand to the water-line. The Ringed Plover led the way, and the Dunlin followed closely. Arriving at the water-line the Plover looked about and ran quickly to certain spots, in which it dug its bill, the Dunlin inspecting and tapping the same spots after the Plover. Having done this the Plover turned and ran back to the flock with the Dunlin immediately behind probing here and there on the way. The flock

remained quietly for a few minutes, then flew to the place which had been inspected by the pair, and began to search eagerly for food.

What the mental state underlying these actions may be is largely a matter of opinion. It seems to be a variable and varying blend of curiosity, sociability, and selfishness, if we humanize the motives for the convenience of description. Perhaps long-continued dependence on the sense of touch has reduced the acuteness of vision below the level maintained by birds with which the Dunlin associates intimately—an acuteness of vision most necessary in dealing with areas showing the most trifling signs of the presence of food. I do not mean that there is an actual diminution in the keenness of vision. What I venture to suggest is that Dunlins sometimes forget to use their eyes. Habitually absorbed in the art of rapid and incessant probing, they are inclined to depend on other eyes for the detection of danger; on feeding-grounds which show slight surface markings or none at all their actions indicate that they are unable to find hidden objects without applying the test of touch, and as in a given time the bill covers a more limited field than a keen sense of vision does, they may rely in part, and it may be unconsciously, on the judgment of other birds.

Apparently they take an interest in the doings of their neighbours, and on occasion they act as if they were assisting or robbing each other. Usually the small animals are seized, extracted from the ground and swallowed rapidly—so rapidly that the steps are not always easy to follow. Sometimes there is delay, particularly when worms of fair size are captured. If not too late, the Dunlins may forestall the first-comer, and by their interference allow the object to escape, but as a rule the capture of a big mudworm is the signal for the nearest Dunlins to hurry to the spot, not to probe immediately but to examine the place by sight, then to tap and probe once or twice and disperse. I have notes of two instances of a less common kind. A Dunlin probed into a colony of mudworms and tugged vigorously without result. It was seen by another, which introduced its bill alongside that of the first. Both pulled together several times, and extracted a worm about three inches long. The second arrival took the worm a short distance away and devoured

it piecemeal; the other resumed probing immediately. A Dunlin pulled a fairly large worm out of its burrow so far and apparently was unable to move it farther. The Dunlin displayed its excitement by tugging energetically, and by stamping on the mud with its feet. Another ran up at once and displaced it, not by direct attack but by introducing its bill into the burrow and seizing hold of the worm. The former let go and retreated a few paces. It soon returned and seized the free end of the worm. Together they dragged the worm out of its burrow, and in the act of being swallowed the worm broke, and each bird got a portion.

We may impute human motives to these attractive birds, but a little consideration will show the propriety of trying to find an explanation in closer agreement with what is known of their character. In the general case, the sight of a Dunlin capturing a small animal of unusual value was sufficient to distract the attention of other Dunlins from their own occupations, and to revive a train of memories in their minds, of which the automatic and outward expression was a general movement to the area to see and probe for themselves. This I have called "curiosity" for want of a better word, but it is not exactly so, for the Dunlins would know perfectly what was likely to be found. In the two special instances matters went farther, and while the primary intention may have been robbery, the subsequent actions seemed to be something more pardonable. If, in the general case, the first Dunlin had not been so prompt in swallowing the worm, plainly the new-comers would have attempted to secure it, and if in each of the special instances the second Dunlin went forward with the same idea in its mind as I imagine to occur in the general case, we may suppose that the continued presence of a struggling worm would fill its mind with the one idea of securing the worm, so that other ideas would be crowded out or placed in abeyance. This does not deny them a lively sense of *meum* and *tuum*. I have never known Dunlins to interfere with another species which was struggling with a resisting worm, but the respect which they entertain for other species would have full play from the first, and would prevent their minds from becoming saturated with the idea of securing the worm. Once the single idea has been allowed to develop (and its development

would not be hindered by consideration of the first-comer, because the Dunlin would have no reason to expect opposition; as far as can be seen, Dunlins do not fight with one another or display resentment) the Dunlin goes forward unable, unless some potent interruption overturns the state of its mind, to receive impressions, and incapable of performing actions other than those called into being by the one idea. It is engaged with nothing but the capture of the worm, and when the worm is swallowed the incident is forgotten. The first Dunlin is in a similar condition. Already occupied and excited by the idea of securing the worm, it becomes frantic when the worm resists extraction unduly, and in such a state it is not able to consider what the new-comer is going to do. It may continue to tug at the worm as if nothing had happened, or it may be driven away temporarily paralyzed by the shock of the second Dunlin's approach. Then the idea of securing the worm, dissipated for a moment by the fresh impression, returns with absorbing force, and the Dunlin goes back to the worm as if no other bird was there.

Now a Curlew, to take an example in similar circumstances, would never think twice of questioning the right of an intruder, but then the Curlew is sedate in its ways, and for a bird its mind is fairly well balanced. The Dunlin, on the contrary, is a nervous, feverishly energetic, excitable bird, and the thread which connects its reason and consciousness with its bodily functions is slender and easily cut. A lack of self-control may be assumed for another reason. The Dunlin is one of those waders which are liable to "bobbing"—that peculiar, rhythmical, backward jerk of the head and body, or of the head alone—in moments of excitement from anxiety, fear, and other causes. During each jerk and sometimes during the series the eyes have a dull and vacant expression, but the observer must be very near to see this.

It may be said that the frantic excitement of the Dunlin is due to fear of robbery—that its continued endeavour to secure the worm is the feeble expression of its resentment. On the surface this explanation is satisfactory, but if we try to analyse the actions by themselves, and in relation to the general activities of the bird, and to picture what is going on within the skull,

it will be seen that the former explanation, apparently the more complex, is in reality the simpler. So that any slight or unusual excitement or irritation will act on the centres of the brain presiding over the motor system through the sense organs without the control or intervention of the higher centres—in other words, without knowledge and understanding, will set in motion actions which habit has associated with particular sensations, and what appears to be robbery and the prevention of robbery resolves itself into automatic though complex movements which in fairness may be excused.

Turning to the way in which the Dunlin finds its food, I wish first to mention the senses of smell and hearing as possible guides. Much has been made of the difficulty of approaching wildfowl down-wind, and the cause has been sought in a keen sense of smell. This may be perfectly true, but it happens that these birds rise up-wind either as a matter of convenience or of necessity, and travel for a time towards the observer who is approaching down-wind. Hence an early start must be made to maintain the margin of safety that each species finds necessary. Of hearing, I can say little, and that not much to the point.*

While it is impossible, without making a difficult and needlessly cruel experiment, to deny the importance of the senses of smell and hearing, the general evidence places both below two of whose value there can be no doubt—the senses of sight and touch. It is convenient to group them according to their use singly or together, if we remember that there is no hard-and-fast line between each, and that there is scarcely anything to which both cannot be applied. Sight alone is represented by surface-feeding, and by work in places crowded with open burrows in which the occupants are near the surface and within view; touch alone by the exploration of seaweed, of ground under water, of muddy and sandy ooze, and the sand along the high-water mark; sight and touch by work on areas in which the food supply is scanty and the signs of it indefinite, and in dealing with mud Crustacea which have retreated into the recurved portions of their burrows.

Surface-feeding includes the search for small objects drifting

* Cf. Patten, 'Aquatic Birds,' p. 277.

in the wash of the sea and in streams, for small insects and spiders* crawling on the land, but the common form of surface-feeding is the capture of small univalves. When the acorn-shells that encrust the rocks in many places die they leave behind them rings of lime, each narrowing towards the top and adherent to the rock at the base. In these asylums small Periwinkles dwell in comparative safety, and wherever they are numerous they become objects of interest to the Dunlin. At certain times molluscs are seen in large numbers on expanses of sand after the tide has ebbed, and in myriads on the ooze of some land-locked bay or harbour. The Dunlin, attentive to the signs, runs swiftly over the sand, turning at the end of its beat to cross the area in a fresh direction. When a considerable number are present the general effect of the crossing and re-crossing is of a game of inviting and avoiding collisions which may go on ceaselessly for an hour at a time, and it is only at long intervals that a Dunlin is seen to bend down and seize hold of a small univalve. At any time it may turn aside from its course with the utmost rapidity to take a mollusc which has caught its eye in passing. The same thing occurs on the mud and on the rocks, only the speed is limited by the nature of the ground. They run shorter distances at a time, and incline to move in one general direction, though they run this way and that as the signs dictate. Here again they pick up shells at long intervals of time and space.

From a study of the birds' habits alone it is difficult to understand this boundless display of energy, and if the gizzards were not packed with shells† the actions of the Dunlins might be taken to prove that something else was the object of pursuit. On the sand and rock the shells are present in hundreds, on the mud they are crowded together so closely that scarcely an inch of ground separates one from another, yet the Dunlins select a shell here and a shell there for some reason or other. True the shells on the sand vary in size, and many of them are too large for the Dunlins' throats to pass, while in the case of the shells on the rocks a limit is imposed by the relative size of the Periwinkles to that of the surrounding rings. But these restrictions

* Alston, 'Zoologist,' 1866, p. 513.

† Swinhoe, 'Ibis,' 1863, p. 412.

do not apply to the shells on the mud, which scarcely vary more than from an eighth to a sixth of an inch in length. These mud shells afford a possible explanation. Close inspection shows that they rest upright on the mud, that large numbers of them are empty, and that many others are in an unhealthy condition. The gentle flow of the tide is insufficient to disturb their balance, and the general appearance of all is the same. If we watch quietly we may see a shell here and there move slightly, rest for a while, and move slightly again. It is the same with the shells on the wet sand and the rocks. In this, as I venture to think, we have an explanation of the Dunlin's feverish display of energy and apparent delicacy of taste. It overruns the ground watching for the slightest movements made by the molluscs from time to time. In this way it guards itself against shells which are empty and shells whose occupants are dead or dying. Some other waders do the same thing in a different way, but the only way open to the Dunlin is to run ceaselessly hither and thither.

In similar fashion the Dunlin treats areas of mud crowded with the open burrows of worms and thin-skinned Crustacea, providing a sufficient number of the occupants are near to the surface. It is, however, more circumspect in its movements, it runs more slowly, and at the last moment, when on the point of making a capture, it rushes forward or to one side and plunges its bill quickly into the mud in an attempt to seize one of the lurking animals on which it feeds.

Search by touch alone is to some extent a misnomer. A certain amount of visual information is necessary to begin with, and it is a valuable adjunct during the process of tapping. The Dunlin proceeds slowly a step or two at a time in no particular direction, and drives its bill rapidly up and down in and out of the ground, testing it very completely in front and on both sides. From time to time it runs or flies to a fresh place and begins again, but there is no evidence to show that the new place is chosen for any special reason. In the course of the up and down movement the bill shows a noticeable tremor.* At times this tremor is more marked, and is seen to be vertical. To close inspection it reveals itself as a lesser up and down movement

* Macgillivray, 'History of British Birds,' iv. pp. 207-213.

with a minute deviation of direction at each downstroke. So each stroke of the bill is of a compound nature. There is the main stroke, and during it a number of lesser strokes, which bring the point of the bill into contact with a larger surface. At intervals the Dunlin finds something good to eat. This is made plain by its eagerness, by the deeper sinking of the bill, the snapping of the mandibles and their sudden withdrawal, grasping an object which, if small enough, is swallowed before the bill is entirely clear of the ground. If contact is made with a worm the bill is propelled downwards over the upper end of the worm by a number of quick thrusts, the mandibles being separated during the thrusts and closed tightly on the worm between each, when the reverted cusps on the palate and the edges of the mandibles prevent the worm from slipping back into its burrow. The result is that an equal length of the worm is grasped by the whole length of the bill, and the worm is ready for extraction, which is effected by one or more steady and gentle pulls. The need for this even distribution of pressure is understood when the extreme softness and fragility of the worms are taken into account.

The method of feeding by touch alone is applied to soft ground under water, to muddy ooze and shifting sands in which food is abundant and exhibits no surface markings, to seaweed whether attached to the rocks or drifting up shore on the waves, to moss and spongy turf, and to the strip of firm sand along high-water mark. This part abounds usually with Sandhoppers and the larvæ of flies which leave no visible marks by which they can be traced. The process here is more one of rapid tapping than of probing the sand. As they flounder over very soft ooze they may be seen to plough the mud steadily with their bills, and to draw them about as if they were tracing patterns of complicated design. Probably they act under water in the same way, but it is not easy then to be sure.

Where sight and touch are given together, I mean to express uncertainty as to which sense is the more important. They are illustrated by the movements of Dunlins on smooth and fairly dry sandy areas, inhabited by a moderate number of thin-skinned Crustacea. These animals in their subterranean burrowings leave aggregations of minute pits here and there on the

surface of the sand. These impressions may be mistaken for those of a bird, and have been attributed to worms. The Dunlin runs over the sand looking for these marks, and also, as I imagine, for disturbances of the sand made by the movements of the crustaceans. When it decides on a likely place it probes the sand rapidly in a certain direction until it comes on the small animal. The same method is applied to Sandhoppers, and the Dunlin is remarkably agile in leaping to secure the crustacean if it jumps. When they are racing over the wet sands during the ebb in search of univalves they are attentive to the worm-casts, and can be seen now and then to plunge their bills hurriedly into casts and to draw out small worms. The extrusion of the casts is not continuous. It occurs periodically, and, as the worms are very near to the surface at the time, I believe the Dunlins overrun the sand on the look-out for castings in the moment of extrusion, when they are able to capture worms which may be out of reach at other times. The same combination is used on areas showing no visible surface-markings, and where the supply of food is limited. The Dunlins probe for a while in one place, and look about for another place to treat in the same way. So engaged they are most liable to sight objects it may be a yard away, and to run swiftly to secure them. This applies to several kinds of ground, and includes the search for small bivalves in the sand. On muddy areas crowded with open burrows, into which the inhabitants have retired as far as they can go, the Dunlins run about looking for what they can find. The worms are beyond reach, but many of the Crustacea have the terminal portions of their burrows recurved; in some cases the blind ends are within a quarter of an inch of the surface and close to the entrance. The Dunlin inspects these burrows, and in some instances taps gently round the entrance with an evident purpose, for it suddenly plunges the bill very obliquely into the mud and reaches upwards with the point. Even then it may miss its object, and the bill is seen to travel in a curved course towards the entrance of the burrow as if following the crustacean, the capture of which may be signalled at any moment by the snapping of the mandibles. For a long time I puzzled over these actions, repeated so frequently, and it was not until I found mud plastic enough

to admit of section that I saw the nature of the recurved burrows and the operations of the Dunlin upon them.

The imprints left by the Dunlins on the sand and mud are worthy of consideration. In surface-feeding there is nothing to note save, perhaps, the absence of certain univalves from their tracks. On the areas of open burrows single probings are seen often wide apart, and, as I will explain later, they are of the deep variety. As a rule each coincides in position with a burrow. For an obvious reason, ground under water, very liquid ooze, and wet sand show no markings, or else they are so much run as to be of no value. The firm sand along the high-water mark is best for the purpose. The hidden animals leave no surface-markings, and the Dunlins tap and probe rapidly in search of food. When they have been on this kind of sand for any length of time it becomes covered with the tracks of feet and bill. The imprints made by the bill are of three kinds,* distinguished not so much by the sharpness of their differences as by the frequency with which the average forms occur. They are a slight double dent in the sand made by a gentle pressure with the point of the bill; a shallow probing, an eighth to a quarter of an inch in depth, usually but not invariably divided into two compartments by a transverse septum of sand; a deep probing, a quarter to half an inch or more in depth, and complete in the sense of having no septum. The relative frequency of the three kinds is variable and depends on a number of conditions, of which the appetite of the Dunlin, the nature, position, and relative abundance of the hidden animals seem to be the most important. As much of the sand is covered only at spring tides, imprints are added at each high water during neap tides, until the imprints nearly cover the sand for considerable stretches, especially if the Dunlins are many and no rain has fallen. Excluding sand which has been visited more than once, we find that the distribution of imprints is patchy, crowded together in some places, scanty in others†—that they are more numerous near clumps of seaweed and decaying vegetable matter. The larvæ are more plentiful in these situations, and may lie in bundles close to the surface under contiguous imprints, which

* Macgillivray, 'History of British Birds,' iv. pp. 207-213.

† *Ibid.*

shows that the Dunlins miss more than they find. The tapplings and septate probings may occur singly or in lines of two or three each, and may or may not end in a deep probing. Deep probings may be found together or singly at wide intervals, with or without associated septate probings. The number of contiguous tapplings and septate probings may be great. I once counted forty in line, gradually deepening to end in a complete probing, and on another occasion forty-seven, when no deep probing was present. This was on a small patch of half-dried mud overlying coarse gravel, and when the mud was sifted nothing was found. The contiguous lines of probings may be straight or curved, directed forwards or to one side, and a fairly common form is a circle of ten to twenty tapplings and septate probings, ending in a complete probing near the first tapping. As a general rule, ten to a hundred imprints are found on the square foot, of which rather less than half are deep probings, but the ratio may be as high as one in three hundred, or even one in five hundred. To produce a tapping the mandibles are required to be separated one millimetre at the tip, to produce a septate probing two or three millimetres. The length of a septate probing is five to six millimetres, which is considerably shorter than the seven or eight millimetres of a double probing made experimentally with a closed bill, and the ten to thirteen millimetres of the double complete probing occurring in nature. The deep probing is directed slightly forwards, is cylindrical in the upper part, and expanded towards the end into a semi-bulbous form, the concavity being on the front aspect of the probing, a relation which can be learned by comparing the probing with the corresponding footmarks.

That the mandibles are separated in the act of tapping and probing runs contrary to accepted opinion; while the construction of the bill, with its guarded tip, points to its use with the mandibles closed. Direct observation of so small a detail is not easy on account of the Dunlin's rapid movements, but it can be made when the bird comes between the observer and still water which is reflecting the light of a white cloud. I have chanced on these ideal conditions twice. On the first occasion during rapid probing the mandibles were separated all the time. The degree of separation varied a little, and at times

the bill was opened up to its base. On the second occasion the bill was sometimes opened and sometimes closed during the downstrokes, but I suspect that the apparent closure was due to my inability to see a trifling separation of the mandibles towards the tip of the bill. Though the shallow probings are not always septate, formation of the delicate septa may be prevented by various causes, and in default of a septum it is seldom that a semilunar ridge cannot be found across the floor of each probing. The present view gains support from observation of the actions of waders which are larger and slower than the Dunlin; septa occur, to my knowledge, in the shallow probings of the Lapwing, Snipe, Common Sandpiper, and Redshank, and the method attains its greatest development in Starlings and Rooks, which often test the ground with the tips of the mandibles separated as widely as they can be.

So there is evidence for the belief that the mandibles are separated during search, and that the separation increases as the bill goes deeper, but they remain nearly parallel until the bottom of the deep probing is reached, when, as a writer has suggested,* the terminal part of the upper mandible is expanded in contact with the capture—a movement which appears to be reflected in the form of the deep probing. The partial separation of the mandibles makes introduction of the bill more easy, it increases the tactile area, and may, by comparison between the two points of contact, afford a clearer idea of the form and consistence of hidden objects. One advantage of the extensile mechanism lies in the fact that the minimum quantity of sand has to be pushed aside,† though I am unable to agree with Mr. Workman in supposing that the bill is closed during introduction, to prevent the mouth from being filled with dirt. The existence of septa in the shallow probings seems to me to prove that the open bill can be driven into and out of the ground without being soiled, but when the bird makes a capture it has to swallow the material of which the septum is composed. In this way I account for the large quantity of extraneous matter, sand, mud, rootlets, and the like, which is found in the

* Pycraft, 'Ibis,' 1893, p. 361.

† Workman, 'Ibis,' 1907, p. 614.

stomachs of some waders killed on soft ground. It does not appear to be an inconvenience to them, and the friction generated by the particles of sand and mud during the act of prehension may help the birds to deal with the slippery animals which are their food.

When the supply of food is scanty the imprints are reduced to a small number per square foot, and usually they are of the deep kind, but have lost the typical form. This is due to the Dunlins feeding by sight and touch together, when the apparent tremor of the bill becomes more marked. The probings are expanded irregularly. They may be elongated, wedge-shaped, with the base directed downwards, or converted into circular pits, and if they are opened gently the walls are seen to be covered with numbers of nipple-shaped depressions. On the level sands, where active Crustacea are the objective, we see long lines of footmarks leading in every direction, and here and there isolated deep probings, or lines of contiguous septate probings, each line ending in a complete probing. Where it is sandworms, we see in places a single deep probing in the most recent part of a worm-casting, which is always small.

I have tried probes made of various materials, but for delicacy of touch none of them is equal to bone covered with soft skin. When contact is made with a living animal a peculiar quivering sensation is experienced, like that felt on touching a vibrating chord. At the same time the animal, especially if it is a worm, stiffens itself preparatory to making its escape. If it is a shell it appears to rise up slightly and proceed slowly to close its operculum or valves. This feeling can be obtained not only by contact with the probe, but also, after a little practice, through a quarter of an inch of intervening soil. It is, I imagine, a sensation like this that guides the Dunlin, in addition, of course, to the disturbance of sand and mud which the animals make when in motion, and it serves to distinguish living animals from inanimate objects offering an equal degree of resistance* to the bill.

* Macgillivray, 'History of British Birds,' iv. pp. 207-213.

BIBLIOGRAPHY OF LONDON BIRDS.

BY HUGH BOYD WATT.

ANNEXED is a brief list which is believed to contain entries of the principal works on the above-named subject, but which can probably be amplified, particularly for suburban districts within the area of Greater London. County avi-faunas, such as Harting's 'Birds of Middlesex,' Christy's 'Birds of Essex,' and Bucknill's 'Birds of Surrey,' have not been included.

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THE VOCAL AND INSTRUMENTAL MUSIC OF INSECTS.

BY A. H. SWINTON.

ON leaving the orchestra of the Cicadas to listen to the instrumentation of the saltatorial Orthoptera, we pass from the rattle of kettledrums and the harlequin overtures of the Crickets that make melody at the mouth of their holes, and the troubadour performances of the strolling Grasshoppers fall on the ear like the clash of the cymbals and thrill of the violin. The males of the Mole-Crickets and Crickets have a raised fiddle-bow more or less S-shaped on the under surface of their fore wings or elytra, along which runs a musical comb, and when one is rubbed on the other this sounds out loudly in the Crickets that have resonant, oval, and triangular patches that resemble the glassy calms on the swirl of a running stream, and more subdued in the Mole-Crickets, whose wing-covers, like a kid glove, are pliant and velvety. The Leaf-Crickets (*Laubheuschrecken* of the Germans) carry their comb beneath the left fore wing and fiddle it over the right, and hence, by setting these musicians with their fore wings on edge, the creaking of the House-Cricket, the grating sound of the Wart-Biter, and the shrill of the Great Green Leaf-Cricket can be reproduced at will in the solitude of the study, where perhaps there is lack of pleasant associations, for ladies on hearing these sepulchral noises are wont to exclaim, "Oh, dear!" The Crickets and Leaf-Crickets themselves interpret and appreciate them, having ears on the shins of their fore legs consisting of a silvery membrane or drum, to which a ganglion of the nervous cords is attached; they are easily seen on the legs of the Field-Crickets, and on those of some of the Leaf-Crickets the drum will be found to be double; a slit further indicates that the ears of the Mole-Crickets are on the femora of their transformed fore legs. This method of hearing is well adapted to creatures that pass their lives in subterranean

galleries, and the Leaf-Cricket on the bough stretches out its often long fore legs to listen with the pride that a Spaniard exhibits the calves of his shins at a bull-fight.

According to Dr. Henry Woodward and others, the gigantic horsetails and ferns that covered the swamps of Europe at an early period were populated by Cockroaches and kinds of Mantis, and when the leaves of the woodland appeared then Crickets and Leaf-Crickets were seen. The Mole-Crickets and Field-Crickets are now distributed over Europe, Africa, Asia, and America, and, as neither fly far, their genealogy recalls vast geological ages.

The European Mole-Cricket (*Curtilla* vulgaris*) haunts moist meadows, and frequents the sides of ponds and the banks of streams, where it excavates its galleries like the Mole with a pair of hands that resemble gardening gloves, and lives the troglodyte life of the immature Cicada. I have only seen it alive on the flowery meadows that border the Hamble River in Hampshire.† Gilbert White, who lived at Selborne, in the same county, says that during fine weather about the middle of April, and just at the close of day, the males begin to solace themselves with a low jarring note continued for a long time without interruption, not unlike the "churr" of the Goatsucker. This croaking note that sounds "ree-ree!" Latreille found soft and pleasing; when laid hold of Yersin says it performs "yea-yea!" which is no doubt more pathetic. About the beginning of May the female lays her sand-coloured eggs, over which, Dr. Ratzeburg says, she keeps watch. The European Mole-Cricket, that possesses no leaping power to assist it to take flight, has been seen at the close of day poised on its fan-shaped wings rising and falling in the air; and Dr. Abel, when travelling in China, was surprised, when the candles were lit in his boat on the river, to see a Mole-Cricket of large size fly in at the window, and sometimes one was found in the beds. In the north of India and Cashmere a small Mole-Cricket is abroad from July to September; it closely resembles the one usually met with in South America. The male

* The nomenclature is in agreement with the recent Orthopterous Catalogues compiled by Mr. Kirby, and published by order of the Trustees of the British Museum.—ED.

† For other British localities, cf. Zool. 1906, pp. 357, 437, 470.

of the Common Mole-Cricket of North America (*Neocurtilla borealis*) commences its music as early as four o'clock in the afternoon, but becomes more noisy at dusk; its gruesome notes "gru-gru!" resemble, it is said, the croak of a Toad at the spawning season, mellowed by distance. The small *Tridactylus variegatus* that digs in the sand of the rivers of Southern Europe jumps well, but is mute. I have specimens of a similar insect common in India.

In the 'Transactions' of the Entomological Society of London for 1902, pls. vii. & viii., may be seen figures of the *Hydropedeticus vitiensis*, a Cricket with brushes on its hind legs, that was seen skating and jumping on the surface of the Upper Navua, a clear and rapid stream in the Fiji Islands; the male of this aquatic Cricket was not musical. The European Field-Cricket (*Acheta campestris*) and its congeners raise the sound of "cree-cree!" and when the males meet they become more noisy. Should one encounter a female he taps her with his antennæ, and plays staccato notes expressive of delight, after which, according to Goureau, he slowly makes off, his partner meekly following. There is a steep, abrupt pasture-field, interspersed with furze, close to the back of the village of Selborne, says Gilbert White, well known by the name of Short Lithe, consisting of a rocky dry soil and inclining to the afternoon sun, that abounds with the *A. campestris*. Here, sitting at the entrance of their caverns, they chirp all night as well as all day from the middle of May to July, and in the hot weather they make the hills echo. As they invariably run into their holes as you approach, although cannibals, their ways are best studied in confinement; a cage full of Crickets was the incentive to a quarrel in the history of 'Don Quixote,' and Gilbert White found that the tunes of a male suspended in the parlour imprisoned in a paper cage marvellously delighted some hearers, filling their minds with a train of summer ideas of everything that is rural, verdurous, and joyous. Now, when the Arcadian plain is much monopolized by wheat and mangolds, it is still possible to picnic among the beeches on Selborne Hanger, where the air of summer softly blows, and meditate on the past. That Capt. Chawner captured the large moth *Ophiodes lunaris* here is, I believe, pleasant fiction; doubtless it is an alien. I have a small specimen of *Deilephila*

euphorbiæ that was sighted flying one afternoon along the weedy bank of the River Hamble that I imagine had come over the water in a lobster-smack or French lugger. All creatures like to bask during winter in the artificial warmth of fires and candles, hence Crickets and Cockroaches have become domesticated and go voyages on board ship, and the latter, from indolence, have become like the Dodo and Solitaire, more or less apterous. In the autumn of 1873 an omnivorous brood of young House-Crickets (*Gryllus domesticus*) were scampering over the grate of a London kitchen in Maida Vale, and the following winter, as the bellows kindled the fire to a ruddy glow, the hearth commenced to echo to a tune of "awhit-awhit!" resembling the sound of a stone running along the ice; this continued as long as the fire burnt brightly, but when it got low a doleful "wee-wee!" was alone heard at intervals. One evening, when left in charge of the house, I heard this uncomfortable lament, and on descending found the servants vanished, and the steps, of which they had availed themselves in their flight, placed against the area railings. When the mornings were frosty and the coals smouldered the Crickets prolonged their music until the break of day, and once I surprised a Christmas party making merry at noon. I captured a female whose charms were the cause of this unusual excitement, and then the uproar subsided; but when I set her free, and she had rejoined her companions, it recommenced. When enclosed together the House-Crickets have a fight. The small Wood-Cricket (*Nemobius sylvestris*) abounds on the Continent, and in August, 1898, I heard the males making a reposeful snoring "ru-ru!" in a ferny coppice at Bagnoles. Mr. Scudder says the Black Cricket (*Gryllus niger*) of North America sounds out "cree!" and the Spotted Cricket (*Nemobius vittatus**) sounds "ru!" The loud music with which the *Æcanthus pellucens* that lives on the trees and bushes of the Leopoldsberg hails the sunset is commented on in the 'Monatschrift' of Vienna. In Switzerland it is found among *Artemisia*.

It is said that the larger number of the Leaf-Crickets are South American, and South America is doubtless their native country. The males as a rule have a more or less S-shaped, raised, musical

* *N. fasciatus*, De Geer, var. *vittatus*, Scudd. (Kirby, Syn. Cat. Orthopt. vol. ii.).

comb on the left elytron or fore wing, which they fiddle over the edge of an oval glassy patch on the right with a shrill resembling the "tric-tric!" of a brownish-green Grasshopper-Warbler that preys on them; one would fancy in the days of old they were more numerous. A large group has a female with a somewhat straight ovipositor resembling the blade of a carving-knife. The October of 1891 I passed in the town of Nantes, surrounded by market-gardens, whence a corpulent peasant-proprietor was wont to drive to market in a wheelbarrow drawn by a couple of labouring dogs. Many of the women wore the Norman sugar-cone hats endeared by childish histories, and the best hotels were primitive; in the one in which I found myself there was a large tub of Garden Snails (*Helix aspersa*) in the backyard, to make broth for the evening repast that concluded with a chicken-bone and dandelion salad. The bedrooms were swarming with the small brown Cockroaches (*Blatta germanica*), that soon discovered my setting-boards. But to compensate for any discomfort there were the most delicious pears to be had for a few pence, and the finest wild blackberries I ever saw I found in my ramble on the ridge known as the Sillon de Bretagne, where, on October 5th, I espied one of the cymbal-players, the hunched-backed *Ephippiger vitium*.* The males, whose saddle-shaped thorax forms a case for their parchment drums, came stalking over the ensanguined bramble-leaves, crisp and sere, with a defiant "snip-snap!" resembling the clicks of a steam-engine or a couple of jingles of the horse-bells; and then, after a suggestive pause, one of them performed a solo, when the notes of its crumpled, crinkled drums clashed and tinkled to the dance music of a tambourine, with ever and anon a refrain of "sweep-sweep!" or "sweet-sweet!" The musician's enamorado seemed to be what servant girls call "perfect sillies," for when I held a stick to them, with a mincing and dainty pace they were ever wont to walk on to the end of it. And as they revelled in gay sounds, a female sat as motionless as a crocodile on a leaf below; on beholding her a male jumped down and gave her a bite, when she screamed like a weasel; she afterwards accompanied me to Southampton, where she died on Nov. 9th. When making a *post-mortem* examination I found the fiddle-bow with which she

* = *E. ephippiger*, Fiebig (1784) (Kirby, Syn. Cat. Orthopt. vol. ii.).

had executed this squeal in a neat little musical comb running along a raised edge that crossed the convex upper surface of the glassy patch on her right elytron, as Goureau has rightly indicated; while that of the male was to be found on a raised edge beneath the left, and came to view browner, broader, and coarser. Hence the music of the male is gruff and masculine, and that of the female shrill and feminine; one plays the bass and the other the treble. Around Vienna, from the commencement of August until October, they often perform duets in the bushes, where at intervals the male gives two chirps and the female replies with one.

Before leaving Nantes I took a trip down the Loire in one of the little steamers known as 'Bees' as far as the Island of Indret, and landed on the confines of the historical Vendée, where I was much impressed with the regal splendour of the departing year. The solitude of the country after the vivacity of the town inspired a moody melancholy; the vineyards around were spread with a funereal cloth of gold, and the fiery yellow and vermilion of the woodland appeared to be the glow of a vast conflagration. Beneath its shade the ground was overrun with dewberries, and I wandered on until I came to a country road, where I met with the *Ephippiger selligera*.* It was not unlike the former cymbal-player, but marine-green in colour, and a cylindrical body gave it much the aspect of a gun-carriage. These hunch-backed Crickets populated the pollard-oaks at the side of the way, and as I advanced a male would leisurely ascend to the topmost spray and play the requiem of summer with a "hist-oh-hist!" and then the other pollard-oaks rang afar with a "hist-oh-hist!" that sounded like the bubbling murmur of a brook. The road led on, and I saw I was coming to what seemed to be a picturesque village, which proved to be a small town with an hotel that had an arched doorway, into which the cows were driven. Yersin says the music of *E. provincialis*, which he found in the neighbourhood of Hyères the first days of August, is a "zig-zig!" No doubt the county echo adds melody to sounds that are harsh. The Katy-did (*Platyphyllum concavum*)† of North America climbs to

* = *Steropleurus andalusius*, Ramb. (Kirby, Syn. Cat. Orthopt. vol. ii.).

† = *Pterophylla camellifolia*, Fabr. ,, ,, ,,

the tree-top, and the woods resound with "katy-did-she-did!" the live-long night; the shrill, it is said, may be heard a quarter of a mile off.

Usually it is only the male Leaf-Cricket that is musical. It seems like the days of romance when the slow-sailing felucca, with noiseless wing, wafted Lord Byron from the distractions of the Villa Deodati, once honoured with a visit of Milton the poet, to enjoy the chiaroscuro of the evening and calm stillness of Lake Lemano, broken by the light drip of the suspended oar and the good-night carol of the omnipresent *Phasgonura virridissima* that La Fontaine mistook for a Cicada and Goureaux calls a Grasshopper. Heard at noon from the hedgerow elm, the fitful "zic-zic!" of the male of the Great Green Leaf-Cricket rings out in response to the din of the carriages hurrying to the racecourse, and recalls the monotonous street cry of "knives and scissors to grind"; and when the comfortless gloom gathers at eight o'clock in the chilly autumnal evening, until the hour that precedes midnight, the shuddering shrill of the predaceous horde of which it is a sentinel, resounds with deceptive echo from the suburban plot of white and-purple-flowered potatoes, running into a giddy whirl resembling machinery in motion. A male I had in confinement in the New Forest commenced its shrieking wail to the tune of the "Last Rose of Summer," in wild snatches at the accustomed hour, and as the daylight faded its strophies came in gushes of half an hour's duration, and terminated in a laconic chirp. Like the Robin and certain classical birds, Crow and Parra, it became uproarious in the oppressive weather, when the air grows light, presaging a shower of rain. While staying at Sangatte I had a male and female in confinement, and when I visited them one morning the male had utterly vanished, and the female, bloated and hideous, alone remained to explain the result of a disparity of temperament. The Great Green Leaf-Cricket is found all over Europe excepting Lapland, and I have met with it in the swamp in the Island of Guernsey, called the "Grand Mare," where Prof. Babbage found it on *Pyrola rotundifolia*, one of the last inhabitants of a submarine forest. Oak, firs, furze, and hazel have almost vanished, and yet the Speckled Wood Butterfly is plentiful, the Oak Eggar Moth zig-zags in the sunlight, and Large Footman Moths appear there. I have never

seen the Great Green Grasshopper use its wings in England, but when taking a stroll at Goschenen, in the St. Gothard Pass, I once watched one winging high overhead in the direction of a willowed brook. The male of the *Phasgonura caudata* of Eastern Europe, whose female is known by its longer ovipositor, is said to make less noise; it may be heard at Saarbruck, in Germany, where the Franco-German war commenced. When the rose hues dye the snowy summit of the Dent du Midi is the time to leave the gastronomy of sweet Clarens and ascend to the blackberry-gorge at Les Avants, where the music of the males of *P. cantans* is to be heard; their short spoon-shaped elytra distinguish them from those of the former species, and this seems the natural result of their sluggish and indolent ways. The violin playing of these slovenly Leaf-Crickets will appear sedative after the clatter of plates and dishes, for it resembles the drowsy song of the Greenfinch and snore of the sleeper; as you approach the grass seems to snore all around, and Nature becomes breathless as we grow when feeling most. On coming nearer the notes rattle away like the agates of a bracelet or a rain of diamonds, but the music is abrupt without the piercing shrill of the narrow, long-winged *virridissima*; unlike it, too, the males seek no concealment, and at the end of August and during September you may see them perambulating the upper surface of the leaves, where the female is wandering in the herbage below lost in wonderment. The habits are those of a Spider; she will seize on a Grasshopper when she sees it, bite off its legs, and, taking it gingerly by the head, slowly suck out its pulsating life until death arrives, as it came to Seneca the philosopher.

The green, fish-like *Conocephalus mandibularis*,* with a pencil-point to its head, abounds among the rank grass on the banks of the Po in August, where I met a man with a tin-can catching prime specimens as food for his Canary. It is also found at Agno, on Lake Lugano; at Mendrisio, on the banks of the Rhone below Geneva; and at Haguenin, on the Lake of Zurich. On Aug. 21st, 1878, I heard the male commence its whistle—a shrill and lively “vree!”—at eight in the evening, and its overtures sounded out from one to five minutes, with corre-

* = *Conocephaloides nitidulus*, Scop. (Kirby, Syn. Cat. Orthopt. vol. ii.).

sponding pauses; and when the full orchestra were aroused to action by the gathering dusk a bee-like buzz resounded all around, as it were the flutter of the oaten flute and plaintive moan of the sea-shell. When the moon arose and silvered the placid stream of the calm flowing Po they ceased their melody. Similar concerts may be heard in far-distant lands, for I have a nearly related species from the Brazils, and the *C. robustus* populates the seashore in the southern parts of New England. When the September sunshine enlivens the swamp of Villeneuve, at the head of the Lake of Geneva, the *Anisoptera fuscum*, a tiny brownish Leaf-Cricket with greenish legs that looks like a big Earwig, is wont to clamber up the stem of the reeds with an alternate sway of its long antennæ to the purple blossoms, where it sends out its evening challenge to its rivals in a Liliputian pussy-cat purr, or dirl, resembling a bracelet-watch running down, and sometimes, to while the live-long day, it twitters. Another programme animates the swamp of Villeneuve when the hoar-frost glitters over the reeds, and the skater is out on the ice trying the dance and the rolling Q.

(To be continued.)

ARCTIC WHALE FISHERY IN 1908.

BY THOMAS SOUTHWELL, F.Z.S.

ACCORDING to Mr. Mitchell's Circular, six vessels took part in the Whale fishery in the season of 1908, two of which went to the Greenland Seas, one to Hudson Bay, and three to Davis Straits; the ketch 'St. Hilda' (79 tons) went to the Straits, where she obtained 235 Walruses, and the 'Queen Bess' (72 tons) brought home the produce of 7 White Whales, 82 Walruses, 1938 Seals, and 8 Bears, also obtained in Davis Straits. 'The Snowdrop' (64 tons) was sent out to Frobisher's Strait to land stores and fetch back produce from the station there; she has not been heard of since July last, and the fear is that she is lost.

Once again the Greenland fishery has been the more productive, ten of the fifteen Whales killed having been there obtained, one in Hudson Bay, and four in Davis Strait and Pond's Bay. The total produce consisted of 15 Right Whales, 540 White Whales, 899 Walruses, 3084 Seals, and 241 Bears, yielding $307\frac{1}{2}$ tuns of oil and $153\frac{1}{2}$ cwt. of bone. The 'Eclipse' also brought home from the Pond's Bay station the produce of one Whale, 671 Walruses, and 26 Bears; 165 Fox pelts were also received. With bone at about £2000 per ton, the total value of the produce may be estimated at between £29,000 and £30,000.

For the following events of the season I am indebted to my friend Mr. Robert Kinnes, of Dundee:—

The 'Balæna' and the 'Scotia' were the two vessels which went to Greenland; each vessel got a Whale of about 10 ft. 6 in. bone in the middle of May at the northern ground. The ice then broke up, and the 'Scotia' went to the southern ground; during her absence the 'Balæna' succeeded in getting three other Whales, one of 9 ft. bone and two others of 6 ft. or 7 ft., all in two days, about the middle of June. On the return north of the 'Scotia,' Capt. Robertson captured three Whales, all about

7 ft. to 8 ft. bone. These also were all taken in June, the weather being very fine, although the ice conditions were not so favourable. Both vessels went to the southern fishery in the end of June, where heavy Whales might be looked for. The 'Scotia' captured one on July 5th and another on the 10th, both being 7 ft. to 8 ft. bone. The 'Balæna' was not successful here, and the 'Scotia' pushed in towards the coast, where she met with a number of Musk Oxen, thirteen of which she killed, and brought home two alive, which the "red-tape" of our Board of Agriculture refused permission to be landed, doubtless much to the satisfaction of the Continental "Zoos."

The season in Davis Strait has again been very unproductive, perhaps owing to the condition of the ice, which has been very unfavourable. The 'Eclipse' did not see a single Whale. Mr. Kinnes says:—"I never before heard of an experienced captain like Capt. Milne of the 'Eclipse' going all over the well-known grounds, and covering more ground than usual, without seeing the blast of a single Whale; it looks to me as though Davis Strait was completely played out. There has been no fall fishing for the last three years in Davis Strait owing to bad ice conditions." The 'Morning,' however, saw a good many Whales, and captured two of over 10 ft. bone, losing two others; while the 'Diana' secured one small Whale.

NOTES AND QUERIES.

MAMMALIA.

Courage in *Putorius nivalis*.—Collectively, the Weasel is known for its fearlessness and ferocity. The following incident, told me recently by Col. Mure, of Caldwell, is interesting as throwing light upon the boldness of a single animal. He was crossing an open space of ground when he sighted a Weasel, and immediately gave chase. Gradually he overtook it, till when about fifteen feet from it the Weasel turned right round and made straight for him, screaming as loud as it possibly could. Such an incident gives one a trifle more respect for a solitary Weasel.—T. THORNTON MACKETH (The Hall, Caldwell, Renfrewshire).

AVES.

***Phylloscopus sibilatrix*.**—This (Jan. 9th) morning, when walking by the River Wye, my terrier disturbed a Warbler from a strip of gorse on the bank. I marked it down, and, sending the dog in front, it turned the bird back, flying past me within some six feet, and settling in a gorse-bush not more than five yards distant. As it apparently listened to locate its disturber, I had a fair view of it, and am convinced it was a Wood-Warbler. It then turned, hopping through the bush, and, coming through the top of it, flew past me again within a few feet, continuing along the top of a high hedge near, and I lost sight of it behind some trees. I searched this hedge and those adjacent, but did not see it again. Its plumage was very bright. The wood on the other side of the river is a resort of the species each spring. I am aware that the Willow-Warbler (*P. trochilus*) has been known to winter in Cornwall, but this was undoubtedly *P. sibilatrix*.—A. B. FARN (Breinton Lodge, near Hereford).

Nesting of the Nightingale (*Daulias luscinia*) on the Borders of Staffordshire and Shropshire.—It is with much pleasure that I can record an instance of the Nightingale nesting in Shropshire, within one mile of the Staffordshire border and not more than ten miles from

Wolverhampton, in May-June, 1907. My brother, Mr. Henry Duncalfe, and I noticed the birds early in May, and, although we made several journeys to the spot, were quite baffled in our attempts to find the nest until June 9th, when we saw one of the birds with a large green caterpillar in its bill, and after watching for some time it hurriedly disappeared amongst the thick herbage. The bird seemed exceedingly nervous, and was constantly flying from bush to bush, evidently very uncertain as to the wisdom of trusting us with its secret. We then found the nest, which was most carefully hidden in the bottom of a clump of nettles and briars growing on a steep hedge-bank, and it then contained two newly hatched young and one addled egg, which latter is now in our collection. The nest was composed of oak-leaves with a lining of fine twigs. We also located another pair about a mile from this spot, but failed to find their nest. Curiously enough, both these pairs were within a few yards of running water, but perhaps this is only a coincidence. I have only known single representatives of this species visit us very occasionally soon after their arrival in this country, and after a short time they disappear. I believe the males usually arrive some few days before the females, and perhaps this would account for the single birds we sometimes get. I have never heard of any nesting in our district before. We were hoping they would return to us again this summer, but unfortunately they did not, although, as far as we know, the young got off safely. Mr. H. E. Forrest, in his 'Fauna of Shropshire,' speaks of it as "being very sparingly distributed along the Severn Valley as far north as Shrewsbury," while Dr. McAlldowie, in his book on the 'Birds of Staffordshire,' says "it is an occasional summer visitant, although authorities include Staffordshire in its regular breeding area"; and again, later, he says: "During recent years it has been a rare visitor, its occurrence having only twice been recorded in the Annual Zoological Report of the North Staffordshire Field Club from 1886-1892." One cannot help feeling that the birds spoken of above really belonged almost as much to one county as to the other, as some of their excursions must have taken them over the border into Staffordshire. I should be very much interested to hear whether other ornithologists have heard of them breeding in either of the two counties lately, and if so, if they are regular visitors, or only turn up occasionally.—A. HUGH DUNCALFE (Perton, Wolverhampton).

Nesting of the Lesser Spotted Woodpecker (*Dendrocopus minor*) and the Great Spotted Woodpecker (*D. major*) in Staffordshire.—My

brother was fortunate enough to find a pair of Lesser Spotted Woodpeckers nesting in the top of an ash-tree on June 2nd, 1907, his attention being drawn to them by their curious note; and on June 14th, 1908, we found the Great Spotted Woodpecker nesting in a holly-stump. The nest was about ten feet from the ground and contained young, but notwithstanding the fact that the old birds must have been most anxious to keep their ravenous offspring well supplied with food, they were so shy and wary that it was most difficult to get a sight of them. We hope to see more of them next summer. As far as I can ascertain both species are rare in our district, though they may be easily overlooked owing to their retiring habits.—A. HUGH DUNCALFE (Perton, Wolverhampton).

Local Name of Corn-Crake.—The use of the name Bean-cracker for the Corn-Crake in South Pembrokeshire, as recorded by Mr. H. B. Booth (Zool. 1908, p. 431), suggests an interesting comparison with the name "Bean-crake" used for this bird in South Wexford. The resemblance is, I believe, in agreement with well-known historical facts.—G. E. H. BARRETT-HAMILTON (Kilmanock, Campile, Waterford, Ireland).

Bird Notes from the Tyrol.—Last year (1908) we took our holiday in the Austrian Tyrol, and as usual I seized every opportunity to see as much of the bird-life of the country we passed through as possible, and I must say I was greatly disappointed with the results, for we saw scarcely any birds, and the number of species noted was so few that I hardly like offering these meagre notes to the Editor, but they may be of interest to persons intending to pay a visit to this very beautiful part of Europe. Why birds are so scarce in the Tyrol was a mystery, for in all the three weeks I was there I never saw a peasant with a gun or heard a shot fired; so different to the South of France, where one often meets sportsmen with a string of Thrushes. Perhaps the Austrian peasants have given up shooting as a bad job, all the birds having been killed by the last generation.

I left London on July 29th. When passing through Switzerland I saw a pair of Storks (*Ciconia alba*) feeding their young on a farmhouse chimney. On Lake Zurich a Great Crested Grebe (*Podiceps cristatus*) was noted swimming close to the train, and out on the lake a few large hawks, probably Buzzards, were wheeling about. Landeck was reached on the 31st. Here the only birds I saw were some Great Tits (*Parus major*) feeding near the river, and a fine Crossbill (*Loxia curvirostra*) in a cage. Our next long stay was Trafoi, with

its beautiful snow mountain at the end of the valley, which is clothed with pine-wood. Here I saw Blackstarts (*Ruticilla titys*) for the first time. Up the mountain we heard Ravens (*Corvus corax*), and saw some Coal-Tits (*Parus ater*), and in the woods near the hotel I saw a Bullfinch (*Pyrrhula europæa*), a Thrush (*Turdus musicus*), House-Martins (*Chelidon urbica*), and a great many Chaffinches (*Fringilla cælebs*). On the way to our next place (Bozen) I noted one Hoopoe (*Upupa epops*), Yellowhammers (*Emberiza citrinella*), Wagtails (species?), Common Sandpipers (*Totanus hypoleucus*), a Kestrel (*Falco tinnunculus*), and a covey of Quail (*Coturnix communis*). From Bozen we took a carriage and drove over the Karrar, Pordoi, and Falzarego Passes. Birds still kept very scarce. However, I noted Pied or White Wagtails, Coal-Tits, Blackstarts, House-Martins, and Swallows (*Hirundo rustica*), the last two species very common in the valleys about villages. We saw no Swifts. One Blackbird (*Turdus merula*) was noted, also some Rooks (*Corvus frugilegus*). The wild flowers on the passes were exceedingly beautiful, and I noticed quite a number growing wild which we cultivate in our gardens at home. Butterflies and moths were not very much in evidence to the ordinary eye, but most likely an entomologist would have noted numerous species. I was greatly struck with a splendid large fritillary and a beautiful little black moth with pink spots on the wings.

Cortina was reached on Aug. 7th. It is beautifully situated by a river and surrounded by dolomite mountains. Here birds were not quite so scarce, and I had the pleasure of seeing two species new to me. One day, while coming down the river, I saw a bird about the stones. Hoping it was a Dipper, I crept up and had a good view of the Alpine Water-Ouzel (*Cinclus albicollis*). I could distinctly see the dark grey back wherein it differs from our species at home, which has a sooty-brown back. I looked out for this bird every time I went up the river, but never saw it again. Another day I saw a family party of Red-backed Shrikes (*Lanius collurio*), which had taken possession of a bush across the river. I had never seen this bird before, as it is extremely rare with us, so I was greatly pleased to get such a good view of this handsome species. I think there was a male, female, and two young, which were being fed from time to time by the old birds, for every now and again they would dart off across the field for insects exactly as our Flycatcher does. Along this river were a great number of Wagtails of different species, but they mostly seemed young birds. In the bushes I once saw a Sedge-Warbler (*Acrocephalus phragmitis*), and in the town Sparrows (*Passer domes-*

ticus) were quite common ; they were much lighter than our Sparrows, especially the hens.

The next place I got an opportunity of looking out for birds was Gossensass, in the Brenner Pass. They were few, as usual, and consisted of Redstarts (*Ruticilla phœnicurus*), females only, and numbers of Chaffinches ; also another finch which I could not make certain of. There seemed to be no birds about the town of Innsbruck. We walked out through great fields of maize to Schloss Ambros, and there I only saw a Mistle-Thrush (*Turdus viscivorus*), and the usual flocks of Chaffinches, which are as common as Sparrows at home. I paid a visit to the Innsbruck Museum to see a collection of local birds, most of them badly mounted and badly labelled, and rather depressing to look at. From this we came straight home, so I had no chance of seeing any more birds ; and I hope I have not taken up too much of your valuable space with these notes.—W. H. WORKMAN (Lismore, Windsor, Belfast, Ireland).

PISCES.

Large Take of Herrings in the Moy Estuary, Killala Bay.—Herrings were late in visiting the estuary this season, very few appearing until the beginning of November, when some large "schools" came in from the bay, and which, in the estuary, kept chiefly at the upper end, between Castleconnor and Roserk Abbey. At each side of that part of the estuary there is a line of training walls to keep the water in the main channel when the tide begins to fall, and which thus confined in the narrow space between the walls increases the "scour," deepening the channel. Between these and the shore there is a wide expanse of sand left bare at low water, with a small shallow channel running close along them, carrying off the water draining from the sands by a narrow opening at the end of the walls to the main channel. At high water, when the walls are covered, the Herrings spread over the estuary, wandering inside them ; but if they do not return to the main channel before the water falls below the end of the walls they are then imprisoned between these and the shore, and the only escape they have is through the narrow outlet at the end of the walls, and if the "school" is a large one they take a long time to pass out when crowding to the opening. If observed in time before escaping outside the walls the fishermen make fine hauls by placing nets across the outlets, and thus keeping the Herrings inside until by the fall of the tide they are left high and dry on the sands,

and are shoveled and basketed wholesale into boats and carts. This season, on Nov. 8th or 9th, the Herrings were observed inside the wall on the Mayo side and nets placed across the outlet, when an immense number were entrapped and kept inside until the tide left the banks, and then the grandest take of Herrings ever known in the estuary was obtained by two men, assisted by their families. One man named Boyd, assisted by his brothers and sisters, captured between 25,000 and 26,000, while his neighbour Patterson got 14,000. The former obtained £48 from a dealer, besides selling several thousands to other parties, and giving away a large quantity to the owners of horses and carts who assisted in carrying the fish to the dealer in Ballina. It was a grand haul for these two men for only part of a day's work, Boyd receiving over £50 for his part of the fish. After this great take Herrings remained for about a week in the estuary, and then left for the bay, when a gale of northerly wind set in. During the time they were in the estuary they were harried every night by a fleet of eighteen boats, but the takes were very irregular, varying from one to two thousand a boat down to a few hundreds.—
ROBERT WARREN (Moy View, Ballina).

NOTICES OF NEW BOOKS.

The Sportsman's British Bird Book. By R. LYDEKKER.
Rowland Ward, Limited.

IN writing a book on British Birds Mr. Lydekker has struck new ground, for birds are rather outside his usual theme, while his treatment of the subject is a departure from the sameness of the orthodox path. The title of the book is explained in the text: "Written more expressly to meet the needs of the sportsman and the amateur rather than the requirements of the scientific ornithologist." Taxonomy is therefore treated as of secondary importance, and groups are used rather than families, the volume commencing with a description of "Game-birds," followed by "Pigeons," "Rail Tribe," "Crane Group," "Plover Group," and so on; but the text is full and informative to the highest degree, and the reader may here acquire a knowledge of the birds themselves, which after all is perhaps more important than their classification. For means of identification the numerous half-tone illustrations are as good as, if not better than, most we have met with, though we are told that in the great majority of instances they have "been photographed under the personal superintendence of Mr. Rowland Ward from specimens mounted at his studios in Piccadilly for this particular purpose." But they have the great merit of exhibiting essential and specific characters, some of them being taken from specimens lying on their backs when it is necessary to show fully the markings and pattern of the under side, so that the "sportsman and the amateur" have thus a facilitation in recognition of species, apart from the very concise descriptions given in the text. Great pains have been taken to describe the full geographical distribution of the British Birds, and, combined with other information, this volume—outside the classificatory arrangement—may be accepted as one of the best books of

its kind to give a sound and general knowledge of our avifauna to those who, not being "scientific ornithologists," wish to acquire a first-hand information from the birds themselves. It is a handsome volume, and should have a wide circulation among the readers to whom it is addressed.

It is, however, a question whether the "novel feature in the omission of the names of the authorities and observers of the facts recorded in this volume" is a good one. It is justified on the ground "that when a statement has once been published it becomes public property." This argument is undeniable, but at the same time there are observers and observers, and observations that have been verified and found not unusual, and others that rest on a single record; while the names of some recorders carry more authority than do those of others.

A List of Irish Birds. By RICHARD J. USSHER, M.R.I.A.,
M.B.O.U. A. Thom & Co., Dublin.

WHEN a list of Irish Birds is prepared by Mr. Ussher it possesses an authoritative value, more especially when each species is accompanied by a note on its status and other concise but interesting particulars. The first list of Irish Birds was compiled by the late A. G. More in 1885, and though a second edition appeared in 1890, according to Dr. Scharff in the preface, twenty-six other species have since been obtained which had not previously been observed in Ireland. In his introduction Mr. Ussher gives a list of twenty-eight species recorded from Ireland since More's list of 1890, but of these five are placed in square brackets, denoting "claim to admission is insufficient." Species with a "M" attached denotes that they are "represented in the Irish Collection of the Museum," whilst other signs distinguish those that either breed in Ireland or do so in every county.

In these days of expensive ornithological publications it is significant that this list with its imprimatur of authority and condensed information can be purchased for the small amount of *fourpence!*

Animal Romances. By GRAHAM RENSHAW, M.B., F.Z.S.
Sherratt & Hughes, Manchester.

THIS beautifully illustrated book, compared with the same author's recent 'Natural History Essays,' will possibly less interest zoologists in the reading, but has probably given its author more pleasure in the writing than was the case with the other mentioned volumes. Dr. Renshaw has a keen eye for the picturesque in environment, and he has an exceptionally keen and fluent pen in describing it, and these pages are an attempt, and a no unsuccessful one, to give by descriptive writing a panoramic view of a number of animals in their natural condition, and not as museum specimens or the inmates of zoological gardens. The work therefore is an "Animal Romance," written by a zoologist and a keen lover of nature, and appeals to a rather different world of readers than that to which his other books are addressed. We have only one criticism to offer to this method, and that is, it may suggest too much. As an instance of what we mean, reference may be made to the chapter entitled "Forest People," where we read: "A yellow butterfly flits past, and instantly a Jacamar has seized it, the golden wings fluttering to the ground." Now, if there is one question more than another that disturbs some entomological theories it is that of the attack on butterflies by birds, whether it is common or frequent, or on the contrary unusual and of little consequence. That birds do attack butterflies *sometimes* is in the cognizance of many travellers; the present writer has seen during his lifetime two or three examples, but Dr. Renshaw's picture implies a common occurrence, and thus promotes a too facile impression. As mentioned in the review of the author's last 'Natural History Essays,' we still anticipate with pleasure more of that series.

The Edible Fishes of New South Wales. By DAVID G. STEAD.
Published by Authority of the Government of the State of
New South Wales.

WE have previously noticed Mr. Stead's 'Fishes of Australia' (Zool. 1907, p. 360), and the present publication is confined to the Edible Fishes of New South Wales. By this term the

author tells us he means "all of those fishes which—while not being of a noxious or unpleasant character (such as Toad-Fishes, Porcupine-Fishes, &c.)—attain a marketable size, or else occur in sufficient abundance to render them of use as adjuncts to our food supply. Strictly speaking, of course, using the term in its widest application, it would necessarily include a host of small fry, like the Gobies, Blennies, &c.; but with one or two exceptions, such as these are not here taken into account." That this fish industry is not a negligible quantity is proved by statistics. During the five years 1903-7, 48,243,238 lb. (or 643,243 baskets) of fish have passed through the fish markets of New South Wales, and this does not include a large amount sold without passing through recognized trading centres.

Among game-fishes, the freshwater Perch (*Percalates fluviatilis*) attains a weight "of at least 5 lb.," and is considered by anglers as "the finest sporting fish in our rivers, indigenous or introduced"; while of the most inedible or despised fishes something may be done, as there is a slight and perhaps growing demand for the pectoral flaps or "wings" of the Common Sting-ray (*Trygonoptera testacea*), and for years there has been a small export of dried Sharks' fins through the agency of the Chinese merchants.

To this useful volume there are attached eighty-one plates and a map showing the river drainage of New South Wales.

The Culture of Vegetables and Flowers. By SUTTON & SONS. Simpkin, Marshall, Hamilton, Kent & Co., Ltd. (Thirteenth edition, 1908.)

THE main subject of this excellent volume is outside the purview of 'The Zoologist,' but the chapter devoted to "The Pests of Garden Plants" is carefully and popularly, while yet scientifically, written and illustrated, and supplies a want. We have been frequently asked by gardeners and lovers of horticulture where this information in a concise and non-technical presentment may be obtained, and have no hesitation in saying that this publication is certainly one in which it may be found. To extirpate the living creatures that act as destructive pests to our

gardens becomes a lesson in economic entomology, for they must first be identified before the proper remedy can be applied. By the aid of these pages both results can be obtained, after which it is hoped this book may have fulfilled its purpose, and created an interest in further study which will require the perusal of other works of a more advanced biological standard.

EDITORIAL GLEANINGS.

BOTH in fresh-water angling and in sea-fishing many remarkably fine "specimen," or large, fish have been captured in the past year. Among the Salmon taken is a handsome specimen of 46 lb., caught in the Shannon at Castleconnell; Major Gerald F. Trotter has killed a 43 lb. Tweed fish; Mrs. Mossop one of 41 lb. in the Tay; and the Hampshire Avon, at Ringwood, has yielded Salmon up to 36 lb.

Mr. A. E. Hobbs has captured the largest Thames Trout of 8½ lb., and Mr. G. Lyne has landed a New River Trout of 8 lb. 9 oz. near Broxbourne; but the largest Trout have hailed from the Irish loughs, where fish of 17 lb. and 14 lb. are reported. Pike up to 27 lb. have been landed on the Norfolk Broads (Mr. Spashett); Mr. Zeffass (London) has taken a 25½ lb. Pike in the Herefordshire Wye; and Major Fraser one of 23 lb. in the Test, near Romsey.

Some remarkable Roach are reported caught; one of 3 lb. in the Dove and Dearne Canal, at Elsecar, Yorkshire, by Mr. W. W. Stenton; 2 lb. 13½ oz. by Mr. W. B. Firmin, at Hatfield; 2 lb. 12 oz. by Mr. F. L. Pearce, at Sturminster Marshall (Dorset Stour); 2 lb. 10 oz. by Mr. J. F. Wieland, in the Sussex Arun, at Amberley; and 2 lb. 3 oz. by Mr. R. Smith, in the Thames, at Shepperton. Mr. Pincott Hill has caught a magnificent Barbel of 9 lb. 13 oz. in the Thames at Sunbury.

A 19½ lb. Cod has been caught at Deal by Mr. A. W. Parker (City of London Piscatorials); Mr. Eldridge (Folkestone), one of 22 lb., at Ballycotton, where another angler has taken a monster Whiting of 4 lb.; Mr. H. T. Ashby has landed a great Skate of 175 lb. at Penzance, where Mr. Dent has captured a 20 lb. Pollack; at Herne Bay, Mr. Fitzmaurice has taken a 30 lb. 8 oz. Dog-fish; at Brighton, Mr. W. Vigar, a 34¼ lb. Conger; and at Dartmouth, Mr. Barnett, a splendid Bass of 13 lb. 6 oz.—*Pall Mall Gazette*, Jan. 4th, 1909.

THE death took place on Sunday, at his residence, Leek, Staffordshire, of Sir Thomas Wardle, President of the Silk Association of Great Britain and Ireland, who was widely known as one of the greatest authorities of the day on all phases of sericulture and all branches of silk manufacture.

At the instance of Sir George Birdwood, who had been the first to call attention to the great possibilities of the commercial utilization of Indian *tusser*, the Secretary of State for India sent Wardle out in 1885 to report on sericulture in Bengal, and to collect typical silks from various parts of the country for the then approaching Colonial and Indian Exhibition at Earl's Court. This was the first of several visits to the Eastern Dependency, followed by reports and recommendations which contributed substantially to improve the methods of sericulture and to the growth of this branch of Indian trade. Sir T. Wardle's most conspicuous service in this respect was the revival of the industry in the valley of Kashmir. The industry was of ancient standing, but had fallen into neglect, and successive epidemics among the silkworms threatened it with complete destruction. It is not too much to say that in the early nineties this fate could not have been averted had not Sir Walter (then Mr.) Lawrence taken up the matter in his capacity as Settlement Officer of the State. Subsequently the subject came to the notice of Sir George Birdwood, and it was upon his initiative that Sir T. Wardle went out to Kashmir as expert adviser to the Durbar. How innumerable difficulties were overcome, and how a moribund industry was placed upon a footing of prosperity such as it had never before experienced, is told in detail in Sir T. Wardle's 'Kashmir and its New Silk Industry' (1904), in which he was able to state that sericulture, besides giving employment to large numbers of villagers in the "Happy Valley," brought the State Durbar a revenue of from £90,000 to £100,000 per annum. Sir Thomas had paid a further visit to Kashmir a few months before the book appeared, and had given advice as to the silk-weaving possibilities of the country.

Sir Thomas Wardle was nearing the completion of his seventy-eighth year, having been born at Leek on Jan. 26th, 1831.—*The Times*, Jan. 5th, 1909.

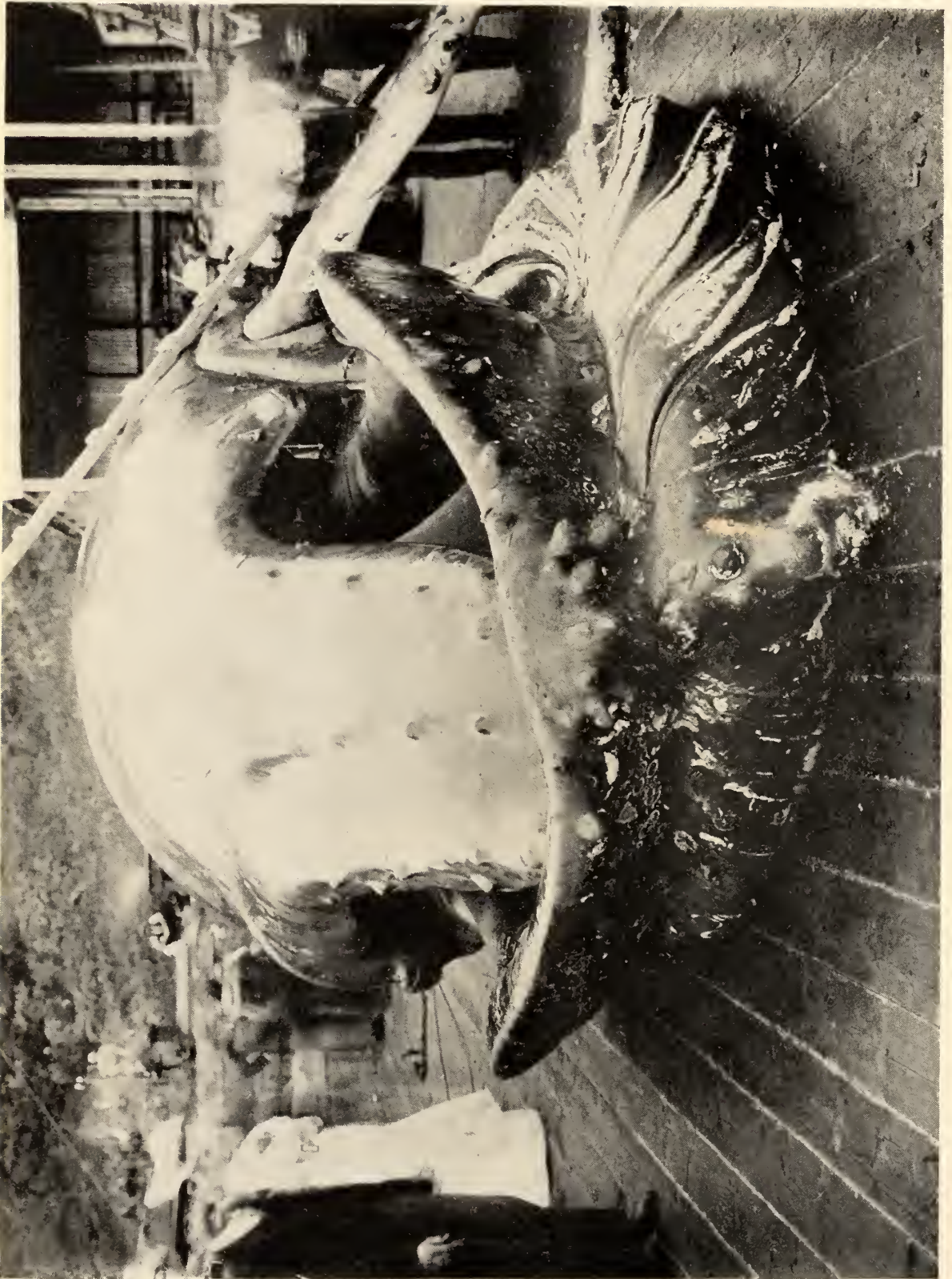
AN incident, which appears to confirm the theory that Partridges migrate, occurred at Margate this week. A large number of birds, which turned out to be French Partridges, were seen crossing the English Channel and approaching Margate. Upon reaching land

they seemed quite exhausted, and numbers were picked up in the streets of the town. "We have always thought that Partridges migrated about the mating season; otherwise, what becomes of the large stocks of birds left at the end of the shooting season? They have to find fresh quarters, as the land is insufficient to maintain increased broods."—*Shooting Times and British Sportsman*, Jan. 9th, 1909.

THE Selborne Society has revived the old title of its Magazine, which will henceforth be called 'The Selborne Magazine (and Nature Notes),' and will be published by Messrs. George Philip & Son, Ltd., of 32, Fleet Street, E.C. All communications with regard to the Society should be addressed to the Honorary General Secretary of the Selborne Society, 20, Hanover Square, London, as heretofore.

It is many years since the essentially farmers' sport of Pigeon-shooting has been practised with such success as this winter. That destructive scourge, suggestive of virulent diphtheria, which choked thousands of Pigeons last year has totally disappeared. The large flocks of migrant Pigeons—birds whose numbers differ enormously in different years—are all in wonderful plumage, which is the first sign of health, and very plump. As many as a hundred birds have been killed in an afternoon on many of the farms in Hertfordshire, Bedfordshire, and Buckinghamshire, and no doubt many other counties. The practice is to bait one or two favourable spots by a spinney or a clump of oak trees, erect a few shelters, and wait for the birds. In one parish—where a Rat and Sparrow Club has recently been restarted—over three hundred Pigeons and nearly one thousand Sparrows have been killed since the beginning of the year. The Pigeon is, of course, shot for the sport it affords and the food it provides, but it is also usually regarded as one of the most destructive of birds. An examination of the crops of some of these birds recently shot in the home counties reveals the fact that, like most other birds, their feeding habits are useful as well as harmful to the farmer. Acorns and beech-nuts are a favourite diet, but the birds also eat in considerable quantities the bulbs of ranunculus or buttercup. The weed is of little good, very hard to eradicate, and the Wood-Pigeon is the only bird that is an effective enemy.—*Daily Mail*, Jan. 14th, 1909.





THE HUMP-BACK WHALE (*Megaptera longimana*), cf. p. 62.

THE ZOOLOGIST

No. 812.—*February, 1909.*

ON THE VERTICAL AND BATHYMETRICAL DISTRIBUTION OF THE BRITISH NON-MARINE MOLLUSCA, WITH SPECIAL REFERENCE TO THE COTTESWOLD FAUNA.

BY W. HARCOURT-BATH.

FOR some years past I have taken a particular and practical interest in that branch of zoogeography and phytogeography pertaining to vertical or perpendicular distribution. This line of research and inquiry has been undertaken with special reference to the elucidation of the various problems connected with the organic and physical environment of animals and plants, and the morphological characters assumed in consequence of the preponderating influence of either one or the other of these two opposing factors.

As regards geographical or horizontal distribution, much has been accomplished by various specialists in the different departments of biological science. On the other hand, the study of vertical distribution has been negatively conspicuous by reason of its almost total exclusion from the domain of geographical investigation. This is at all events perfectly correct so far as the fauna is concerned ; the flora, on the other hand, it is true, at least in Europe, has received some share of attention at the hands of Prof. Christ, Mr. Ball, and others, and in our own country more especially by Dr. H. C. Watson.

This is wholly inexplicable when one considers how important a matter vertical distribution is, and in the British Isles in particular it is fraught with a considerable degree of scientific interest; for, as is well known to students of physical geography, vertical distribution estimates the affinities existing between the fauna and flora of disconnected and isolated mountain chains and far-distant latitudes. As far as the British Isles are concerned, it affords a very efficient indication of the affinities existing, on the one hand, between the montanic molluscous forms inhabiting all the higher altitudes in the mountain districts of the British Archipelago and their equivalents or representatives occurring at lower altitudes in more boreal latitudes—that is, in the Arctic and sub-Arctic regions of Scandinavia, Russia, Siberia, and North America; and, on the other hand, at higher elevations still in the Alpine and sub-Alpine areas occupied by the Alps, Pyrenees, Carpathians, and other elevated mountain ranges of Central and Southern Europe. Then, again, some of the lowland and maritime forms occurring exclusively in the South of England, Wales, and Ireland possess their nearest relatives and allies in the more austral region of the Lusitanian Conchological Province (in the South of France and in the Iberian Peninsula). It is thus evident that vertical distribution provides a better index concerning the extreme range of temperature and other climatic phenomena which each species can endure than mere geographical distribution is capable of accomplishing in anything like the same space upon the horizontal isotherms. For example, there are greater differences of temperature experienced in ascending a hill only three thousand feet in elevation than there exists between the Scilly Isles and the extreme north of the Shetland Islands, which are distant from one another about seven hundred miles. On the average it will be found that the distance afforded by two degrees of latitude (*i. e.* one hundred and thirty-nine miles) either in a boreal or austral direction is capable of producing only a difference in the mean annual temperature of about one degree Fahrenheit, which a trifling vertical ascent or descent of a hundred yards will accomplish upon the side of any hill. This is well exemplified in Dr. H. C. Watson's well-known treatise entitled 'Cybele Britannica,' which deals with the geographical and vertical distribution of the British

phanerogamic vegetation and Filices, and in which work a series of vertical or ascending zones will be found described for every latitude in the British Isles. In the 'Entomologist' for January, 1894, I also proposed and tabulated a similar series for the purpose of studying the perpendicular distribution of the British Lepidoptera, based principally on the statistics given in the 'Meteorological Atlas of the British Isles,' published by the Council of the Royal Meteorological Society,' at the same time giving their equivalents in the principal mountain ranges of Central and Southern Europe, as well as in Scandinavia, for purposes of comparison. These would suffice equally well for the Mollusca.

The Bathymetrical Distribution of the British non-Marine Fauna, particularly the Mollusca, opens up another important field for investigation and inquiry which has hitherto been very badly neglected, if not, indeed, wholly ignored. It is easy to understand that the practical study of the depths to which the Marine Mollusca descend is beyond the power of most individual students, by reason of the elaborate preparations necessary in conducting dredging operations and the expense entailed thereby. But its application to the freshwater denizens of our lakes and extensive expanses of water prevailing more particularly in the northern parts of these islands, would afford much less difficulty of attainment, and the results accruing therefrom would no doubt be of inestimable service to zoology, as has recently been the case in the bathymetrical investigation of the fauna of the Alpine tarns in Switzerland.

It has been my good fortune, from a conchological point of view, to be located during the past season on the plateau of the Cotteswolds in Gloucestershire at an altitude of close upon 1000 ft. above the sea-level. The range of elevation is not great from the point of view of the study of the vertical distribution of the Mollusca, only three points in the whole chain—which extends from Bath in the south-west to near Stratford-on-Avon in the north-east—just exceeding 1000 ft. above the sea-level, the average elevation of most of the hills being between 500 ft. and 900 ft. The entire district therefore comes within Dr. H. C. Watson's two lowest climatal or phytogeographical zones, namely, his lower agrarian and mid-agrarian zones. The

former of these attains to the altitude of about 850 ft. above Gloucester city, which is itself about 50 ft. above the sea-level, high spring tides still continuing further up the river to occasionally as far as Upton-on-Severn, near Malvern. This belt terminates upwards at the point where the graceful climbing *Clematis vitalba* ceases to flourish, for, although it may be seen in the greatest luxuriance up to 600 ft. or so, it can occasionally be met with in the shape of dwarfed and stunted specimens for another 300 ft. higher still, within the protection of woods, deserted stone-quarries, and other sheltered situations. From 50 ft. to 600 ft. above sea-level it climbs over the trees and hedges in such profusion that it constitutes in places quite a characteristic feature in the landscape, and by reason of its great luxuriance affords an almost subtropical aspect and appearance. The range of mean annual temperature of this zone is from 50° to 47° Fahrenheit.

The mid-agrarian zone of Dr. Watson rises above the preceding belt, and embraces all the summits of the hills upwards of 900 ft., and most of the escarpment plateau as well, where the distinctive Cotteswold fauna and flora predominate. It only occupies, however, an exceedingly circumscribed area in all. Now, although, as it will be perceived, the altitude is not great, I hope to show in the following account of the local Terrestrial Mollusca that something can be accomplished even in this restricted perpendicular area in studying their vertical distribution, and in the influence of altitude upon their morphology. It must be considered, however, only as an outline of my observations. I have not included the fluviatile forms for the simple reason that I have as yet not paid particular attention to them in the Cotteswolds, where they are apparently not very conspicuous in consequence of the scarcity of the necessary element, springs and small brooks being plentiful enough, but pools and ponds almost entirely absent, and what few there are at the higher levels becoming mostly dried up during the summer months.

The geological formation of the Cotteswolds consists of the oolite, which contains an abundance of lime; consequently Terrestrial Mollusca are exceedingly numerous both as regards species and individuals. And the beautiful beech woods which

extend for miles in various directions, especially along the picturesque western escarpment, in many of the "combes," and frequently crest the higher ridges, constitute the habitat of many "good things" which are very scarce or local elsewhere; while the numerous parish commons, covered with their characteristic grasses and aromatic herbage, afford a happy hunting-ground for the heath-snails and other species which frequent such situations.

The whole district forcibly reminds one of the chain of the Jura Mountains between France and Switzerland, where the Jurassic system is so magnificently developed. Of these distant mountains the Cotteswolds seem, as it were, a small detached fragment, considering their similarity not only in the geology but in the fauna and flora as well, though of course all existing here are on a comparatively much inferior scale. In the extensive beech forests of the Jura, the same as in the beech woods here, one may meet with *Ena montana* and *E. obscura* climbing up the smooth tree-trunks in company with *Clausilia bidentata* and *C. laminata*, with its white variety *albida*, while upon the ground the gigantic *Helix pomatia* is equally at home.

Although the last-named species is found on the Continent in a great variety of situations, such as upon grassy banks by the roadside, and even in gardens remote from woods, in the Cotteswolds it is apparently confined exclusively to the arboreal areas, many yards from the beneficent shelter of which it seldom strays, at least, according to my own observations. Here it ascends to about 950 ft. above the sea-level—that is, to the extreme upper limits of the arborescent vegetation—and would no doubt continue to ascend for another two or three thousand feet still if the wooded hills were of a sufficient elevation, as I have seen it up to at least 5000 ft. in the Eastern Alps (in the Canton of the Grisons), which is well within the Lower Alpine or Pseudo-sub-Arctic zone, or belt of conifers.

Respecting the influence of altitude and environment upon their morphology, it is interesting to note that there are two extreme forms of the shell as regards coloration in the Cotteswolds. The first, which I distinguish as var. *arborea* (mihi), is a dark one inhabiting the deep recesses of the woods between 400 ft. and 750 ft., where it is difficult to discern by reason of its

close resemblance to the russet-brown beech-leaves which bestrew the ground, and among which it crawls. The second form, which I call the var. *petrea* (mihi), is of a light "sun-washed" appearance, with the band very indistinctly marked, closely approximating in extreme examples to the var. *albida*. This form occurs principally on the more open, stony, bush-covered, semi-precipitous slopes of the escarpment, generally at a higher altitude than the preceding, to which, however, it is similar as regards size. This likewise possesses a remarkable resemblance to its environment, looking wonderfully like the pale yellow oolitic stones among which it exists.

Although some may be inclined to consider both these cases as protective resemblance, pure and simple, and attribute them to the preponderating influence of the organic environment, I have been compelled to modify the views which I formerly held in this respect in connection with the Lepidoptera (as published in the 'Entomologist' and elsewhere), and have since arrived at the conclusion, from more mature deliberation and practical investigation in the Himalayas and other mountain ranges in Europe and Asia, that the physical environment is a factor of at least equal importance in deciding the morphological characters of animals, though not so potent possibly, except perhaps indirectly, in fixing their geographical and vertical distribution, and this principally in an equatorial or downward direction. I therefore do not consider the two cases described in connection with this king of the Cotteswold Mollusca to be examples of protective resemblance at all, though they superficially possess the appearance of such, but to be due either directly or indirectly to the preponderating influence of the physical environment. In support of this contention concerning the species under consideration, I may state that I do not know of any mammal, bird, reptile, or batrachian which preys upon these snails. Thrushes, which are so notoriously fond of *Helix nemoralis* and *H. hortensis*, find *H. pomatia* too large a pill. As far as my somewhat circumscribed experience is concerned, the larvæ of certain dipterous flies, and possibly those of some Coleoptera also, are the greatest enemies of the Mollusca, more especially during the adolescent stage and hybernating stage (the diaphragm being pierced with impunity); so that protective resemblance to

their surroundings would be of no avail whatever against such insinuating and indiscriminate foes as flies. *Helix pomatia* varies considerably in size, but altitude does not seem to affect it in this particular at all, at least in the Cotteswolds.

A precisely parallel case is presented to the preceding as regards coloration in respect to the environment in *Pomatias elegans*, which ranges up to about 900 ft. or thereabouts in the Cotteswolds, and discloses two extreme forms, a dark and a light, the same as the "Roman," the former frequenting the woods, the latter being found more especially, but not exclusively, on the stony, sun-scorched slopes, particularly of the western escarpment. A very difficult puzzle to the tyro of the local palæontology is presented by the occurrence of this shell in a sub-fossilized state, often two or three feet beneath the surface, mixed with Brachiopoda and Marine Mollusca of the oolitic period. They can thus be often seen *in situ* upon the edge of a stone quarry, and the interesting question arises as to how they came to occur at such a depth below the surface. Well, I have elucidated the problem—at least, to my own satisfaction—during the season by observing how in dry hot summers the surface of the ground cracks in places, reminding me in a small way of the yawning fissures which I witnessed on the plateau of the Cossya Mountains in Assam after the memorable earthquake of June 12th, 1897. I have no doubt in my mind that the shells are engulfed or washed into the fissures by storms, the fissures subsequently closing, and the shells after the lapse of a number of years becoming eventually fossilized, or partially so. They may be seen in surprising numbers in different places. With them, but as a rule only a few inches beneath the surface, may also be found sub-fossilized shells of *Helix nemoralis*, *Hygromia rufescens*, *Ena obscura*, and a few others, but as yet I have observed no extinct post-glacial species of Mollusca among them.

Most Mollusca in the Cotteswolds, as probably elsewhere, are considerably larger and richer in colour at the lower elevations, especially within the shelter of the woods, becoming smaller and paler in appearance in the higher and more exposed places where greater fluctuations of temperature prevail. This applies especially to *Hygromia rufescens*, which abounds in many localities up to nearly 1000 ft. *Helicella itala* also, which is very large

and opaque white as regards the ground colour, at about 500 ft. or 600 ft. or so, is not much more than half the diameter and semi-diaphanous at 900 ft. to 1000 ft. above the sea-level. To a less degree also *H. caperata* is similarly affected concerning colour, but altitude appears not to influence it in size, for large specimens may be found at all the higher elevations. *H. virgata* is of comparatively larger size—at least, many individuals attain to such—at the lower levels, especially on the lias clay at from 200 ft. to 300 ft., the average becoming smaller the higher the species is found. Although it has a wide area of distribution in the Cotteswolds, it is rarely found in such prodigious abundance as is the case on the chalk downs further south. In the Cotteswolds it seems to abound principally on the higher parts of the pseudo-plateau and hill tops, often in the most exposed places, while few or none at all are to be found below. This, I assume, is owing to the absence of organic competition in the shape of animal enemies at the higher altitudes, otherwise, no doubt but for their presence it would be at least equally plentiful in many lower localities than is the case, and where the climate would be more congenial to its taste. It seems to be the most hardy species of mollusc which we possess, judging from the absence of shelter in the situations it frequents, and at altitudes where the greatest vicissitudes of temperature prevail.

In the case of arboreal species, the presence or absence of shelter afforded by the beech woods appears to have more effect in fixing the morphology than absolute altitude above the sea-level; for many species are much larger and of deeper coloration, or else of a more pellucid character in the former environment, than they are even at lower elevations without. Special mention may be made in this connection of *Helix nemoralis*, *H. hortensis*, *Helicigona arbustorum*, *H. lapicida*, *Clausilia bidentata*, and *Jaminia secale*, among others, while with regard to those which dwell principally in moss and rarely expose themselves to the air, such as *Vitrea crystallina*, I have not observed any apparent diminution in size even at the highest altitudes.

The great majority of the species of Cotteswold Terrestrial Mollusca range up to fully 950 ft. above the sea-level—that is, to the extreme upper limits of the arborescent vegetation. All the slugs are thus found, I believe, with the exception of *Testacella*

maugei, *T. haliotidea*, and *T. scutulium*, alien species which have hitherto been recorded only, as far as I am cognizant, from gardens in the vale, between 50 ft. and 300 ft. above the sea-level, where they were no doubt originally introduced with exotic plants. Another class are confined exclusively to the middle altitudes, apparently the presence of the woodland areas deciding their occurrence in an affirmative way. Among these may be enumerated the local *Ena montana*, *Clausilia rolfhii*, and *Hygromia fusca*, with, perhaps, *Helicella cantiana*, *Azeca tridens*, *Cœcilioides acicula*, and *Succinea oblonga*. As regards the first named, *Ena montana*, this only occurs, according to my present knowledge, in three different stations here, but will no doubt be eventually found in others when looked for, as in one of them, which I consider to be its metropolis in the Cotteswolds, it occurs in considerable abundance. It is found exclusively in the beech woods at not less than 400 ft. and never more than 750 ft. above the sea-level, according to my experience. I distinguish three forms with reference to coloration, *viz.*: (1) what may be termed the typical form of a dark brown, fairly pellucid; (2) of a pale brown and semi-diaphanous, which I call var. *cotteswoldensis* (mihi); and (3) of a pale opaque brown, the var. *birdlipensis* (mihi). Although I have examined a considerable number of specimens at different times, I have hitherto failed to meet with the white aberration *albida*, which I have, however, found in the commoner *Ena obscura* on several occasions.

Concerning the local *Clausilia rolfhii*, of which, by the way, I have just recently discovered an additional locality (which makes three places where it exists here to my present knowledge), I distinguish two forms as regards colour—the first dark brown and the second with a reddish tinge and somewhat pellucid. In regard to size, they vary somewhat; the more elongated forms I call var. *major* (mihi), and the small stunted specimens var. *minor* (mihi). The common *C. bidentata* also varies considerably in size, the longest being confined to the woods, the shortest being found principally on the higher ground and more exposed places generally.

Of *C. laminata*, I distinguish five different forms in the Cotteswolds. It is often an abundant species up to 950 ft. or so, though in the more elevated and exposed places it assumes a

more stunted appearance, having a much shorter spine and being more ventricose than the typical form found in the woods, where, however, abbreviated aberrations frequently occur also. I call this variety *submontana* (mihi).

Of the arboreal forms there are four distinct varieties, *viz.*: (1) var. *pellucida*, and (2) var. *albida*, which are both of frequent occurrence, the latter occurring in the proportion of about ten per cent. to the whole. The typical form (3), by the way, here as elsewhere is pale brown and fairly pellucid. In addition to the preceding is a pale yellowish brown form, sometimes passing into whitish in the upper whorls—var. (4) *oolitica* (mihi)—constituting a somewhat parallel aberration to the var. *nelsoni* of *Clausilia biplicata*, originally found near Hammersmith by Mr. J. W. Taylor.

Among the highest ascending species in the Cotteswolds is the common *Helix aspersa*, which abounds in gardens at close upon 1000 ft. above the sea-level at one small village. Here it is much sought after by certain men who make a practice of coming round periodically and obtaining permission from the cottagers to look for it among the stone walls, where it hibernates in clusters, and thence the snails are taken to Gloucester, where they are commercially known by the cognomen of "wall-fish," and find a ready sale in this disguise in the various fishmongers' shops.

The form occurring at the highest elevation is considerably smaller and darker than the one found in the vale. The beautiful variety *exalbida* I have collected between the altitude of 400 ft. and 750 ft. above the sea-level.

As may be expected from the fact that they are all of Arctic distribution, the following species range up to the highest altitudes in the Cotteswold Hills, *viz.*: *Pyramidula rotundata*, *Punctum pygmæum*, *Euconulus fulvus*, *Vallonia pulchella*, and *Cochlicopa lubrica*, which, with other Cotteswold species, have been recorded for Arctic Norway, Lapland, and Siberia by Dr. Middendorff, Nilson, and others. With them may be mentioned the following species of a less boreal nature, *viz.*: *Jaminia secale*, *Clausilia bidentata*, *Ena obscura*, *Hygromia hispida*, *Vitrea crystallina*, *V. alliaria*, *Zonitoides nitidus*, *Vitrina pellucida*, and *Pyramidula rupestris*, which latter sometimes occurs in thousands on

the stone walls in various localities up to 950 ft. or thereabouts. In the mountain regions of the North of England and in Scotland much more might be accomplished in tabulating the altitudes to which the various species ascend than in the Cotteswolds. For example, in the Grampians, on Ben Lawers in Perthshire, Dr. Grant Guthrie has recorded *Clausilia bidentata* from an elevation of 2400 ft., while more recently the sub-Arctic *Limax tenellus* has been discovered in abundance in the elevated pine woods of the great Forest of Rothiemurchus, in the same region, by the Rev. Robert Godfrey. It is thus very possible that there are several Arctic and Alpine species, or at least varieties, of Mollusca yet to be added to the British fauna from a study of their vertical distribution in this country.

The following table must only be considered of a temporary character. The chief difficulty in the way of tabulating the vertical distribution of the Cotteswold Mollusca is to be found in procuring data for their inferior rather than their superior range, owing to nearly all the lower levels being monopolized by agriculture; while, on the other hand, some species undoubtedly will require to have their area of occurrence extended upwards. It will be found, however, approximately accurate, and will serve its purpose sufficiently, perhaps, as a suggestion as to what could and should be done in other districts, if conchologists would only deviate from the frequent course of forming huge collections without reference to the important scientific service which would undoubtedly accrue from a study of the environment whence their specimens were obtained. This is a subject which the Conchological Society might undertake officially in the same way as has been done in recording the horizontal distribution.

If in penning these few lines I shall have been the means of inducing others to take up a branch of study which has afforded so much pleasure to myself, I shall feel sufficiently rewarded for the trouble I have taken.

PIONEER LIST OF THE COTTESWOLD TERRESTRIAL MOLLUSCA, GIVING THEIR VERTICAL DISTRIBUTION (BASED ON THE LIST OF LAND AND FRESHWATER SHELLS OF GLOUCESTERSHIRE IN WITCHELL AND STRUGNELL'S 'FAUNA AND FLORA OF GLOUCESTERSHIRE').

<p>CENSUS OF SPECIES.</p> <p>The Nomenclature and Arrangement in accordance with that adopted by the Conchological Society, 1904.</p>	<p>Approximate Absolute Range of Altitude above the sea-level (in feet).</p>	<p>Occurrence in Dr. Watson's Lower Agrarian Zone (0-900 ft.).</p>	<p>Occurrence in Dr. Watson's Mid-Agrarian Zone (900-1080 ft.).†</p>
<i>Testacella maugei</i>	0-300	*	
<i>T. haliotidea</i>	0-300	*	
<i>T. scutulum</i>	0-300	*	
<i>Limax maximus</i>	0-950	*	*
<i>L. flavus</i>	0-950	*	*
<i>L. arborum</i>	-950	*	*
<i>Agriolimax agrestis</i>	0-950	*	*
<i>Milax gagates</i>	-750	*	
<i>Vitрина pellucida</i>	0-1000	*	*
<i>Vitrea crystallina</i>	0-1000	*	*
<i>V. cellaria</i>	0-950	*	*
<i>V. rogersi (= glabra)</i>	-950	*	*
<i>V. alliaria</i>	0-1000	*	*
<i>V. nitidula</i>	0-950	*	*
<i>V. pura</i>	0-950	*	*
<i>V. radiatula</i>	-950	*	*
<i>Zonitoides nitidus</i>	0-1000	*	*
<i>Euconulus fulvus</i>	0-1000	*	*
<i>Arion ater</i>	0-950	*	*
<i>A. hortensis</i>	0-950	*	*
<i>Punctum pygmæum</i>	-1000	*	*
<i>Sphyradium edentulum</i>	?	?	
<i>Pyramidula rupestris</i>	500-950	*	*
<i>P. rotundata</i>	0-1000	*	*
<i>Helicella virgata</i>	200-1000	*	*
<i>H. itala</i>	400-1000	*	*
<i>H. caperata</i>	0-1000	*	*
<i>Cochlicella barbara</i>	?	?	
<i>C. cantiana</i>	500-750	*	
<i>Hygromia fusca</i>	400-750	*	
<i>H. granulata</i>	?	?	
<i>H. hispida</i>	0-1000	*	*
<i>H. rufescens</i>	0-1000	*	*
<i>Acanthinula aculeata</i>	-750	*	
<i>Vallonia pulchella</i>	-1000	*	*
<i>V. costata</i>	-750	*	

CENSUS OF SPECIES. — The Nomenclature and Arrangement in accordance with that adopted by the Conchological Society, 1904.	Approximate Absolute Range of Altitude above the sea-level (in feet).	Occurrence in Dr. Watson's Lower Agrarian Zone (0-900 ft.).	Occurrence in Dr. Watson's Mid-Agrarian Zone (900-1080 ft.).†
<i>Helicigona lapicida</i>	-950	*	*
<i>H. arbustorum</i>	0-950	*	*
<i>Helix aspersa</i>	0-1000	*	*
<i>H. pomatia</i>	400-950	*	*
<i>H. nemoralis</i>	0-1000	*	*
<i>H. hortensis</i>	0-1000	*	*
<i>Ena montana</i>	400-750	*	
<i>E. obscura</i>	-1000	*	*
<i>Cochlicopa lubrica</i>	0-1000	*	*
<i>Azeca tridens</i>	400-750	*	
<i>Cæcilioides acicula</i>	600-700	*	
<i>Jaminia secale</i>	400-1000	*	*
<i>J. cylindrica</i>	-750	*	
<i>J. muscorum</i>	?	?	
<i>Vertigo minutissima</i>	?	?	
<i>V. antivertigo</i>	?	?	
<i>V. pygmæa</i>	?	?	
<i>V. pusilla</i>	?	?	
<i>Balea perversa</i>	?	?	
<i>Clausilia laminata</i>	-950	*	*
<i>C. biplicata</i>	?	?	
<i>C. bidentata</i>	0-1000	*	*
<i>C. rolphii</i>	500-750	*	
<i>Succinea putris</i>	0-	*	*
<i>S. elegans</i>	0-	*	*
<i>S. oblonga</i>	-750	*	
<i>Carychium minimum</i>	-1000	*	*
<i>Pomatias elegans</i>	400-950	*	*
<i>Acicula lineata</i>	?	?	

† The highest point in the Cotteswold Hills is Cleeve Cloud, near Cheltenham, which is 1081 ft. above the sea-level, according to the trigonometrical survey.

HUNTING THE HUMP-BACK WHALE (*MEGAPTERA LONGIMANA*) IN NATAL WATERS.

BY H. W. BELL-MARLEY.

(PLATE I.)

UNTIL very recently nothing had been published or made known about the habits of these Whales. In the earlier attempts at classification Mr. Beddard* shows how much we may read with caution or accept as authentic, and regards this Whale as known under no fewer than twelve names, the late Dr. Gray being responsible for four of these synonyms. This Whale's great distribution has probably caused the difficulties in the fixing of the species. Mr. W. L. Sclater† writes:—"Whether there are several species of Hump-back Whales or only one widely distributed species cannot be definitely settled until further comparisons with more material are possible."

It having been noticed, between the months of May and August, that these Whales passed in great numbers between Natal and the Delagoa Bay coast, a company was formed last May by some enterprising Norwegians, the Government having given permission for a shed and machinery to be erected on the Bluff side of the Channel. Catches of one or two Hump-backs a day made it soon evident that this speculation would prove a financial success, the first capture taking place on July 3rd; and, without troubling the reader too much about statistics of any kind, some idea of the value of this cetacean's oil may be obtained. The 'Board of Trade Journal' says that "during September oil to the value of £3397 was shipped from the Port of Natal to the United Kingdom and elsewhere," as many as ninety-five to one hundred Whales being cut up for this purpose, one Whale averaging as much as six to eight tuns of oil.

* 'A Book of Whales,' p. 164.

† 'Mammals of South Africa,' ii. p. 183.

Wishing to witness a hunt, on Sept. 5th I accepted the captain's invitation, and embarked on board the whaler 'Ornen,' a fourteen-ton flat-bottomed tub, the usual stamp of vessel one sees around the coasts of Iceland. She was getting up steam as I stepped aboard just before six o'clock, and I made a light repast of some biscuits and ship's coffee with Capt. Andersen, as I anticipated some rough weather the next few hours at sea. A quarter of an hour later we prepared to move out, by hitching off and making for upstream a few yards distant, where everything had been prepared at the station for the removal by us of an old carcase. The blubber having been stripped off in quick time, this lump of flesh was connected by guys to the winches, and then wound with a splash into the sea, where it floated, and was again made fast to the port-bow. Turning round, we made for the bar, crossing it a few minutes to seven o'clock. We commenced our journey in earnest by getting tackle and blocks into ship's order; the cargo—one quivering mass of putrefaction—I was informed, was to be let adrift when the stream had been reached, a matter of another hour or so. The wind veered round, almost paralysing my olfactories by the nauseous air we breathed, and the spice of the promised adventure lost much of its interest.

To those whose stories of Whales date back to their school days, and which were garnered from the pages of Kingston and Ballantyne, the proceedings are somewhat unorthodox.

A number of sea-birds that had followed us all along were now joined by others, which, excited at the prospect of a meal, kept hovering around us at close quarters, screaming and uttering all sorts of mournful cries. With one exception I was able to recognize some familiar types, and, as my observations must not take up too much space, I will enumerate a few species only.

Among the *Gaviæ* was noticed *Larus dominicanus*, a bird common along the whole coast; they were in company with some smaller birds, which I thought to be young Gulls. *L. cirrocephalus*, Grey-headed Gull. Several old birds.

Of the *Sterninæ*, Mr. W. L. Selater mentions no fewer than seventeen species as inhabiting these coasts.

I made notes of the following stragglers, for such I believe

them to be, and as having come up from East London and Bird Island with the fishing-boats :—

Hydrochelidon hybrida.

Sterna bergii. — *S. media.* The latter and active little bird—a frequent visitor of ours—prefers, it appears, our bay with its sand-banks to the more lofty and breezy sides of Table Mountain.

The Giant Petrel (*Ossifraga gigantea*), fairly common, with its expansive wings of brown; it rarely ventures inside the Channel. It is what might be called a sociable bird.

Lastly, a single specimen and rarer bird, which I find I have queried *Sterna saundersi.*

The 'Ornen' having come to a standstill, the excitement of these birds I found was due to the carcass, which, owing to the heavy sea and strain put upon it, had come to grief, the stomach having opened out, allowing the viscera to divide. The captain seeing this ordered the men to let way. Immediately, to our relief, it swung round and floated quickly out to sea, with the whole host of birds fighting and screaming in its wake.

It was near ten o'clock when the skipper changed hands. The morning which looked so unpromising now commenced to brighten up with a change of wind. The mate asked me if I would care for some breakfast? I declined, the dead Whale still being fresh in my memory.

The breakwater was now just visible, the Bluff Lighthouse in the hazy distance being silhouetted by its verdant surroundings. The captain, coming on deck, began to see that everything was in working order, the duties of the harpoon-gun being his, and sent the mate aloft to a barrel at the masthead—the old crow's-nest—the wheel being handed over to the helmsman. Here I may make some remarks on the deadly weapon upon which the sport of the day depended. The gun is screwed down at the extreme end of the bow, moves round on a swivel, and discharges a harpoon nearly six feet long, to which is screwed an explosive in the head of the projectile, behind which again are the three barbs or prongs which, if the fuse be correctly timed, open out; but they will also unlock independently of the bomb. The weight of this harpoon is about

112 lb., and, attached to a cable of some twenty-five fathoms, is placed within the gun's muzzle.

We had been cruising around when, without any warning, a large Whale hove in sight, probably not more than one hundred yards distant. We seemed to have frightened it, and, not wishing to run any risks, it dived without exposing either its head or pectorals, but I had time to see its hump and massive back, its tail only coming into view when the rest of its body was covered up. We saw nothing more of it, although we stood by some twenty minutes. The captain all this time had not removed his eyes from the place where it went down, and now called out something in Norwegian to the man above, and I noticed the course was altered, and the reason for this, I was informed, was that sport would be later this day, as the Whales were still at breakfast.

With Captain Andersen I indulged in a smoke and chat, and we exchanged confidences, so far as our limited knowledge of each other's language would permit, when suddenly the tranquillity was broken by the report of a gun, followed shortly after by that of another. In the hazy distance, which might be a little over one and a half nautical miles, we were able to see the other whaler's ('Jupiter') white barrel and a little of her hull. On our arrival home we heard the news of this whaler's record catch, the captain having come up with the "school" quite early.

We passed this whaler and steamed straight on, it being obvious no time was to be lost, as ahead of us, for the first time, we saw little white puffs everywhere, though the Whales remained hidden. We were not long in overtaking them, and as we silently approached, their snorting became more audible, and we perceived hurried strokes of their tails, but it was some time before they had courage enough to let us pass them. The 'Ornen' slackened down apace, and as she did so this large assembly of Whales (twenty or more) commenced their acrobatic turns, and I have still in my eye the picture these cetaceans presented, and cannot refrain from dwelling upon it, for I am not likely to forget a scene so unlike anything else in the great field of big game.

Under an opaque sky, and overhead the sun enveloped with a

nebulosity that predicted a scorcher, these beasts splashed and snorted all around us, our approach, if it had been noticed, making no difference to them as they pursued their sports or affections unheeding. Without suspicion they rose and dived under our bows, so that it was with difficulty a collision with them was averted. Two Whales occupied my attention for some time by their extraordinary behaviour, for no sooner did one appear to breathe than the other, coming up at the same time, would prepare to assail it in a fashion I have not seen or heard of before; and it appeared that the first Whale, wishing to avoid the other's interference, would before diving roll over and use one of its pectorals on the flanks of the other. I saw them again come up together, and both seemed blown out before they finally disappeared, and this time they made some quick rushes through the surface, as if racing each other. One Hump-back, later in the noon, rose out of the water about two hundred yards distant, the striking of the water with its tail being distinctly heard on board, and this appeared to be a solitary one, as we could see no others in that direction. I also witnessed what was evidently a fight with four Whales; it needs little describing beyond stating that one of the pack, possibly larger than the others, and whose great pectorals made him more conspicuous, kept swinging his tail when half his body was under water. Once only I saw two young Whales playing away from their adults; they were very timid, so it was impossible to see much of them.

I had reason to notice, and I think it worthy of attention, that the Hump-back (or, more correctly speaking, *Megaptera longimana*) is a poor blower for so large an animal; of its timid and shy disposition we have already spoken, and from the fact that no Whales were noticed till late in the day, we may reasonably conclude their absence was due to the large shoals of Herrings (commonly called Sardines in Natal) and other fish that about this period of the season make their way up from the Cape or Agulhas to these shores.

In swimming and diving the tail does all the work, but it might be observed, on alarm or suspicion of danger, the fins are not raised out of the water preparatory to diving. When watching these animals' movements there is nothing graceful

about them. After coming up for air and to enable them to dive down again, both pectorals were used for this purpose, and I observed further that the tail, by the various twists it gave, proved what a disadvantage the Whale was put to, and the exertion necessary to bring this about.

For nearly one hour we had been cruising in and out of this large "school" or company of Whales, and having slowed down took things easy, but it was some time before the captain (who all along had been scanning the sea with his glasses) had fixed upon the object of his choice, when with full speed ahead we swung, as it were, sharply round—and these little steamers can move, as I shall presently relate. A large Hump-back—or, as it is known to the men, "Knoe"—appeared a short distance off, but I could see half of its proportions only. We made for the crest where it had just disappeared, but the 'Ornen' overshot her mark by a few yards, and we waited again, rocking gently to and fro. The captain, having once more taken up his duties, showed his great impatience by swinging the harpoon—a manner I have noticed among good shots—and every ripple was watched for the Whale's whereabouts. Its reappearance was a matter of but a few minutes. Away to starboard a watery depression appeared, caused by some disturbance beneath, and to this we made, when with a great snort it emerged, somewhat raising its head, perhaps to enable it to see what we are. Whilst we were watching this monster another appeared just as the first was about to dive; they went down together, the fin of one striking the other in so doing.

But now the captain saw his chance, and swung round the harpoon on the dorsal of the second Whale as it was about to disappear. With the report the cable flew away, and for a few moments shook; then it started to vibrate and ran out; all now became excited, and the skipper at once prepared to recharge the gun, a process lasting a few minutes. After seven minutes the captive came up, blowing hard, and it was seen at once that it was badly hit, though it did not dive for some seconds. It then turned over by putting all its force into a long plunge, as if trying to rid itself of the instrument of torture that held it, and which had entered below the back. At this time a great strain was placed upon the "manilla," and it appeared to me

remarkable that it did not snap, so to avoid accident—for the Whale was making speed and had doubled towards the rudder—the captain ordered eight knots astern, then a quick manœuvre, and we spun round in remarkable time, only just preventing the wounded animal from coming up under the ship's stern. On its appearance this time it could be seen at once that it was exhausted, and blood changed the colour of the sea in several patches; but what was most surprising, another Whale, which may have been its mate, kept diving under the captive, possibly exhibiting the sympathy of one for the other.

The Whale, still finding itself prisoner and its strength going, prepared for one final attempt to release itself of the harpoon by diving down and lashing out with its tail; the other one did likewise, only in a quicker way. Preparations were now made to haul the captive in; as the pulls on the rope became more frequent it made feeble attempts to dive, the other cetacean having now disappeared as mysteriously as it came.

The harpoon was once more brought to bear on the dying Whale whilst it is floundering about, and the bomb strikes and bursts, the sound being distinctly heard by us. As soon as it received its quietus, the shock caused the Whale to bound upwards, and strike out with its tail and pectorals; then the whole body quivered for a few moments, the tail being the last to demonstrate once again its wonderful power.

Little more remains to be said about the capture, for having been secured it is now drawn up with the line, and the long flukes cut off. After this a chain cable is stretched round the stump, and then, lashed to the port, it is ready for home. Sometimes only one charge is given, the Whale being dispatched with a long lance, but this dangerous performance has resulted in many accidents.

To revert to the chopping off the tail, we were about fifteen miles out when this Hump-back—a fine bull, over forty feet long—was taken. No Sharks had been noticed during the day, only some Dolphins, and we (or at least myself) were not a little surprised to see that a large congregation of these brutes, which had been attracted by the splashing, had now put in an appearance. They fought for the pieces of the tail, so

that it was with difficulty we prevented them from tearing the throat out of the Whale, and on this occasion, giving a hand, with a long pole with a hook at its end, I finally succeeded in running one through the gills and damaging others. On the 'Ornen' turning about the Sharks left us, but later on, when looking in that direction again, their black dorsals skimming the surface spoke of their disappointed greed.

On our homeward journey (now half-past three) it was noticed that the carcass began to lose its equilibrium, the head being forced under water almost horizontally, as it were, and so, to prevent the chain snapping, a clever mechanical contrivance was brought for the first time into action, and deserves, I think, to be described. A long lance enclosing a metal tube (to one end of which is fastened a rubber pipe, the other end being attached to a pump connecting the engine-room) is forced down into the Whale's body, the air being pumped through the aperture in its point into the stomach until it is raised to the surface again. This invention, I heard, belonged to the mate.

We again made a move, nothing more of interest happening during the afternoon. A small flock of birds, which I judged to be Curlews of some kind (*Numenius*), passed us, bearing down south.

From what had happened and been observed during the short time these Whales were apparently in season, and the great number of this species of cetacean that has been boiled down (no fewer, I find, than one hundred and four, including two Rorquals, between the months of July and early September), goes to confirm what writers have said of it—"never fierce or easily alarmed"—allowing steamers to approach quite closely; and such accidents as getting under the ship's propeller and striking out, as recently happened to the 'Jupiter,' was the result of the wounded animal getting caught in the keel. Most of these and such-like happenings would never take place if the balls burst, or if the time-wires had responded in the first instance.

The question may be asked, On what does the Hump-back feed? In reply I can only relate what I saw when a Whale was being dissected last August. One of the stomachs, which may

have been the first (*rumen*), contained about half a ton of Herrings (*Clupea sagax*), a quantity of greenish water, possibly gastric juices, some fish remains, and, lastly, discoloured sand or detritus. The heads on the Herrings still had some of their red colour preserved.

The fine photo which accompanies these pages was taken on our return from a trip that I made some little time subsequently. One of the two harpoons having entered a few inches below the right eye had doubled itself round on reaching the bones at the occipital region. Note the large warts that adorn the lips; these are called hair-warts, and, according to Beddard, are of an early and rudimentary origin. The tubercles are of all sizes, a large orange being the usual size of a fine one. I have dissected many, and with few exceptions found these so-called hairs very small, whilst many warts are without them. It would appear these hairs are of no use to the Whale, and that it is only a matter of time before they will entirely disappear.

I will now proceed to remark on some of the parasites that are found upon these Whales. For the purpose of specific diagnosis I sent some barnacles and a louse to the Rev. Thos. R. R. Stebbing, from whom I received the following report:—“The barnacle you enclose is *Coronula diadema* (Linn.)” Of another that resembles this, but flatter, on which I made no notes, he goes on to remark: “This is a probable *C. balænaris* (Gmelin), and there appears to be some question whether *C. diadema* is found on these Whales. Your specimens seem to settle that doubt.” Attached to one of these shells was a fine example of a stalked crustacean. This he names *Conchoderma auritum* (Linn.). I found them in bunches of five, seven, and nine; the largest would not be longer than eight inches, whilst the smallest only exceeded about half this measurement. Quite an hour after the Whale had been hauled out of the water they still spread out their antennæ-like structures, attached firmly to the epidermis of the pectorals and jaws chiefly; they cannot be removed without a knife. In the young stage *C. diadema* becomes deeply rooted or embedded in the flesh, so that nothing of the shell is visible. On some young Whales these parasites are in hundreds, the larger ones drawing up large protuberances, the scars of which remain long after they become detached; so

we can have some idea of how their presence must inconvenience the Whale. Its tumbling and leaping out of the sea, which have given currency to most incredible yarns, may be due to this reason. In the larger Whales I found fewer of the smaller ones (barnacles), the larger being more noticeable about the fins, jaws, and vent; the back and sides below the scapulars, under surface of both pectorals and tail being quite free.

In the 'Fauna of South Africa,'* Mr. Sclater, in writing upon the subject of Whale parasites, confuses *Conchoderma auritum* with the ship's barnacle; they are so totally different that one wonders how the mistake occurred.

The louse Mr. Stebbing identifies as *Cyamus erraticus*, and mentions also that this is probably the only species represented. The specimens I sent home were removed off the head near the blowhole, where they had fixed themselves. They appear gregarious in habits, all the sizes keeping together. I noticed, even when exposed to the sun, they made no effort to separate. Some have been found in the gular folds of this Whale.

It is only recently that the great wild preserves of Africa and their large game have received any attention from their Governments; the wanton destruction of the Elephant and Giraffe, and the killing of so many thousands of other species have made it imperative to pass laws protecting them from early extinction. But, it may be asked, what of the other big game—our Whales? If we are to believe all that is told us, the day cannot be very far distant when it will be asked, "Quelles sont les dernières nouvelles à Natal?" and the reply will be, "The last Whale has been killed."

* "Mammals," ii. p. 183.

THE EASTBOURNE CRUMBLES.

BY E. C. ARNOLD.

My acquaintance with the Crumbles dates from the spring of 1899, but it was some years before I came to properly appreciate the ornithological possibilities of the place, and even since I have become aware of them I have seldom, except in the Christmas holidays, been able to get there more than once a week, and I have never visited them in April or August or early September. Under these circumstances my list of interesting visitors must necessarily be incomplete, but even so it seems worthy of being placed on record as being well-nigh unique, if one considers the size of the ground, which is only a few acres in extent, and its proximity to a thriving town. Derelict pots and pans mixed up with an odd bath or so and a sprinkling of motor oil-tins stranded on a mud-flat do not form an ideal setting for the delicate form of a Phalarope, a Wood-Sandpiper, or a Pectoral, yet all these birds and many others have disported themselves in apparent contentment amidst these weird surroundings, and some species, such as the Redshank and Ringed Plover, have even increased in numbers since I first knew the place. The fact is that, excluding the Eastbourne end, the remainder of the Crumbles is extraordinarily well situated and fitted to attract a varied assortment of birds. To the north lies Pevensey Marsh, having on its southern edge, near the 'Archery Tavern,' a fringe of market-gardens, brick-kilns, and marshy pools. To the south lies the sea, and to the east the vast waste of Pevensey shingle.

The "Crumbles shoot" begins with what is locally known as the "Hassock," a sort of mere of the Aldeburgh type, with the aforesaid pots at one end and a bed of reeds at the other—a rare place for Snipe in hard weather. Then comes a strip of brambles, hawthorns, and furze-bushes, which runs round two sides of a depression in the shingle known as the "Ballast-hole,"

where there are numerous shallow pools with muddy borders and single bushes scattered about. The majority are bramble-bushes, but there are also thorns, dog-roses, and a few tamarisks, which seem to attract birds, though they are too thin to conceal them. In the summer the shingle is gay with viper's-bugloss, horned-poppies, sea-campion, and many smaller plants, and, after trying for seven seasons, I have, thanks to the heavy dews of last autumn, successfully introduced four tufts of sea-pink, one of sea-lavender, and three shoots of the famous Cley "bushes" (*Sueda fruticosa*)—these last for the benefit of future naturalists; at present they could barely shelter a beetle between them.

Of the birds that habitually breed here, the Redshank (*Totanus calidris*) is the most interesting. Its breeding flight is sure to arrest attention; it hangs suspended with wings decurved, falls several yards, and then beats up again with whirring wings, like a huge moth. It here makes a very slight nest in quite a small tuft of grass on the shingle. Six or seven years ago these tufts were so few and meagre that the eggs were easy to find. Now they have increased in number, and have ceased to be a guide, and there are more broods brought off every year. Some of the eggs have an unusually beautiful purple tinge about them. The Ringed Plover (*Ægialitis hiaticula*) is more numerous, but its eggs have always been very hard to find, scattered about as the pairs are over a very wide area, and making no nest whatever, unless a lining of very small pebbles can be called one. Myself, I hunted two whole seasons before I found a clutch. I have since found one other, and known a boy stumble on a single egg. The Lapwing (*Vanellus vulgaris*) breeds less abundantly also on the bare shingle. It makes much more of a nest, and all the eggs I have seen here have always had a dark yellow-ochre ground colour. I remember once finding a small chick whose mother went through some strange antics. Instead of feigning a damaged wing, she flew at a neighbouring bank of shingle and proceeded to climb it, much as a Woodpecker climbs a tree. A small and scattered colony of Terns make their nests about the higher shingle, and, like the Lapwings, they mostly use a fair amount of dry grass. I presume they are Common Terns (*Sterna fluviatilis*), and so says Mr. Bates, the local

birdstuffer, but Capt. Knox, in his 'Ornithological Rambles in Sussex,' talks of Arctic Terns breeding on this shingle, and, as I have never shot one of these, I cannot say for certain which they are. I judge them to be Common by the note. It is at present the object of my ambition to find a Dunlin's nest on the Crumbles, and thus add it to the list of Sussex breeding birds. I often see the bird in spring, and have several times seen *pairs* about for days in May and June, and have heard of eggs being found, but never so far from the finder; the information has always been second-hand. Of the smaller breeding birds, the most interesting is the Yellow Wagtail (*Motacilla raii*). It has increased as a breeding species with the increase of the grass, and it nests, like the Redshank, in a tuft. The same may be said of the Reed-Bunting (*Emberiza schœniclus*). I once thought the Blue-headed Wagtail was nesting here, but could never prove it.

The strip of furze, &c., between the "Hassock" and the "Ballast-hole" produces nests of the Sedge-Warbler, Whitethroat, Nightingale, Linnet, Greenfinch, Chaffinch, Hedge-Sparrow, and Red-backed Shrike, and I have seen a Cuckoo haunting it in June. Autumn always sees an influx of waders, which pass in lesser numbers in spring. They are mostly Dunlin, with a few Knot, Grey and Golden Plover, Common and Green Sandpipers, Curlew-Sandpipers, and Little Stint. The last-named may be regularly expected, though they are doubtless overlooked, for a Little Stint, puffed out, may easily pass for a Dunlin, unless one looks specially for its shorter beak. I have also seen it more than once late in the spring. In July we get a return passage of the Cuckoo. In September Wheatears are common, and also Pied Wagtails and Meadow-Pipits; and in October a flight of Ring-Ouzels is no uncommon event. Later on, beside the commoner finches, I have met small flocks of Goldfinches and Snow-Buntings, with an occasional Brambling or Redpoll or Goldcrest, and have known birdcatchers to take the Shore-Lark (*Otocorys alpestris*) and Lapland Bunting (*Calcarius lapponicus*), while the commoner Gulls are always passing, and are often present in large numbers. Hard weather brings Common Snipe in large wisps, and a few Jack and Water-Rail, and at times a Coot. A few Geese pass over, but generally high up, and

sometimes the duck-shooting is for a day or so quite good, *i. e.* until the lagoons are frozen. Mallard come nearly every night, and I can vouch for the appearance of the following:—Wigeon, Teal, Scaup, Golden-eye, Tufted. I have also heard of Pochard, Sheld, and Shoveler being shot, and Mr. Bates has three Ferruginous Ducks in his possession, which claim to have been secured on one of the ponds. Herons from the Hurstmontceaux herony are common. I have seen seven at once. I have never encountered the Bittern so far, but in December 1905, in a garden near the 'Archery Tavern,' a man, going out to gather cabbages, nearly stepped on one squatting amongst the stalks. He gave chase, and was a good second up to the garden-wall and no further, for the Bittern just cleared it and he just didn't. Crows, both the Hoodie and the Common, are to be seen daily foraging in the winter, and often a Kestrel hovers over the more grassy portion of the "Hassock." Dr. Colgate once saw a Raven shot there during a fog, and I saw a Peregrine pass one evening just before flight-time. I have only heard of one Woodcock. It was killed by some rabbit-shooters after they had peppered one of their own party in the face at the first attempt.

The following perhaps deserve dates:—

1901.

Sept. 26th.—Immature Red-necked Phalarope (*Phalaropus hyperboreus*) on the "Hassock." Its flight reminded me of a dragonfly.

1903.

July 22nd.—Saw and heard a Temminck's Stint (*Tringa temmincki*); it hung its legs a good deal as it flew.

Sept. 20th.—Mr. A. H. Streeten and I saw a Bluethroat (*Cyanecula suecica*). We walked it about for a long time, and often had it only a few yards off. There was no mistaking the half-red tail, but we never could get a view of the breast, nor have I ever managed to do so in Norfolk. This bird behaved much like a Robin.

26th.—Got a Blue-headed Wagtail (*Motacilla flava*), either an immature or a mature bird in autumn plumage. There were others about, as there often are in September.

1904.

Sept. 17th.—A Ruff (*Machetes pugnax*) on the "Hassock," and a dubious small duck.

Nov. 17th.—Got a Water-Pipit (*Anthus spipoletta*) near the lagoons. It was flying with a very dropping flight, and looked large and dark on the wing. The feet were black with light lemon soles, and the light portions of the outer tail-feathers nearly but not quite white. Its throat was whiter than that of a Rock-Pipit, and there was an entire absence of the greenish tinge that pervades the latter, the general hue being more russet. The spots on the breast were also fewer and narrower.

25th.—Got another Water-Pipit near the same spot. Its colour was greyer than the last, and the tail-feathers whiter.

1905.

Oct. 11th.—Went to get a common bird to give a lesson in stuffing, and stumbled on a Grey Phalarope (*Phalaropus fulicarius*)! It appeared to me to swim lower in the water than the Red-necked.

Nov. 16th.—A Sand-Martin still about, and a queer bird of the Bunting type. It was, roughly speaking, like a Corn-Bunting, but much yellower. I thought it might be a female Black-headed Bunting.

1906.

Sept. 20th.—A boy, G. H. Beattie, with a small Winchester rifle, got an immature Glossy Ibis (*Plegadis falcinellus*) near one of the lagoons. By the time it reached Mr. Bates few cared to inspect it too closely. He, however, spurred on by his wife, who had not got to do the job, ploughed through the stuffing gallantly, and it is now at the Institute.

22nd.—Another boy, L. E. Dennys, shot a Red-necked Phalarope (*Phalaropus hyperboreus*) on the "Hassock" amidst the pots and pans. During the afternoon a huge flock of Swallows arrived, with some Little Stint and four Twites.

Dec. 26th.—Got an immature Golden-eye (*Clangula glaucion*) while fighting on the Crumbles in hard weather. It flew far faster than any duck that passed that night.

1907.

Sept. 21st.—There were various small waders, including two

Little Stint and two Curlew-Sandpipers, amongst the pots. L. E. Dennys and I put them up, and one dark bird stayed behind. This he subsequently shot, and it proved to be a Pectoral Sandpiper (*Tringa maculata*). I have now seen this bird three times at least in England, the first time being at Aldeburgh on Sept. 13th, 1900, and the last at Cley several times during September, 1908. In addition, I rather think one passed me in January, 1907, at Pegwell Bay, and Dennys feels sure he saw one at Budleigh Salterton, in August, 1908. I believe it is commoner than is generally supposed, but it is overlooked owing to its silent habits. Its note is a very low "chup," seldom uttered. It is distinctly larger and darker than a Dunlin, and, though it consorts with these latter on the sands, it generally separates when it rises. Through glasses it looks more like a Green Sandpiper with a dark piece on the upper breast. The Aldeburgh bird flew very like a Snipe.

Nov. 1st.—Watched a Short-eared Owl (*Asio accipitrinus*) hawking over the lagoons.

22nd.—Saw what I fancy was the strange Bunting of November, 1905. It was with some Larks, and attracted me by its very yellow rump.

1908.

Jan. 7th.—Visited the Crumbles in the midst of a south-west rain-squall, and got an immature Tufted Duck (*Fuligula cristata*).

Sept. 19th.—Put a Nightjar (*Caprimulgus europæus*) off the shingle.

23rd.—A man got a Hoopoe (*Upupa epops*) near a field of swedes amidst the shingle.

26th.—Got a Wood-Sandpiper (*Totanus glareola*), which when I first saw it was standing on some mud near the pots. It was very tame, quite unlike a Green in this respect, and attracted me by its conspicuous light eye-stripe.

Oct. 7th.—Was pursuing a dubious Pipit when a bird put its head out of a tamarisk-bush. Its strange appearance caused me to divert my aim, and I picked up an Aquatic Warbler (*Acrocephalus aquaticus*), a bird for which I have been searching for fifteen years. Its eye-stripe was most pronounced, more so almost than the stripe down the crown, and its tail-feathers were very pointed. The feet were very light, and it had a more fragile

appearance than a Sedge-Warbler. It was an immature bird. The weather had been very fine and still for some days, and the wind was south-east.

Nov. 17th.—Saw two Dartford Warblers (*Melizophilus undatus*), not in the furze but in some bramble-bushes. I followed them for some time at a distance of a few yards, and often had an excellent view. This is an interesting note, as Capt. Knox mentions that they occasionally frequented this scrub years ago. It is the only time I have ever seen one in it for certain.

The above complete the list of Crumbles birds for which I am prepared to vouch, but it may be worth mentioning that I have heard statements to the effect that the Greenshank, Dusky Redshank, and Spotted Crake have occurred. I myself put up what I judged to be a specimen of the last-named bird in May, and I have watched what I took for a Pratincole and a Grebe which seemed to be a Great Crested in winter plumage. I believe, moreover, that I saw a small flock of Richard's Pipits in the autumn of 1907, and I have seen one very small Lark which struck me as odd, and another of the size of a Sky-Lark, but abnormally dark.

Finally, it is earnestly asserted by Mr. Bates that three Spotted Sandpipers were once shot there in one afternoon. I believe Mr. Gurney has one of them.

AN EARLY WORK ON BIRD-MIGRATION.

BY W. RUSKIN BUTTERFIELD.

It is always interesting, and often amusing, to trace the early attempts to explain such complex phenomena as those of bird-migration. So far as I am aware, the earliest treatise on migration published in this country is a rare duodecimo tract of fifty pages issued anonymously in 1703. Its scope is fully indicated in the title-page, which is as follows:—

‘An Essay Towards the Probable Solution of this Question. Whence come the Stork and the Turtle, the Crane and the Swallow, when they Know and Observe the appointed Time of their Coming. Or Where those Birds do probably make their Recess and Abode, which are absent from our Climate at some certain Times and Seasons of the Year. By a Person of Learning and Piety. London, Printed for Samuel Crouch, at the Corner of Pope’s-Head-Alley, over against the Royal Exchange. 1703.’

After a somewhat diffuse and not very pertinent argument the author announces (on p. 18) his “probable solution,” namely, that migratory birds, on leaving this country, retreat to the moon!

Sixty days are allowed (p. 40) for the outward journey, and a similar period of time for the return journey. The explanation of the manner in which the space beyond the earth’s atmosphere is traversed is, naturally enough, not very convincing to readers nowadays.

The author’s answer to the objection that a bird will require to eat and sleep during the journey is characteristic of his reasoning, and may be here transcribed. He says:—“As to eating, it may possibly be [*i. e.* exist] without in that temper of the Æther where it passeth, which may not be apt to prey upon its Spirits as our lower nitreous Air; and yet even here Bears

are said to live upon their Summer fat all the Winter long in Greenland, without any new Supply of Food. Now we noted before that some of those Birds (and perhaps it may be true of the rest) are very Succulent and Sanguine, and so may have their Provisions laid up in their very Bodies for the Voyage.

“As to Sleep, 'tis very probable that they are in a Sleep or sweeven if not all the Way between the Attraction of the Earth and that of the Moon, to which Sleep the swift acquired motion may very much contribute. . . . Now it is likely these Birds being there, where they have no Objects to divert them, may shut their Eyes, and so swing on fast asleep, till they come where some change of Air (as a middle Region about the Moon or Earth) may by its cold awaken them. Add to this, that this sleep spares their Provisions; for if (as some would have it) Cuckows and Swallows can lie asleep half the Year without eating, why cannot these in as deep a sleep as well for two Months forbear it” (pp. 43-45).

The moon is not, of course, a stationary body in the heavens, and so “it cannot be supposed,” our author continues, that the birds at the outset of their journey “direct their Course to the Moon, but rather offended by the Steams of the Earth do tend directly from it, and that straight Line 'tis probable they pursue, till they come so near the Moon, that she is their fairest Object to draw their Inclination; for if the Moon hath a Motion in a Month about the Earth, then at the two Months end they find it in the same Line of direction where it was when they began their Journey; for, suppose it Full Moon at the place where they began, just at two Months end, it will be Full Moon again to the same place which they left; therefore if they proceed in the same straight Line, they will be sure to meet the Moon in their Way. . . .”

In a postscript, which occupies pp. 48-50, the author meets the objection which the great distance between the earth and the moon sets up by stating that there may be nearer bodies of small size, which he likens to rocky islets in the sea, “which may be the Recess of these Creatures, and may serve for little else but their Entertainment.” And he concludes his essay with the statement, which at any rate few will dispute, that “if

the Moon will not be allowed, some other Place must be found out for them.”

With regard to the authorship of the work, in Tonkin's edition of Carew's 'Survey of Cornwall' (p. 83), it is attributed to the Hon. Francis Roberts, though on what authority I have been unable to ascertain. The work was known to John Legg, author of 'A Discourse on the Emigration of British Birds,' as is shown by Legg's criticism of it on pp. 12, 13 of the 'Emigration,' and by some remarks upon the Woodcock, borrowed (without acknowledgment) by Legg. In the earlier work these remarks occur on p. 25; in Legg's book on p. 35.

The views expressed in this tract may seem ridiculous in our day, but it may be suspected that they are not more so than some of the ideas entertained on the subject at the present time will appear to ornithologists of the future.

NOTES AND QUERIES.

MAMMALIA.

Mammals of the Channel Islands.—Since the publication of my Notes on the Mammals of the Channel Islands (Zool. 1908, p. 461), Mr. Sinel tells me that the Bat doubtfully referred to *Barbastellus* has been identified by Dr. Ticehurst, of Guy's Hospital, as a melanic Pipistrelle. This makes only four known species for the Islands, *i. e.* Pipistrelle, Serotine, Long-eared, and Greater Horseshoe—a very small record when one considers the proximity of the Continental species, and one which should arouse the local and visiting naturalists to a closer search for the occurrence of other members of this interesting order in such a favourable district. — R. H. BUNTING (Natural History Museum, South Kensington, S.W.).

Correction.—On the last line but six of p. 449 (Zool. 1908), in my "Fish Notes," I referred to Porpoise-hide, a statement which several inquiries on my part have proved to be incorrect. Porpoises *were* sold, and universally believed among the fish fraternity to be used for making leather. In the leather trade *porpoise* is an erroneous term in use for the skin of the Beluga or White Whale, and in some instances for specially prepared horse-hide.—A. H. PATTERSON (Great Yarmouth).

AVES.

Nightingale breeding in Shropshire. — Mr. A. H. Duncalfe (*ante*, p. 29) asks for information as to the nesting of the Nightingale in this county. It is ten years since I wrote the 'Fauna of Shropshire,' and facts that have come to my knowledge during that period somewhat modify the statements therein. The Nightingale is a regular summer visitor to the country on both sides of the Severn from Bewdley up to Buildwas, and especially frequents the small spinneys in the vicinity of Linley and Broseley. Further to the north and west it is of irregular occurrence, the limit of its range fluctuating from year to year in a manner quite unaccountable. The year 1902 was especially remarkable. At least six pairs took up breeding quarters in the

environs of Shrewsbury. One nest was within two miles of my house. I photographed it *in situ* when it contained five eggs, and after the young had flown took the nest, which is now in Shrewsbury Museum. As a rule the Nightingale keeps to the Severn Valley, but a few isolated pairs have been known to nest in other parts of the county, *e. g.* at Onibury in 1905.—H. E. FORREST (Shrewsbury).

Nesting of the Nightingale (*Daulias luscinia*) in Staffordshire.—In reply to Mr. A. H. Duncalfe (*ante*, p. 29), the Nightingale occurs most years in this county, and I have authentic records of its having nested in the Rectory Gardens, Hamstall Ridware, in 1897, and at Stramshall, near Uttoxeter, in 1904.—JOHN R. B. MASEFIELD (Rosehill, Cheadle, Staffordshire).

Breeding of Coal-Tit in Wilsden District.—A friend and I were sitting down on the outskirts of Bingley Wood last summer when our attention was attracted by seeing a Tit enter a hole in an old wall at some distance from where we were sitting, and almost immediately come out. Being uncertain whether it was a Marsh- or Coal-Tit, I went and sat down within about four feet of the hole, where, I presumed, would be a nest, when my friend protested that he would give no guarantee to stay where he was until the old bird came near enough for its identification. However, knowing fairly well the habits of this species, I remained in my position. For some time the parent, evidently the female—the male kept at a much greater distance—made several attempts to arrive at the nest, sometimes hovering for many seconds near the hole leading to it, thus clearly disclosing the grey patch on the nape characteristic of the Coal-Tit, but only to retire to an adjacent oak, where it poured forth a volley of notes, in tones scolding, minatory, and objurgatory. Finally, however, it gained confidence and entered the nest, but remained such a time on it that we were induced to have a peep at the nest, but no sooner was this done than the bird resented the intrusion by sparring and hissing in true Tit fashion. It is a singular feature in the history of this species that it should be such a scarce breeder in the district, only three nests having been recorded for over forty years, all of which were built in holes in masonry. In the late nineties I spent a few days between Grange and Windermere, and the Coal-Tit was, next to the Willow-Warbler, the commonest breeding species in early April; three nests were built near my lodging, but, curiously, all these were built in holes in the ground.—E. P. BUTTERFIELD (Bank House, Wilsden).

Two Young Cuckoos fed by a Titlark.—A short time ago I called to see an ornithological friend who resides some little distance from this place, and he informed me that last August he had watched a Titlark feed two young Cuckoos near his residence. In reply to my inquiry whether he might not have been mistaken, having suggested after all that there might have been two foster-parents, he declared without hesitation that he had watched a single bird feed one of the Cuckoos, then fly away for a short distance and return to feed the other, and this he had witnessed repeatedly. Two eggs of the Cuckoo in the nest of its dupe is not a very rare occurrence in this district, but up to the present I have never known foster-parents rear two—indeed, the gastronomic requirements of one Cuckoo are so heavy, in addition to its being of such a quarrelsome disposition, that such an occurrence would be of more than ordinary interest. Young Cuckoos are so very fractious, untractable, and of such a wandering nature as to render it not improbable that they may lose their own foster-parents occasionally. — E. P. BUTTERFIELD (Bank House, Wilsden).

Honey-Buzzard (*Pernis apivorus*) in Staffordshire.—On Sept. 30th last, Lieut.-Col. E. S. P. Wolferstan, of Statfold, Tamworth, reports in 'The Field' that his gamekeeper shot a Honey-Buzzard within half a mile of his house. This record, taken in conjunction with the occurrences of this bird in the Eastern Counties reported by the Rev. F. L. Blathwayt and Mr. Dye (Zool. 1908, pp. 428, 468) in the same month, would seem to show that there was an immigration of this species at that time, and if possible, it would be interesting to ascertain if all the birds obtained were *young* birds, and their sex? We have now six recorded instances of the occurrence of the Honey-Buzzard in Staffordshire, besides Mr. C. Buchanan's statement in 'The Zoologist' for 1856, p. 5096, that the bird nested in this county in the year 1841. The editor of 'The Field,' commenting on the last recorded instance of this bird shot in Staffordshire, says:—"An inoffensive summer visitor, which might well have been spared. Unlike other of the larger hawks, its prey consists chiefly of insects and their larvæ, wasps, bees, beetles, and earthworms." Would that our land-owners could be prevailed upon to spare Honey-Buzzards, which then might once more be induced to stay and breed with us!—JOHN R. B. MASEFIELD (Rosehill, Cheadle, Staffordshire).

Snow Geese in Co. Mayo.—A day or so after the great snowstorm of Dec. 29th, 1908, that was so severe over Scotland, parts of England, and the northern counties of Ireland, but which passed so lightly

over this western district—only a few sleety storms and rain, and only one degree of frost on one night—a little flock of four Snow Geese were seen by Mr. Claud Kirkwood, flying over Bartragh Island. They appeared coming from the north, and, having passed over the island, pitched on the sands (the tide being out) about half a mile away, and, after resting for some time, rose and flew up the estuary and river, evidently heading for Lough Cullen. They were easily recognized as Snow Geese by their snow-white plumage and black-tipped wings. During the great snowstorm we had here on Dec. 26th, 27th, 28th, 29th, and 30th, 1906, fourteen Snow Geese visited Bartragh, and were seen by Capt. Kirkwood on the 30th feeding near his stables on the sands. There were four adults perfectly white, and ten greyish birds, evidently immature.—ROBERT WARREN (Moy View, Ballina).

Smew (*Mergus albellus*) in Middlesex.—Among the Coots and Diving Ducks at Ruislip Reservoir on Jan. 24th was an immature Smew. Although it swam lower in the water than the Pochards and Tufted Ducks it looked but little smaller than they, and, judged by its size, appeared to be a male.—CHARLES OLDHAM (Watford).

Black Grouse, ♂ (*Tetrao tetrix*).—Shot on the Ince Estate in November or December of 1888. This date is taken from a receipt for preserving the specimen, and additionally confirmed by Mrs. Park Yates, the donor of this interesting addition to the local collections in the Museum.*—ALFRED NEWSTEAD (Grosvenor Museum, Chester).

Mr. T. A. Coward writes:—"The Black Grouse breeds annually on the south-eastern border of Cheshire from Bosley to Whaley Bridge. In the neighbourhood of Ince, Frodsham, and Delamere Forest the bird was formerly common, but has been extinct for some years. At one time, within the memory of old men, the Black Grouse bred in the Forest, and a few years ago Lord Delamere attempted to restock a portion of the Forest, but the attempt failed. This was since 1885—I think about 1900—and Black Grouse were thought all to have vanished long before 1885."

Red-throated Diver (*Colymbus septentrionalis*) in Hertfordshire.—On Jan. 10th, at Wilstone Reservoir, Tring, I watched a Red-throated Diver for some time; its slender, slightly upturned bill and speckled back were quite apparent at close quarters. I cannot find any previous record for this species in Hertfordshire.—CHARLES OLDHAM (Watford).

* There is a female in the Museum collections from Broughton Gardens, Chester, Nov. 21st, 1892.

Ornithological Records for Chester and North Wales since January, 1908 :—

SHOVELER DUCK (*Spatula clypeata*).—Two males. Cumbermere Abbey Estate, Jan. 6th, 1908.

MERGANSEER (*Mergus serrator*).—Female. Burton Marsh, Dec. 22nd, 1908. A second specimen shot, but not obtained.

BUZZARD (*Buteo vulgaris*).—Male. Eaton Estate, Dec. 22nd, 1908.

PEREGRINE FALCON (*Falco peregrinus*).—Immature. Shocklach, near Malpas, Jan. 4th, 1909.

RAVEN (*Corvus corax*).—Male. Corwen, 1908.

PIED FLYCATCHER (*Muscicapa atricapilla*).—Male. Corwen, 1908. The female of this interesting species was seen, but fortunately not obtained.

GREAT SPOTTED WOODPECKER (*Dendrocopus major*).—Mollington, December, 1908.

RUFF (*Machetes pugnax*).—Immature. River Gowy Meadows, Sept. 30th, 1908.

GOLDFINCH (*Carduelis elegans*).—A flock of about fifteen specimens observed near Chester, apparently feeding on the seeds of the common thistle, Nov. 21st, 1908. — ALFRED NEWSTEAD (Grosvenor Museum, Chester).

Ornithological Notes from Scarborough.—A Great Bustard was shot at Cloughton, near Scarborough, about last Christmas-time, by Mr. Bennett, who unfortunately did not have it preserved, but took it home and had it cooked instead of a Turkey for Christmas dinner, and he says it was superior in delicacy to the Turkey. A female Smew has been killed at Rillington, near Scarborough, on Jan. 4th, 1909, being only the second recorded specimen obtained in twenty years. Two Nuthatches were also obtained by Messrs. Raine and Maw respectively (Jan. 5th and 8th last) under riddles in stackyards at Hackness, having gone into the stackyards in search of food during the late snowstorm. This is the first time the Nuthatch has been obtained near Scarborough, but the fact that two birds have occurred in the same week would almost lead to the conclusion that it breeds in the locality. A Whooper Swan (immature) has also been shot by Mr. Clarke on the rocks here (Dec. 28th, 1908). — J. MORLEY (King Street, Scarborough).

Bird Notes from the Tyrol.—In reference to Mr. Workman's interesting notes on the above (*ante*, p. 30), I would like to state that I visited the Tyrol in 1892; arrived at Muhlau on August 28th and left

September 15th. Muhlau (where I stayed the whole time, with the exception of three days spent on an excursion) is a hamlet about three miles north of Innsbruck. During my stay I could only devote ten days to field work, and several of these were given up to high mountain climbing, where one could not expect to see much bird-life. I am sorry few notes were taken of our common birds, mostly rarities attracting our attention. The first day I saw a Wheatear (*Saxicola oenanthe*), which evidently belonged to the large variety from its size, and the fact that it perched on the top of a somewhat high tree in our garden. Later in the day I took a walk through the pine woods adjoining our *pension*. Several small birds were heard, and momentary glimpses caught of them flitting about among the pines, but it was impossible to identify them correctly. However, numerous Tits of different kinds inhabited the forest. Later on during our rambles we occasionally noticed in clearings Crossbills (*Loxia curvirostra*), and it was most interesting to watch these clumsy-looking but nevertheless acrobatic birds feeding on the seed of the pine-cones; every now and again they managed to sever the stalk, the cone falling to the earth with a thud, but never did a Crossbill follow the cone to the ground to continue its feast. On our first high climb, about 7400 ft., when resting on a narrow ledge of bare rock, I noticed a pair of birds which closely resembled in appearance and actions our Rock-Pipit (*Anthus obscurus*); in fact, they were indistinguishable from our bird, although, as far as I know, this shore-loving bird does not inhabit the Austrian Tyrol. No sooner had the Pipits disappeared than we caught sight of a pair of Chamois grazing far above us. We saw during the day several large birds of prey, but could not name them owing to distance. I may state that these high climbs were not to my taste, but my companion had been an ardent member of the Alpine Club for some twenty years. We should have done much better by sticking to the woods, or the limit of forest growth. Another day I caught sight of a bird which resembled a Magpie minus the long tail, but its appearance was too fleeting to be certain what species it belonged to; possibly it was a Magpie in moult. One day my companion met an Austrian he knew well. This man was an ardent sportsman, and had a small private museum containing birds he had shot. These included Eagles, Owls (different species), Hawks, Falcons, Harriers, Black-game, and Capercailzie, but, most interesting of all, he had an Eagle-Owl (*Bubo ignavus*), which he had kept alive. He found this bird a year before as a nestling at the foot of a tree which contained the nest. He assured us that when an Eagle haunted the neighbour-

hood of his ch^âlet he chained this poor bird to the top of a tree, when it often attracted the Eagle within shot. Soon a boy appeared with a large basket, into which the huge Owl was stowed, and off went our friend with his gun towards the forest, accompanied by the boy carrying the Owl. This man was the only sportsman carrying a gun I saw during my stay.

On one occasion, when proceeding along the bank of a slow river, we saw a Kingfisher (*Alcedo hispida*) and a Water-Ouzel, but the usually rapid flowing streams of the Tyrol cannot suit the habits of the former bird, and I imagine it must be very rare in the mountainous regions. On September 13th, when at the end of a three days' excursion, we completely lost our way in a very desolate region, where there were no marks of the Alpine Club to direct us. I well remember we were toiling up a slope beside a roaring torrent, the noise of which drowned any sound we made during the ascent, and when we topped a rise there in front of us, within twenty yards, on a flat piece of grass, sat a magnificent Golden Eagle (*Aquila chrysaetus*). On observing us the bird rose in the most awkward, clumsy manner imaginable, with legs stretched backwards, neck stretched to full extent—in fact, it looked like a combination of a Great Coot and Cormorant rising from water, but this awkwardness disappeared in a few yards; then, with neck retracted and legs drawn up, it sailed away in splendid flight. I would like to know if any readers of 'The Zoologist' have noticed this bird rising from a flat surface, and if the flight for a few yards has been as described. On a few occasions, when a boy, I have seen these birds soaring about over hills in wild parts of Scotland, but never had the good fortune to be close to one rising from level ground.

In the Tyrol I found (as I have done in Normandy and Brittany) that the forests were carpeted in some places with such thick undergrowth that only very slow progress could be made, in others there was no undergrowth whatever; the former prevented observation, while the latter is inimical to most bird-life.—J. E. H. KELSO (San Remo, Festing Road, Southsea).

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THE DARWINIAN THEORY IN 1867 AND NOW.

BY W. C. McINTOSH, M.D., LL.D., F.R.S.

ON the 15th of March, 1867, a brief summary of Darwin's views on Evolution and of the antagonistic doctrines was given in a popular lecture to the Literary and Antiquarian Society of Perth. Very urgent occupations in other fields and perhaps a great disinclination to theorize have prevented further work in an area so fascinating and so fruitful to many. The lecture stands as it did in 1867, and in brackets a few paragraphs indicate, in the briefest possible manner, the general trend of facts and opinions on this and cognate subjects in recent times.

Two great views (not to mention minor ones) have agitated the scientific world on the question of the Origin of Species. Thus one group of naturalists holds that every animal and every plant was created as it is now seen, and that the progenitors in each case were in all respects identical with their descendants ; moreover, that where extinction has caused great blanks in the organic world a new creation has occurred on the ruins of the former epoch, the plants and animals of this new creation differing in specific characters from those of pre-existing forms. The followers of the second doctrine, again, assert that while creation of a few primary forms took place at some epoch, all the modern species of plants and animals are derived from these early progenitors by direct lineal descent with modification (the Darwin-Wallace theory). In the former case little or no variation of

each original type is admitted; in the latter the power of variation is supposed to be very great.*

Thoughtful and experienced naturalists have long felt some difficulty with the question of the origin of the various species of plants and animals both fossil and recent. Such a question arises, for instance, in reflecting on the close affinity between the skeletons and soft parts of the various vertebrates. Lamarck was the first who hinted that they might all be produced by variation from a few ancestors. He reduced these ancestors, indeed, to two, the vibrio and the monad, and that these sprang from inorganic matter by spontaneous generation. On the one hand the development led through the annelids, cirripeds, and shell-fishes to fishes; and on the other—from the monad—through rotifers, polyyps, starfishes, insects, spiders, and crabs. The class of fishes thus derived its several characters from transmuted squids and crabs. From the fishes the development proceeded through the well-defined vertebrate pattern up to man. Evolution further, according to Lamarck, depended on acquired characters. Buffon had previously advanced the opinion that man was one of the forms originally created, and that monkeys and the lower mammals were degenerated human beings. This, perhaps, was a more comfortable doctrine than that of the eccentric Lord Monboddo, who held, even before the time of Lamarck, that men were descended from the monkeys, that the ourang-outangs were members of the human species, and that in Bengal there existed human beings with tails. The list of authors who have enunciated more sober doctrines in relation to the development of existing from pre-existing species includes names very eminent in natural science, as well as the anonymous author [now known to be Dr. Robert Chambers] of the well-known 'Vestiges of Creation,' a work wherein what is called the progressive development theory is expounded. The author of the 'Vestiges' believed that all forms sprang from a single cell, and even this cell from inorganic matter, and that the several series of animated beings, from the simplest and oldest up to the highest and most recent, were, under the providence

* The Darwin-Wallace communication "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection" was made to the Linnean Society on July 1st, 1858.

of God, the results, *first*, of an impulse which had been imparted to the forms of life, advancing them, by generation, through various grades up to the highest animals and plants; and, *second*, of another impulse which tended to modify, in the course of generations, the organic structures in accordance with external circumstances. This work differs in many points from Darwin's, especially in regard to Mutation, though some arguments are common to both; but these are wielded with much greater skill by the trained and philosophic naturalist.

In examining briefly some of the points brought forward by Darwin in support of his theory of the origin of species by means of what he calls "Natural Selection," one of the aims of this theory may be better understood by quoting the words used by a distinguished man of science, who put the saying of Lucretius in the mouth of a curious speculator or Darwinian interrogating a palæontologist. "You have," he says, "abandoned the belief in one primæval creation at one point of time; you cannot assert that an Elephant existed when the first saurians roamed over earth and water. Without, then, in any way limiting Almighty power, if an Elephant were created without progenitors, the first Elephant must, in some way or other, have arrived physically on this earth. Whence did he come? Did he fall from the sky (*i. e.* the interplanetary space)? Did he rise moulded out of an amorphous mass of earth or rock? Did he appear out of the cleft of a tree? If he had no antecedent progenitors, some such beginning must be assigned to him." Darwin and his followers assert that such an Elephant must have had ancestors.

[To-day the Darwinian might point to the discovery—in the Upper Eocene of the desert-region near the former Lake Meris—of an apparent ancestor of the Elephant, somewhat pig-like and smaller than a Horse, and to which the name *Meritherium* has been given by Andrews, its discoverer. Further, that a series of forms with long jaws from the same Fayûm (or desert-region) of Egypt, as well as the *Tetrabelodon* of the Miocene of France, lead to the condition in the American *Mastodon* in which the jaws are considerably shortened; and finally to the still shorter jaws of the modern Elephant with its "bull-dog" skull (Lankester).]

Darwin's whole theory being based on the mutability (adaptability) of species, and their derivation or development from

primary forms, he puts aside the ordinary view of the independent creation of each organism, and proceeds to give his reasons for this conviction. Briefly stated, Darwin's Theory of Natural Selection supposes:—(1) That every kind of animal and plant tends to increase in number in a geometrical progression. (2) That each tends to transmit a general likeness with individual differences to its offspring. (3) Every individual may present minute variations of any kind and in any direction. (4) Past time has been practically indefinite. (5) Every individual has to endure a severe struggle for existence. (6) Every variety of a kind tending to save the life of the individual possessing it, or to enable it more surely to propagate, will in the long run be preserved. He first illustrates the variability of animals by appealing to what we find in domestic species. Every one is familiar with the numerous races of many domesticated animals, such as the horse, ox, sheep, dog, and pigeon, and moreover of the difficulty which one would have in saying whether a given race, say, of cattle, is merely a variety or a distinct species of cattle. Even Bacon long ago wrote in regard to variability by domestication: "By art also we make them greater and taller than their kind is"; "Also we make them differ in colour, shape, activity, many ways." The extraordinary variability, for example, of domestic pigeons is striking, for it is generally admitted that they are probably all derived from a single species of pigeon—the Rock-Pigeon (*Columba livia*). Any one, even a naturalist, who for the first time surveys specimens so widely different as these varieties, would at once call each a separate species, and he might further group some under different genera; that is, their distinctions are so great that there would be even more than specific divergence. It would, indeed, be hard to convince him that these were not produced originally from as many separate pairs of pigeons or species as there were varieties. Yet such cannot be the case, for, besides the statement previously made, only two or three other species of Rock-Pigeon exist, and these have none of the characters of the domestic breeds. That the numerous varieties of domestic pigeons are artificial productions, if the term may be used, their very curious structure of beak, feathers, and crop sufficiently testifies, for in no other group of pigeons is anything similar to

be found. The fact also that occasionally a young pigeon (*e. g.* a tumbler) is produced with the white croup, double black wing-bar, and barred and white-edged tail-feathers—in short, in the very livery of the original Rock-Pigeon—is a very strong corroboration of its direct descent therefrom. No one will for a moment suppose, however, that these various breeds of pigeons have been solely produced by the modifying circumstances of habit and external conditions; on the contrary, it is at once perceived that they have been effected by the adaptation of man, who has sometimes had less a view to the creature's benefit than his own caprice.

It seems bold to emphasize this modification by man, yet some may be acquainted with facts that prove the occurrence of wonderful changes in this respect in a single race of cattle or sheep, even during a man's lifetime. The same is observed in the domestic fowls—which some suppose to have sprung from a single species—in horses, and in garden flowers and fruits. It is known that the cabbage, cauliflower, broccoli, kale, and kohlrabi are derivatives of one species, and rape or colza, turnip and probably ruta-baga (Swedish turnip) of another species. The late Hugh Miller, who was well known to have very strong antipathies to the development-theory (Darwin's in the present day), observes:—"Man is a mighty improver of creation. He adds to the beauty of the flowers which he takes under his charge, to the delicacy and fertility of the fruits; the seeds of the wild grasses become corn beneath his care; the green herbs grow great of root and bulb, or bulky and succulent of top and leaf; the wild produce of nature *sports* under his hand; the rose and the lily broaden their discs and multiply their petals; the harsh green crab swells out into a delicious golden-rhinded apple streaked with crimson." And so the udders of the cow and goat enlarge, the fleece of the sheep alters, and the cocoon of the silkworm becomes more bulky. The key to all this, says Darwin, is man's power of accumulative selection; Nature gives successive variations; man adds them up in certain directions useful to him or that satisfy his caprice.

In antagonism to the foregoing remarks, one of the most formidable of Darwin's opponents, the celebrated Prof. Louis Agassiz, of the United States, affirmed that Darwin had failed to

establish a connection between the mode of raising domesticated races and the cause or causes to which wild animals owe their differences. He instanced the alternate generations of the sea-jellies, and the reproduction of the Salpæ, and added that there are far more astonishing phenomena than the slight differences produced by the intervention of man among domesticated animals, and which would shake their belief in such differences being trustworthy indications of the variability of species. Agassiz held that animals and plants could not have sprung from a single centre of creation, but were created where they now are; and with regard to each new species in successive strata, "Nature made him, and then broke the die."

[Since the publication of the 'Origin of Species' much has been done by Darwin and others at home, and much by the numerous band of Evolutionists abroad, to illustrate variation in animals. In Britain, Bateson held that variation—continuous and discontinuous—indeed, offered the best chance of explaining evolution, and his laborious work is well known. According to Galton great deviations are less common than slight deviations. The Mendelian theory, again, which has sprung into prominence lately chiefly by the labours of Bateson, is thought by some to be the theory which will solve the riddle of Evolution. Briefly, Mendel's law of inheritance in hybrid varieties holds that if a well-established form, with a definite character, *e.g.* size or colour, be crossed with another in which the character is different, the offspring will usually resemble one of the parents in the distinguishing character which is "dominant," the character remaining latent being "recessive." If the hybrids are crossed, the descendants will be of two kinds, some like the dominant, some like the recessive. When those like the recessive parent are crossed only recessives are bred. When those like the dominant parent are crossed the results are pure dominants, and apparent dominants, that is, with power to produce more pure dominants, more pure recessives, and more apparent dominants. The two characters do not combine in successive generations, and their antecedents occur in the germ-cells. More complex phenomena, however, occur in other cases, as *e.g.* in the breeding of fowls with single comb, rose-comb, and pea-comb. Thus when pea is crossed with single comb it acts as dominant. When pea is crossed with rose-

comb an entirely new ("walnut") comb results, which has bristle-like hairs; the proportion of walnut, pea, and single by this mating being as 9 : 3 : 3 : 1. These complex phenomena are supposed to be due to compound allelomorphs in contrast with others in which simple allelomorphs only are present in the ova.* Selection, in certain cases, the Mendelians affirm, will never make a form breed true. Some Darwinians severely criticise the methods of the Mendelians and Mutationists in this country, and hint that instead of aiding in the work of elucidating evolution they appropriate much that is Weismann's and hinder progress.

Besides the foregoing much also has been observed and written concerning Heredity† since 1859, the problem being as to "How it is that a single germ-cell can produce, by repeated division, an organism in which the peculiarities of the somatic units of the parent are reproduced?" (Poulton). Among the most conspicuous efforts to solve it is Weismann's theory of "The Continuity of the Germ-Plasm," or the *blastogenic* theory, which is in contrast to the *somatogenic* or theory of *Pangenesis* of Darwin, in which every somatic cell is a germ-cell, the germ-cells proper being the central meeting-place.]

Darwin points out in the next place that variation occurs amongst animals and plants in a state of nature. One of the most remarkable of such variations is that recently described by Mr. Bates as occurring in the butterflies of the great Valley of the Amazon. He observed that a gregarious butterfly (one of the *Heliconidæ*) swarmed in incredible multitudes. In these swarms are to be found in small numbers other species of butterflies belonging to at least ten genera and some moths, and these intruders, though structurally different, mimic the members of the great group with which they associate so closely that it is a most difficult thing to distinguish them. That they are really intruders is shown by the fact that these mimickers depart from the usual colours of their genera. Moreover, they evidently do so to escape destruction by birds and other animals, for Mr. Bates found that the species of the large group which they mimic are seldom or never preyed on, as he thinks, on

* *Vide* an interesting epitome of Mendelism by Mr. R. C. Punnett, 1905.

† *Vide* the excellent treatise on 'Heredity' by Prof. Arthur Thomson, 1908.

account of their offensive odour, and moreover that a knowledge of edible and inedible forms could be transmitted by heredity. Mr. Wallace, the author who conjointly propounded the theory of Evolution with Mr. Darwin, in the Linnean 'Journal' in 1858, has likewise described and figured similar variations in the females of certain butterflies in the Malayan Archipelago.* Darwin states that it is in the largest genera or groups that the variations are most marked, both in plants and animals, mainly because such afford a wider area for the action of the law.

[Fritz Müller has given a different interpretation of this condition from that of Bates, for he thinks that the object of the mimicry is to reduce the danger from attacks of young and inexperienced enemies, which have to acquire the necessary knowledge. This author has further advanced an interesting series of facts in connection with the structure and development of the Crustacea, which he can only explain by Darwin's theory.] †

Prof. Louis Agassiz, on the other hand, maintained that all that can be proved is that there exists a considerable difference amongst individuals of one and the same species. Let anyone, he said, familiar with the fossil oxen and dogs compare them with the modern races of these genera, and he will find no correspondence whatever between them, for the simple reason that they do not owe their origin to the same causes. This author, however, advocated the specific distinctions of the various races of men, and was of opinion that they could not have all sprung from a single pair. He was supported by Dr. Hunt, who stated that there is as good reason for classifying the Negro as a distinct species as there is for making the ass a distinct species from the zebra; and if in classification intelligence is taken into consideration, there is a far greater difference between the Negro and the European than between the gorilla and the chimpanzee. Darwin's theory at least would give a single origin to man, while that of the foregoing authors who adhere so much to the original and independent doctrine of Creation assigns a multiple origin to man.

Some, like the Duke of Argyll, affirm that many structures (*e.g.* the feathers of the Humming-bird) have been created for

* And previously about new species (Ann. Nat. Hist. 2nd ser. vol. xvi. p. 184, 1855).

† See also Wallace on 'Natural Selection,' 1870 (Macmillan & Co.).

beauty,* and have not been developed by variation, but Darwin says with force that the idea of beauty obviously depends on the mind of man; thus neither the Negro nor the Chinese admires the Caucasian *beau ideal* of a woman. Were the volute and cone shells, he asks, of the Eocene created to be admired in man's cabinet? He further explains that the beauty of many flowers is a provision for attracting insects in order to scatter the pollen, and the attractive delicacy of some fruits, such as the cherry and strawberry, is a lure for birds to swallow them and so spread abroad their seeds.

One of Darwin's reviewers, said to be Prof. Owen, in commenting on the statement that it is in the largest genera that the widest limits to the species and the most extensive variation are found, brings forward the counter-statement that the Elephant is a small genus, comprising only two species, yet the range of both Indian and African examples is considerable. The Borneo Pongo (or Orang) consists likewise of but one species, which varies much. On the other hand, the species of the Antelope "genus" have not hitherto presented noteworthy variations; yet the "genus" in respect to number of species is one of the largest in the mammalian class.

Darwin supposes that those variations which are profitable to the individual of any species, in its complex relations to other organic beings, will tend to the preservation of the individual, and will generally be inherited by its offspring. In the struggle for existence which all animals, not excepting man, are constantly engaged in (and perhaps, it has been truly said, the nearer the kindred the more internecine), such modified descendants will have a much better chance of surviving than those not so favoured, and the latter will die out. Now comes into play Darwin's great talisman, "Natural Selection," or the preservation of favourable and the rejection of injurious variations either in plants or animals. Since many more individuals are born than can possibly survive, those individuals and those variations which possess any advantage, however slight, over the rest are in the long run sure to survive, to propagate, and to occupy the field, to the exclusion or destruction of their weaker brethren. It elucidates, says Prof. Asa Gray, the advantages

* 'Reign of Law.'

of good breeding, and makes the most "of every creature's best."

As an illustration of this law of Natural Selection, suppose, says Darwin, that all the rabbits of a country were to perish, so that the dogs and foxes required to subsist solely on hares. It is evident that the longest limbed, most agile, and swiftest of these predatory animals would be most successful in gaining food in times of scarcity, and would rear most young, which would tend to inherit such advantages; while the less agile would perish. And so with any animal which depended on its speed, strength, weapons of offence and defence, either in regard to obtaining food, or superiority in combat between males.

[Another theory subsequently broached by Darwin and elaborated at considerable length is that many of the variations are due to the selective power of the animals themselves. Thus female birds (which are generally clad in sober colours) choose for mates the finest and most perfectly coloured males. The strongest and most courageous males amongst deer and other animals drive off their weaker brethren and select their partners. Thus it is, he states, that special developments, such as horny or warty appendages, the perfume of the Musk-deer, tufts, beards and moustaches of men and the apes, are to be accounted for.

Mr. Wallace,* again, objects to Darwin's views on this head, and holds that the colours of animals are not due to such selection, which the more potent influence of Natural Selection would neutralize. Mr. Wallace also holds that the latter will not account for the condition of man.]

Every organic being is striving to increase to its utmost, but there are various checks which tend to keep each within due limits, such as the supply of food, the climate, and seasons of extreme cold or drought. In the years 1826 to 1828 this was well shown in La Plata, where from great drought most of the cattle died, and the country everywhere swarmed with mice. The latter disappeared on the advent of moist weather. Again, where there is abundance of food and no great check some animals increase extraordinarily—for example, the Passenger Pigeon and the Fulmar Petrel—yet the latter lays only one egg.

* 'Tropical Nature,' p. 211, &c., 1878.

Darwin states there is little doubt that the stock of partridges, grouse, and hares on any large estate depends chiefly on the destruction of vermin, though others might also suggest that the amount of protection is important. Thus the Malthusian doctrine—that population, if left to itself, increases at something like a geometrical progression, while the means of sustenance from the fertility of the land and bringing in waste only increases at something like an arithmetical progression—suits well with the Darwinian theory, and, like it, requires the agency of checks. The lucky and the strong must prevail, or multiply and vary, while the weaker and ill-favoured perish.

[No more striking instance of the feature alluded to by Darwin could be mentioned than the introduction of rabbits into Australia. The same may be said of the Voles (*Arvicola agrestis*) of our own country, which occasionally appear in incredible numbers in woods, and do great damage to trees and shrubs both above and below ground. The plan of sheltering young trees and shrubs in exposed situations by permitting the grass to grow around them prevents the owls and hawks from preying so readily on the Voles, and thus aids in keeping up their numbers.]

His opponents, however, instance the fact that according to the rate of modification experimentally proved in regard to domestic pigeons, we ought to find evidence of progressive increase, for example, in the combative qualities of the antlers in those deer that for centuries have fought and bred in the mountain wilds of Scotland. Such is found not to be the case on comparing modern antlers with the most ancient ones from submerged forest lands. Cuvier, too, proved that no change of specific characters had occurred in the ibis, cat, and crocodile found in the tombs of Egypt, and ranging back three, four, or five thousand years ago. Moreover, Agassiz adduces the evidence that the coral polyps engaged at present in constructing the reefs on the coast of Florida have been engaged there for thirty thousand years at least, and all this time no change has ensued in their specific characters. Darwin gets over this difficulty by saying that it is not necessary that every species should vary, but only some, and that only occasionally.

There are others, again, who object to the notion that any

being is placed under unfavourable conditions by the Creator, and roundly charge his whole theory with atheism. One of his supporters, Prof. Asa Gray, quaintly asks: "Are not many individuals and some races of men placed by the Creator under unfavourable circumstances, at least under such as might be advantageously modified?"

[Thus *Sphex* (a hymenopterous insect like a wasp) stings caterpillars and spiders through the nervous system, so that they continue to live and afford food for its larvæ in their cells. Another hymenopterous insect, *Polynema*, deposits its eggs in those of a dragonfly (*Agrion virgo*), and these are developed at the expense of the latter, which serves as a store of food-yolk. Such instances sufficiently illustrate the unfortunate conditions of certain types under natural conditions, and the same is seen in the white pigs of Virginia, which are poisoned by the paint-root (*Lachnanthes*), whilst black pigs escape.

Again, conscientious adherents of the Church, such as George Henslow, have striven to show that the very same laws of Evolution equally regulate the growth of Religion, whether in the Individual, the Church, or the Nation. Wasmann, in Germany, adopts similar views as to the evolution of animals, but he excepts man, who has an immortal soul, and has a totally different origin from them.]

Darwin believes that this law of Natural Selection, for instance, keeps the colour of certain birds, when once acquired, true and constant; for if any one was produced with a colour different, say, from the usual hue of a Grouse, hawks would very easily observe it. A white Pigeon in a flock of blue Rocks has a greater chance of being struck by a hawk, and a white wild rabbit is perhaps a conspicuous lure for a fox.

Natural Selection always acts slowly, and its action depends on the occurrence in nature of certain places which can be better filled through some of the inhabitants of the country undergoing modification of one kind or other. The favoured races supersede those which are not modified, just as we see breeds of cattle and sheep and varieties of flowers taking the places of older and inferior kinds.

[Yet in this connection nothing is more remarkable than the persistence of the food-fishes in the ocean. For ages they have

been harassed by every nation bordering on the sea, and by each succeeding generation in an ever-increasing degree. Nevertheless, no serious diminution in their numbers has yet been proved, even though the great array of international workers have been striving to this end. Everything in their mode of reproduction and in their surroundings is so advantageous to their safety and endurance. No less striking is the fact that, though the pelagic eggs and sperms of several species commingle in the ocean, no crossing occurs.]

Pictet, the celebrated palæontologist, of Geneva, allows that species are not immutable in modern times, but demurs to having the principle much extended. The law of extinction of certain types is also admitted by most naturalists, though adverse to this theory of Darwin's. Professor Owen, for example, mentions a remarkable instance of gradual extinction in modern times in the case of the Great Auk, which has not been specially hunted down like the Dodo, but by degrees has become more and more scarce. The influence of man also not unfrequently causes extinction; thus the Dodo, a large bird allied to the Pigeons, once inhabiting the Mauritius, *Rhytina stelleri*, a kind of Manatee formerly abounding on the coasts at Behring's Strait, the Capercaillie* in Britain, and probably also the Irish Elk, are examples that have become extinct more or less through man's agency. Even now there are species whose numbers are daily diminishing under the same hand, viz. the Wapiti or Canadian Deer, the Ibex of the Alps, the Bearded Vulture, the Bison, Beaver, and Wild Turkey.

This "Natural Selection," say his opponents, rests on a purely conjectural basis. They bring forward the remarkable case of alternation of generation in *Campanularia*, which produces a bell-shaped Medusa or jelly-fish, from the eggs of which the hydroid stock arises, and ask in such a case, "Have the parent forms become extinct?" Cuvier also, while admitting variation, affirmed that the capacity to vary proceeds only to a certain point.

Admitting that structure, instinct, and habit vary, it may be asked, Why do they vary together and harmoniously instead of vaguely? The Darwinians allow they cannot tell. The

* Now reintroduced.

opponent goes on to illustrate his principle. Now suppose, for instance, the gills of an aquatic animal converted into lungs, while instinct compelled a continuance under water, would not drowning ensue? No doubt, answers the Darwinian; yet we see that young Frogs do not keep their heads under water after ceasing to be tadpoles. The case of the Climbing Perch (*Anabas scandens*) also seems adverse to Darwin's theory.

Darwin lays hold of the Lamarckian doctrine of use and disuse, and shows how certain birds (as the Apteryx and Ostrich) may have by Natural Selection lost the use of their wings as organs of flight. He further treats of the curious instances in which distinct species present analogous variations, and where a variety often assumes some of the characters of an allied species, or reverts to some of the characters of an early progenitor. This is seen in the tendencies of some domestic Pigeons to assume the bluish colour and characteristic marks of the original Rock-Pigeon. The whelp of the Lion sometimes presents stripes, and in like manner the young of the Puma, Tapir, and Wild Pig, and the young of the Blackbird are all speckled. He also illustrates this subject by referring to the occasional presence of stripes on the legs of the various species of the Horse genus (such as the Ass, Mule, Quagga), like those on the Zebra, or stripes on the shoulder, as in the Ass; and by comparing his examples with the analogous case of the domestic Pigeons he comes to the following conclusion:—"For myself, I venture confidently to look back thousands on thousands of generations, and I see an animal striped like a Zebra, but perhaps otherwise very differently constituted, the common parent of our domestic Horse (whether or not it be descended from one or more wild stocks), of the Ass, the Hemionus, Quagga, and Zebra."

He sees no difficulty in Natural Selection forming the expanded membrane of the Flying Lemurs and Squirrels, but he makes no mention of the Flying Dragon. The flank-membranes of the former are stretched out by the limbs, while the latter has its membrane on its ribs (six). So complex an organ as the eye is accounted for by this Natural Selection and gradual development. "In living bodies variation will cause slight alterations, generation will multiply them almost infinitely, and Natural Selection will pick out with unerring skill each im-

provement. Let this process," says Darwin, "go on for millions and millions of years, and during each year on millions of individuals of many kinds; may we not believe that a living optical instrument might be thus formed as superior to one of glass as the works of the Creator are to those of man?"

His opponents instance the case of the Trilobites, which occur in the lowest fossiliferous rocks, and show how complex their eyes are (each having from four hundred to six thousand facets), while the time for developing these intricate organs is supposed to be limited. [Now, however, this time has been greatly extended, even to five hundred millions of years as the age of the earth.]

Darwin observes that where the habits and structure of an animal are not in agreement, the apparent anomaly can only be explained by its struggle for existence, it having been beaten off its natural ground and forced to seek subsistence elsewhere. Thus it is why Grebes, Coots, and Waterhens, all eminently aquatic in their habits, have imperfectly webbed feet—indeed, the latter not at all; why the Landrail which closely resembles the Waterhen is almost as terrestrial as the Partridge. So when winter shuts out with its barriers of ice the *Mustela vison* (an animal much resembling an Otter), which all summer has preyed on fish by diving, it leaves the frozen water in its struggle for existence and preys, like a Polecat, on mice and land animals.*

Darwin cautions his objectors as to the fallacy of rashly concluding that this or that organ could not have been formed by transitional gradations of some kind, and adduces in support of his position the fact that the alimentary canal of the larva of the dragonfly and the fish *Cobites* (a kind of Loach) acts the part of a lung, stomach, and intestines. The Common Hydra may be turned inside out, and what before acted as skin now acts as stomach and the stomach acts as skin.† Again, it might be

* Change of habits is seen also in the Tyrant Flycatcher, hovering like a hawk and plunging into water for fishes; in the Black Bear, swimming on the surface of the water with widely open mouth catching insects like a Whale; and in the case of Baker and his German's Donkey, which, when hunting in the Basé Country, fed on the flesh of Antelopes, and throve exceedingly. In the same way the Zetlandic cattle acquire a fondness for dried fishes.

† This is now interpreted differently.

supposed that the head of the Vulture was made naked for the purpose of feeding on putrid flesh, yet the head of the clean-feeding Turkey is similarly naked. It might be held that the tail of the tadpole was given to it for swimming, yet the tadpoles of the Surinam Toads, which never enter the water, have a similar tail.

In treating of instinct he has to make remarkable admissions with regard to the slave-making ants. He accounts for the habits of the Cuckoo also by Natural Selection. The American Cuckoo builds a nest and sits on its eggs. Suppose that at one time the European Cuckoo had the same habit, but that occasionally it laid an egg in another bird's nest. If the old bird profited by this means and was enabled to migrate earlier, or the young birds were made more vigorous, then the old birds or young would gain an advantage. The young would be apt to follow by inheritance the habit of the parent, and lay eggs in other birds' nests, and so on by degrees until we have the present condition. This habit of laying eggs in other birds' nests is seen in the case of the Guinea-fowl depositing eggs in Partridges' nests, and Pheasants and Greyhens in each other's nests.

The want of evidence in ancient times of the fossil connecting links between Darwin's original species and their present descendants he lays solely at the door of the imperfection of the geological records. He affirms that it is only during subsidence of the sea-bottom that our great geological deposits rich in fossils have been formed. Moreover, he points out that we would not expect to find the missing links intermediate between any two given species, but between each and a common progenitor, *e. g.* the Pouter and Fantail are both derived from the Rock-Pigeon; if all the intermediate varieties existed there would be a close series between each and the Rock-Pigeon, but *none* intermediate between the Pouter and Fantail.

He shows how little of the surface of the world has been minutely explored for fossils, and how closely consecutive formations are related to each other in their fossil remains as compared with the formations more distant from each other in time. One of his supporters, in criticising Agassiz's views in regard to prophetic types (that is, the combination in an animal of structural peculiarities which at later periods are only observed

separately in different animals, *e.g.* Pterodactyles and birds—*Ichthyosauri* and *Cetacea**)—says that this is just what we would expect, for, to take the *Ichthyosauri*, for example, it is apparent that by Natural Selection and divergent variation they were resolved into common fishes and Saurian reptiles, the intermediate grades being extinguished in the struggle for existence which ensued between the various species.

[Poulton thinks that in the case of the large mammals preceding those which gave rise to the quadrupeds now upon the earth, the small brains of the former were conspicuous, and he thinks they were worsted by animals which were in other respects no better endowed. In the same way the gigantic reptiles of the Secondary Period were at a disadvantage with the mammals of the Tertiary. Moreover, that Natural Selection does not account for the beginning of things, and that therefore organs are formed by the modification of pre-existing organs.]

Darwin's drawing on the imperfection of the geological record is met by the objection that our only ground for prophesying what may come from such sources is by the analogy of what has come to light. It is known that the last *Ichthyosaurus* is hardly distinguishable from the first. The oldest Pterodactyle is as thorough and complete as the most recent. Moreover, no contrast can be more remarkable than the appearance of the various species of *Ichthyosaurus* in the marine strata of the chalk period, and the utter blank in reference to any form calculated to throw light on their origin.

[Prof. Haeckel, for the Darwinians, points out that physiologically Friedenthal has shown that the blood of man acts poisonously on and decomposes the blood of the lower Apes and other mammals, but has not that effect on the blood of the Anthropoid Apes. Selenka, again, demonstrated that certain

* Cetaceans resemble Ichthyosaurians in non-union of the majority of the ribs and sternum, in the peculiar articulation of the ribs with the vertebræ, in the remarkable sternum itself, in the chevron bones of the caudal region, late union of neural arches and bodies of vertebræ, long symphysis of mandible, in the teeth, and in the absence or rudimentary condition of the pelvis. Palæontology reveals transition forms between Cetacea and Sirenia. *Haliitherium*, again, links the Sirenia and hoofed animals.

peculiarities in the formation of the placenta deemed to be conclusively human are present in the Anthropoid Apes. Haeckel, indeed, asserts that the descent of man from extinct Tertiary Anthropoid Apes is proved as plainly as the descent of birds from reptiles, or the descent of reptiles from amphibians. The Neanderthal skull and the fossil Ape-man (*Pithecanthropus erectus*) from Java are unhesitatingly believed by Haeckel to be "the missing links."]

Undismayed by the difficulties presented by the geological record, Darwin goes on to account for the absence of ancestry to the occasionally complex fossils in the old Silurian rocks by hinting that perhaps we see in the granitic rocks the transformed strata long anterior to the Silurian epoch. Dr. Carpenter is of opinion that an important link is to be found in Eozoön, which he and its discoverers, Sir William Logan and Dr. Dawson, consider to be a gigantic Foraminifer. Careful observation by others, however, negative this view.

It is a well-known fact that a species which has been extinguished never reappears. The evolutionists ask with force—Why, on the hypothesis of independent creation, were the failing species not re-created in those regions so well adapted for their well-being? They assert, for instance, that no part of the world now offers more suitable conditions for Wild Horses than the Pampas and other plains of South America, a fact that is well enough proved by the facility with which they have run wild and multiplied enormously since their introduction by the Spaniards in comparatively recent times. Why, on the principle of original and direct adaptation of species to climate, were they not reproduced? Darwin's hypothesis alone, say they, gives the clue. The chain of direct descent was completely broken by the extinction of the first race of Horses.

In the most distant parts of the earth, again (such as North America, Tierra del Fuego, India, and the Cape of Good Hope), the organic remains in certain beds have a close resemblance to each other. Natural Selection, says Darwin, has caused this by gradually spreading the dominant forms of life throughout the successive strata.

Agassiz states that Darwin's whole chapter on the geological record appears to him as a series of illogical deductions and

misrepresentations of the modern results of the science. In vigorous language he portrays the beliefs which Darwin would have us entertain, and adds his view of the real state of the facts, *e. g.* : He (Darwin) would have us believe that each new species originated in consequence of some slight change in those that preceded, when every geological formation teems with types that did not exist before. He would have us believe that animals disappear gradually, when they are as common in the uppermost bed in which they occur as in the lowest or any intermediate bed. Species appear suddenly and disappear suddenly in successive strata. Agassiz also denies that the fossiliferous deposits took place during subsidence, and instances the whole of North America as being formed of beds that were deposited during successive upheavals.

[To-day the evolutionists bring forward a vast amount of evidence from every quarter of the globe in favour of descent with modification in almost every group in the animal kingdom. Nowhere have these views spread with greater acceptance than on the Continent of Europe, and especially in Germany, where Haeckel and Weismann in their several fields in zoology, and Strasburger in botany, have conspicuously laboured. In our own country the work of Huxley, Flower, Avebury, Galton, F. M. Balfour, Lankester, Romanes, Bateson, Weldon, Poulton, and many others have brought to light important facts which are of permanent value irrespective of their theoretical bearings.]

Some most interesting facts are given by Darwin and his supporters in expounding the geographical distribution of plants and animals, with regard to oceanic islands. The absence of terrestrial mammals and batrachians and the presence of bats is held as inexplicable on the theory of creation. Darwin also adverts to the fact that at St. Helena there is reason to believe that the naturalised plants and animals—that is, those imported by man—have nearly exterminated the native productions; and he taunts the defenders of the doctrine of the creation of each separate species in its most appropriate locality by saying that they will have to admit that a sufficient number of the best adapted plants and animals were not created on oceanic islands; for man has unintentionally stocked them from various sources

far more perfectly than did Nature. Sir Joseph Hooker, again, observes that no other theory explains so many of the facts connected with the distribution of plants in oceanic islands, of which he specially instances the Canaries, Azores, and St. Helena in the Atlantic, and Kerguelen in the South Indian Ocean.

In the five or six great plans on which the animal kingdom is constructed Darwin saw only the hidden bond of inheritance. Thus he explained the similarity of pattern in the hand of Man, in the flipper of Seal, and in the wing of Bat. It is hopeless to account for these by utility or the doctrine of final causes (Teleology), and Owen admits this. Darwin explained this by the Natural Selection of successive slight modifications, and showed that however much modified there would be no tendency to alter the framework of bones. Why, he asks, should similar bones have been created in the formation of the wing and leg of a Bat, used as they are for such totally different purposes; that a bird like a Thrush (Dipper) should have been created to dive and feed on subaquatic insects? Why should teeth have been created in young calves that never cut the gums, or in Guinea-pigs that shed them before they are born; and that teeth should be present in young Finner Whales when the adult animal is toothless?

On the contrary, with regard to classification his antagonists hold that from the beginning there could have been no community of origin between the several branches of the animal kingdom, since they are founded on different plans of structure, and so with the subordinate groups.

Darwin is charged with denying the existence of design in the material universe. In one chapter he says:—"If our reason bids us admire with enthusiasm a multitude of inimitable contrivances in Nature, this same reason tells us, though we may easily err on both sides, that some contrivances are less perfect. Can we consider the sting of the bee as perfect which, when used against many attacking animals, cannot be withdrawn, owing to its backward serratures, and so inevitably causes the death of the insect by tearing out its viscera?" This passage has been cited in accusing him of sneering at the designs of Providence, and in denying any agency beyond that of a blind

chance in the development or perfection of the organs or instincts of created beings. His followers say that the adoption of his theory would leave the doctrines of final causes, utility, and special design just where they were before.

Darwin made so much of the resemblance amongst the young of vertebrate animals that he thought it probable all the members in the four great classes, *viz.* Mammals, Birds, Reptiles, and Fishes, were the modified descendants of one ancient progenitor, which was furnished in its adult state with branchiæ, had a swim-bladder, four simple limbs, and a long tail fitted for aquatic life.

In regard to the resemblances between young animals, Agassiz states that the embryo of the American Freshwater Turtle and the embryo of the Snapping Turtle resemble one another far more than the different species of the former in their adult state; a young Snake resembles a young Turtle or a young bird much more than any two species of Snakes resemble one another; and yet not a single fact can be adduced to show that any one egg of an animal has ever produced an individual of any species but its own.

Dr. Asa Gray sums up that Darwin's theory, leaving man out of the question, very well accords with the great facts of zoology and comparative anatomy, or goes far to explain both the physiological and structural gradations and relations between the two kingdoms, and the arrangement of all their forms in groups subordinate to groups, all within a few great types; that it reads the riddle of undeveloped organs and of structural conformity, of which no other theory has offered a scientific explanation, and supplies a ground for harmonizing the two fundamental ideas which naturalists and philosophers conceive to have ruled the organic world, though they could not reconcile them, *viz.* *adaptation to purpose* and to *the conditions of existence*, and the Unity of Type. While the theory seems inadequate to the task it so boldly assumes, it must be remembered that the more important objections relate to questions on which we are confessedly ignorant. Those who imagine it can be easily refuted and cast aside must, he says, have imperfect or very prejudiced conceptions of the facts concerned and of the questions at issue.

The opponents of the Theory, on the other hand, while giving credit to Mr. Darwin for his great candour, logical skill, and his extensive knowledge of Natural History, say that he has not proved his case, *viz.* that species are mutable. One of them concludes with the statement which he says has never been impugned: "Classification is the work of science, but species the work of Nature."

[Such, then, is a brief outline of the *hypothesis* of Evolution as expounded by Mr. Darwin, and which has shed a new light on biological researches, and, on the other hand, of some of the antagonistic views. Evolution, as Prof. Allman tersely puts it, depends on two admitted faculties of living beings—*heredity*, or transmission of character from parent to offspring, and *adaptivity*, or the capacity of having these characters more or less modified.

This theory has met with wide acceptance, and is held by many to suggest a more satisfactory explanation of the main facts in zoology, botany, and geology than any other. Moreover, Darwin has enabled observers to extend the effect of known causes to cases in which they have not been suspected, and has given a fresh impulse to studies of the structure, development, and relationship of animals. The meaning of this will be more evident by reference to one or two examples. Thus in the Lower Eocene of North America is a small five-toed animal (*Phenacodus*), from which the ancestry of the Horse can be traced. In the same formation is another—*Eohippus*—of the size of a Fox, with four well-developed toes and a rudimentary fifth in front, and three toes behind. In the next higher division of the Eocene another—*Orohippus* (*Hyracotherium*)—of similar size appears, with four toes in front and three behind. Then a third (*Mesohippus*), the size of a Sheep, presents itself in the subsequent formation (Miocene), with three functional toes and the splint of another in front, and three behind. In a somewhat higher horizon *Miohippus* (*Onchitherium*) occurs with a similar structure, except that the splint-bone is reduced in size. *Protohippus* (*Hipparion*), of the size of a Donkey, again appears in the Pliocene above, and exhibits three toes in front and three behind. Further upward comes *Pliohippus*, a near ally of the Horse, with only a single functional toe to each foot, but differing in the structure

of the teeth. Lastly, the true Horse is found just above this horizon, and the series is complete. It appears therefore reasonable to conclude that this series of gradations is best explained by the theory of Evolution. In the same way Dr. Smith Woodward traces upward from small ancestors the gigantic Ground-Sloths and Armadillos of South America, in which the land area may have been more extensive—even perhaps connected with a great Antarctic continent which included Australia—a hypothesis supposed to be favoured by the finding of the large, extinct Horned Tortoise both in Queensland and Patagonia. Moreover, “strange Ungulates (Toxodontia, Typotheria, and Lipoterna), which in some respects resembled rodents, can also be traced in the same region from small progenitors to gigantic representatives. Some of the Lipoterna were one-toed, and were curious mimics of the Horse, of the northern hemisphere”

Further, the riddle of the occurrence of gills in the young of the Land Salamander of the Alps, which never enter the water and of course never use their temporary gills, as also the presence of gill-clefts in the young of the higher vertebrates, is surely fairly read by the supposition or theory that such have probably had aquatic ancestors.

The Zoëa-stage, again, in the young of the Shore-Crab points to a long-tailed progenitor; just as the birth of the young Flounder in a shape similar to that of a young Cod (and having an eye on each side) indicates theoretically a common ancestry, the turning of the eye to the other (coloured or upper) side being a subsequent adaptation to suit its ground-haunting habits.

Mr. Darwin and the evolutionists may fairly claim that their hypothesis embraces a greater number of phenomena and suggests a more satisfactory explanation of them than any other theory yet propounded. This much even those reared in the schools of Goodsir and Oken, Owen and St. Hilaire, must frankly admit, though, as shown by Prof. Cleland of Glasgow, they must, apart from all external influences, supplement the theory by a definite evolution of organization dependent on a definite cause. While the evolutionary theory explains the order and fitness of the organic beings on the surface of the earth, it does

not fully explain the vital properties, for instance, of living protoplasm, *viz.* the *heredity* and *adaptivity* of Prof. Allman, notwithstanding all the labours of Weismann and Semon. Haeckel, however, holds that all living plasm has a psychic life, but that the higher psychic functions, particularly the phenomena of consciousness, only appear gradually in the higher animals.

Prof. Francis Darwin, again, insists that the dim beginnings of habit or unconscious memory in the movements of plants and animals must have a place in morphology, and in his able and ingenious Presidential Address to the British Association he concludes by stating that the mnemonic hypothesis of Evolution makes the positive value of Natural Selection (which has been taunted with being a negative power) more obvious. There can be no doubt that memory goes far down in the animal scale.

Special difficulties present themselves to the investigators of complex groups, for example, the Polychæte Annelids and Starfishes. In the former it is hard to decipher the ways of natural or other selection in the marvellous general variety, yet individual fixity of structure in the bristles and hooks. For instance, in such forms as *Harmothoë*, not only do the bristles in front differ from those in the rear, but the dorsal and ventral divisions of each foot present a characteristic variation from the upper to the lower edge of each fascicle. Moreover, every member of each species shows precisely the same variation anteriorly and posteriorly, and from the dorsal to the ventral border of each division of the foot. Further, a single bristle or hook of almost every species of annelid retains its characteristic structure from generation to generation, so as to be a key to the species. Nevertheless, it occasionally happens that two forms come so near each other that it is hard to decide as to specific identity or difference.

In regard to the latter (Echinoderms), the younger Agassiz, confining his remarks for the moment to the Sea-urchins, stands aghast in calculating the possible combinations that can be produced by the modifications of ten of the most characteristic features. He is of opinion that the making of a genealogical tree is a hopeless task.

In conclusion, while difficulties in detail, the imperfection of the geological record, and perhaps the chase of a phantom which never can be seized, prevent the complete realization of the Evolutionary theory, there can be no doubt that it has given a great impetus to the study of the Natural Sciences. For this science is mainly indebted to the patient industry, the resolute endurance of physical delicacy, the philosophic caution, and the powerful intellect of Charles Darwin, who long before the appearance of the 'Origin of Species' was honoured and esteemed for various researches, including his works on the Cirripedes, on Coral Reefs, and on the Voyage of the 'Beagle.' His works bearing on Evolution since that date (1859) have spread his fame over the whole civilized world, and as a naturalist made his name imperishable.]

ROUGH NOTES ON DERBYSHIRE NATURAL HISTORY,
1906-1908.

BY THE REV. FRANCIS C. R. JOURDAIN, M.A., M.B.O.U., &c.

(Continued from vol. x. p. 142.)

OF late years I have contributed a series of Ornithological Notes to the 'Journal of the Derbyshire Archæological and Natural History Society,' and the present paper therefore contains a *résumé* of the more important occurrences therein recorded during the past three years, in addition to several records which have hitherto been overlooked.

MAMMALIA.

LESSER SHREW, *Sorex minutus*, L.—One found in a wood near Repton by Mr. T. Rumney in 1908. It has already been recorded from this district by Mr. Storer, but is evidently not common.

POLECAT, *Putorius putorius* (L.).—Mr. Rumney also found the remains of what appears to have been a Polecat near Repton. The last occurrence of this species in an undoubtedly wild state was at Bradley, near Ashburne, in 1900.

BADGER, *Meles meles* (L.).—On June 13th, 1907, I saw two half-grown Badgers at Osmaston, which had been taken from an earth in Shirley Park. Two were dug out of an earth at Sutton-on-the-Hill on Jan. 22nd, 1908. The male weighed twenty-six pounds.

OTTER, *Lutra lutra* (L.).—A female, forty-four inches long, was trapped on the Dove, near Okeover, towards the end of January, 1907.

AVES.

SONG-THRUSH, *Turdus musicus*, L.—A nest with the unusually large number of six eggs was found at Clifton on June 3rd, 1906.

BLACKBIRD, *T. merula*, L. — A remarkably early nest in a shrubbery at Mapleton contained young birds on March 6th, 1906. Clutches of six are not nearly so rare with this species as with the Thrush. Two were reported to me in 1906, one from Egginton and one from Clifton.

STONECHAT, *Pratincola rubicola* (L.). — A nest with five eggs, found by Mr. G. Pullen late in the summer of 1907, is the only recent record of the breeding of this species in the county.

NIGHTINGALE, *Daulias luscinia* (L.). — One reported by Messrs. R. Hall and W. Statham as singing for several nights at the end of April, 1907, in Matlock Dale. It then disappeared, but one was heard a few days later at Duffield. Last heard on May 13th. Mr. Walton also notes the occurrence of this bird near Derby in 1908 ('British Birds,' ii. p. 66).

COMMON WHITETHROAT, *Sylvia communis*, Lath. — On May 29th, 1907, I came across a nest with six eggs, the only one I have ever seen in Derbyshire, where the clutch varies from four to five as a rule.

CHIFFCHAFF, *Phylloscopus collybita* (Vieill.). — A single bird was noticed by the River Dove, near Ashburne, on March 10th, 1906, an early date even for this hardy little bird. Of late years it has become quite scarce in the south-west of the county, except in one or two favoured spots.

REED-WARBLE, *Acrocephalus streperus* (Vieill.). — The usual clutch of this species in the Trent Valley consists of four eggs, and sets of five are quite unusual, so that I was the more surprised to find a nest with six eggs in a small bush overhanging Sudbury Pond on June 20th, 1907.

GRASSHOPPER-WARBLE, *Locustella naevia* (Bodd.). — Mr. F. H. Sikes found two nests of this somewhat erratic visitor in 1907, one near Rocester, and the other near Beeston Tor, in the Manifold Valley. It is strange how this species varies in numbers from year to year, but on the whole it seems to be less numerous than ten years ago.

TREE-PIBIT, *Anthus trivialis* (L.). — On May 28th, 1907, I found a nest with five pale blue eggs, quite unmarked, and not unlike those of the Wheatear, but the bird was not on. On June 2nd I was astonished to find a Tree-Pipit sitting on the nest! Mr. D. Welburn has a clutch in which one or two of the

eggs approach this set in colour, but I do not know of any other instance of a clutch of unmarked blue eggs being found in England, although I believe a similar set has been once met with in Denmark (1898).

GREAT GREY SHRIKE, *Lanius excubitor*, L.—On Feb. 1st, 1907, I had a good view of a Great Grey Shrike, which got up from a hedgerow in front of us while motoring near Bradbourne. Its flight was weak, and it seemed unable to gain upon the car, and finally turned aside to some isolated thorn-bushes in a field, but would not allow itself to be approached again.

RED-BACKED SHRIKE, *L. collurio*, L.—Mr. T. Rumney reports a pair as breeding near Repton in 1908. They have now quite ceased to nest on the hillsides near the entrance to Dovedale.

PIED FLYCATCHER, *Muscicapa atricapilla*, L.—A male, on migration, seen by me between Clifton and Norbury on May 1st, 1908. The only other bird of this species I have seen in this district was also a cock, at Ashburne, on May 14th, 1887, but it is occasionally noticed on passage both in the Dove and Derwent Valleys. Probably the inconspicuous plumage of the hen causes it to be overlooked.

HOUSE-MARTIN, *Chelidon urbica* (L.).—Several House-Martins' nests may be seen annually, built on the beams *inside* an open shed, and underneath the roofing, instead of on an outside wall, as is usually the case, at the 'Dog and Partridge Hotel,' Thorpe. Unlike the Swallows' nests in similar sites, the entrance of the nest is at the side, and the nest is not open at the top.

GREENFINCH, *Chloris chloris* (L.).—A nest with the unusually large number of seven eggs was found in a hedgerow at Ashburne on June 9th, 1906.

CROSSBILL, *Loxia curvirostra* (L.).—A flock visited the Ashburne district in the early spring of 1904, and two were shot at Yeldersley on Feb. 24th and 26th.

SWIFT, *Apus apus*, L.—In 1908 the main body of Swifts left the Ashburne district on Aug. 9th–10th, but on Aug. 25th a party of eight birds was noticed by Mr. J. Henderson at Mapleton, and at intervals three or four birds were constantly seen in the Dove Valley till Sept. 1st, when only a single bird was noticed, as was also the case on Sept. 4th and 5th. On Sept. 14th Mr. J. Henderson saw one at Mapleton in the morning,

and both he and I distinctly saw another (or the same bird) at Ashburne in the afternoon of the same day. Previous latest records:—Sept. 1st, 1885; Sept. 4th, 1887 (one); and Sept. 3rd, 1905 (one).

NIGHTJAR, *Caprimulgus europæus*, L. — Mr. G. Pullen found these birds breeding on Breadsall Moor in 1906 and 1907, and Mr. C. H. Wells found a nest with two eggs in a fir-wood near Ambergate on June 8th, 1908.

CUCKOO, *Cuculus canorus*, L.—Mr. T. Rumney informs me that a Cuckoo's egg was found in a Willow-Warbler's nest at Repton in 1908. Though not an uncommon foster-parent, I have no previous record of this species for the county.

TAWNY OWL, *Syrnium aluco* (L.). — Mr. C. H. Wells found a Tawny Owl incubating three eggs on a ledge of rocky cliff in Dovedale on April 17th, 1908. One of the eggs was not covered, and showed up, white and conspicuous. A second nest found by Mr. Wells not far from Ambergate was in a similar situation, but contained only one egg on April 19th, though three more were subsequently laid. All the other nests found in this district (where the Tawny Owl is by no means uncommon) have been placed either in holes of trees or on rude platforms naturally formed by the accumulation of rubbish between boughs, or in old Rooks' nests. Four eggs is also an unusually large clutch for a Derbyshire bird, but a nest found at Mapleton on March 26th, 1908, also contained this number.

LITTLE OWL, *Athene noctua* (Scop.). — One clearly identified by Messrs. H. G. and A. G. Tomlinson while sitting in a privet-bush in a wood close to Mr. Tomlinson's house at Burton-on-Trent on Nov. 5th, 1906.

ROUGH-LEGGED BUZZARD, *Buteo lagopus* (Gm.). — One seen at Ashford-in-the-Water, Feb. 13th, 1907 (W. Boulsover).

HONEY-BUZZARD, *Pernis apivorus* (L.). — A considerable immigration of these fine birds must have taken place in the autumn of 1908. A "Golden Eagle" was reported in the local papers to have been seen near Dovedale on Aug. 22nd, while on Sept. 2nd Mr. J. Henderson, Jun., caught a glimpse of two Buzzards (sp. ?) soaring near Ashburne, and on Sept. 10th a very dark Honey-Buzzard was received for preservation at Ashburne, which had been shot at Osmaston, probably on the

previous day. Numerous other specimens have been recorded in 'The Zoologist,' 'British Birds,' 'The Naturalist,' &c., as having been shot in various parts of England, Wales, and Ireland.

HOBBY, *Falco subbuteo*, L. — One shot at Sudbury in June, 1906, by the keeper.

PEREGRINE FALCON, *F. peregrinus*, Tunst. — One reported as having been shot at Biggin by Mr. Bosley on Aug. 31st, 1901. Another seen by Mr. J. Henderson near Newhaven on Sept. 30th, 1908.

MERLIN, *F. aesalon*, Tunst. — Three nests of this beautiful little Falcon were taken by keepers on the North Derbyshire moors in the spring of 1908. It is wonderful that this bird should still exist in spite of the unremitting persecution to which it is subjected.

WILD GEESE, *Anser* sp. ? — A "gaggle" of eighteen Wild Geese was seen by Mr. G. Pullen on Jan. 12th, 1908, but the weather was too misty to identify the species. On Dec. 18th another flock passed over Hanging Bridge in V-formation, while during the previous week a smaller party of about eight birds alighted in the meadows by the River Dove. These were certainly "Grey" Geese of some species.

[EGYPTIAN GOOSE, *Chenalopex aegyptica*. — One shot on a pool near Staveley in the spring of 1906 (Canon Molineux).]

WHOOPEE, *Cygnus musicus*, Bechst. — Three seen near the River Dove (Hanging Bridge) on March 28th, 1906, and five seen flying down the Henmore Valley on April 2nd, two of which alighted at Birdsgrove, while the other three went on to Calwich. Mr. Henderson and I both identified these birds as Whoopers.

BEWICK'S SWAN, *C. bewicki*, Yarr. — Three passed close overhead on Feb. 6th, 1907, flying up the Dove Valley, between Clifton and Mayfield.

POCHARD, *Fuligula ferina* (L.). — A fine drake, strong on the wing, seen on the ponds at Osmaston, on June 13th, 1906. It is quite possible that this bird may have been breeding at the time. Mr. Storrs-Fox records two Pochards seen on Ashford Lake, near Bakewell, on Jan. 27th, 1907. He had only once before seen a Pochard here. On March 27th, 1908, I saw two couple of these Ducks on the lake at Calwich Abbey.

TUFTED DUCK, *F. fuligula* (L.). — On one of the islets at Osmaston I flushed a Tufted Duck from a nest, or rather heap of eggs, which were obviously the produce of three or more birds. Altogether there were twenty-eight eggs in the nest, but the bulk of them were quite cold.

COMMON SCOTER, *Ædemia nigra* (L.). — One seen on the wing near Ashburne by Mr. G. M. Bond on Jan. 19th, 1906. This may have been a pricked bird, for a "Black Duck," unable to fly, was reported to me from a stream in the neighbourhood. A drake had been shot within a mile of the spot on Nov. 4th, 1904.

PALLAS'S SAND GROUSE, *Syrnhartes paradoxus* (Pall.). — I find that the two examples of this species which are stated in Whitlock's 'Birds of Derbyshire,' p. 184, to have been killed in July, 1889, were really shot in June, 1888.

QUAIL, *Coturnix coturnix* (L.). — One caught at Chaddesden on June 20th, 1908 (G. Pullen).

TURNSTONE, *Streptilas interpres* (L.). — This is an addition to our county list, as no definite occurrence has hitherto been recorded, although there is little doubt that it has occurred in the Trent Valley. Three were killed during the night of June 1st, 1906, near Longcliffe. One of these was sent to Mr. Adsetts for preservation, and has now passed into the Calke Abbey collection.

OYSTERCATCHER, *Hæmatopus ostralegus*, L. — One shot on March 16th, 1900, at Parwich by Mr. Naylor.

GREY PHALAROPE, *Phalaropus fulicarius* (L.). — One shot some time between Dec. 15th and 17th, 1906, on a small pond not far from Winster, by Mr. G. Wood. It is now in the possession of the Rev. J. R. Ashworth, of Hartington, and is the eighth specimen definitely recorded for the county.

GREEN SANDPIPER, *Totanus ochropus* (L.). — One flushed from the side of the upper pond at Osmaston on July 10th, 1908.

WHIMBREL, *Numenius phæopus* (L.). — One shot at Parwich on May 19th, 1906, by a keeper named Brownlee.

BLACK TERN, *Hydrochelidon nigra* (L.). — One shot at Aston Hall, and sent to Mr. Adsetts for preservation on Aug. 27th, 1908.

BLACK-HEADED GULL, *Larus ridibundus*, L. — Two seen at Bakewell by Mr. W. Boulsover on May 23rd, 1907, and nine on

the following day on Calton pastures (a late date for this species). Mr. A. Cox also records this bird in winter plumage from Spondon in March, 1908.

HERRING-GULL, *L. argentatus*, Gmel.—One seen at Derby on April 13th, 1908 (A. Cox).

LESSER BLACK-BACKED GULL, *L. fuscus*, L.—A flock of fifteen flew over Clifton on Aug. 11th, 1907, and, curiously enough, on Aug. 11th, 1908, about twelve were again seen near Clifton, and on the following day I again saw eight large Gulls in the distance, which were either this or the preceding species.

LITTLE AUK, *Mergulus alle* (L.).—One was picked up dead on the ice at Sudbury Pond on Nov. 29th, 1904, by Mr. J. Bottrell, who has the bird still in his possession.

GREAT CRESTED GREBE, *Podiceps cristatus* (L.). — Two pairs of these fine birds breed annually on the ponds at Osmaston, and in 1907 a pair bred for the first time on the pond at Yeldersley. A pair or two also nest at Sudbury.

MANX SHEARWATER, *Puffinus anglorum* (Temm.). — One was captured alive in a bakehouse at Alvaston, near Derby, after the gale of Sept. 8th, 1908, where it had taken refuge. This is the thirteenth record of this species for the county, and it is interesting to note that in almost every case of which we have details the bird was obtained on the September migration.

NOTES AND QUERIES.

AVES.

The Reported Great Bustard in Yorkshire.—In 'The Zoologist' (*ante*, p. 78) it is stated by Mr. Morley, under the head of "Ornithological Notes from Scarborough," that a *Great Bustard* had been shot near Cloughton last December. Some of the feathers of the bird were sent to me, and it was easy to see that it had been no Bustard but a female *Silver Pheasant*. Although I had no doubt myself on the subject, I sent on the feathers to the Natural History Museum, where my opinion was confirmed. I saw a letter from Mr. Bennett, in which he spoke of the legs and feet and the space round the eye being of a bright red.—W. H. ST. QUINTIN (Scampston Hall, Rillington, York).

Nottinghamshire Bird Notes.—The following recent occurrences in the county of Nottingham are of sufficient interest to be placed on record:—

GREAT SPOTTED WOODPECKER (*Dendrocopus major*).—One specimen at Calverton, March, 1908.

TAWNY OWL (*Syrnium aluco*).—One at Eastwood, December, 1907.

LITTLE OWL (*Athene noctua*).—One at Widmerpool, Dec. 10th, March, 1907; one in the Trent meadows opposite Clifton Grove, 14th, 1908.

ROUGH-LEGGED BUZZARD (*Buteo lagopus*).—One shot near Bingham, 1907.

PINK-FOOTED GOOSE (*Anser brachyrhynchus*).—A pair were shot in the meadows by the Trent at Gunthorpe on Dec. 26th, 1907. There is only one previous record of the occurrence of this rare bird in the county.

SHOVELER DUCK (*Spatula clypeata*).—One on the pool near Trent Bridge, Nottingham, August, 1908.

RUFF (*Machetes pugnax*).—One shot at Colwick, December, 1907.

BAR-TAILED GODWIT (*Limosa lapponica*).—One at Hoveringham, on the Trent, Jan. 2nd, 1909.

All these specimens have been acquired for the local collection of birds in the Natural History Museum at University College, Nottingham.—J. W. CARR (University College, Nottingham).

PISCES.

Trachinotus ovatus an Enemy to the Queensland Oyster Fisheries. One of the Blue Books recently received from the Colony of Queensland gives particulars of the Oyster fisheries in Moreton Bay, which supply the city of Brisbane. The cultivation of the Oyster-banks, by thinning out the tops of the reefs and by culling out clumps, is proceeding apace. The banks have been much benefited by the regular rains which have visited Queensland and the bays and estuaries. The fishing in Moreton Bay during the year has been highly satisfactory. Mullet is to be got at all times in the bays, rivers, and inlets, while from Moreton Bay large supplies of Whiting, Taylor, Gar, Bream, and other kinds have been drawn. Owing to the increasing number of Sharks infesting the Bay, it is suggested that a bonus be given per gallon on Shark-oil, and a bonus per ton on fertilizer made from the carcasses. Dugong fishing has been going on briskly. Fish and Prawns have been very plentiful off the coast, and the Queensland authorities are hopeful that the representatives of the Scottish fishermen who recently visited Australia, and who are negotiating for an Australian fishing centre, will settle on the Queensland coast.

The Oyster fisheries have been attacked lately by "a peculiar kind of fish, which works in droves, and crushes the shell of the young Oysters with little apparent effort." The Report continues:—"These fish I have seen working, but they are very shy, and it seems almost impossible to catch them. In appearance they resemble the 'big green Toad,' with similar jaws, and run to as much as three feet six inches in length, with a peculiar feathery top to the tail; they work in rows, and will cut a track through a bank of young Oysters, leaving the white broken shell looking as if a steam-roller had passed over it. To prevent this the lessee went to the expense of fencing in about ninety acres with galvanized wire-netting, which plan, he informs me, has proved very successful." A specimen of this fish has at length been captured, and has been found to be a large sample of the species known as *Trachinotus ovatus*, or, to coin a vernacular name, the "Snub-nosed Swallow-tail." The genus inhabits the inter-tropical seas of both hemispheres.—THE LONDON CORRESPONDENT OF THE 'NORTH QUEENSLAND HERALD' (Bassishaw House, Basinghall Street, E.C.).

[The food of *Trachinotus carolinus* "seems to consist very largely of small bivalve shells," &c. (Investig. Aquat. Resources and Fisheries

of Porto Rico; Washington, 1900, p. 140). In Texan waters "the Oyster has but few enemies, the Drumfish* being the only one dreaded" (Proc. Nat. Fish. Congr. Florida, 1898, p. 314).—ED.]

O B I T U A R Y.

CHARLES BERRY.

ALTHOUGH little known, save by West of Scotland naturalists and geologists, Charles Berry, who died Feb. 1st, 1909, is well worthy of some brief commemoration in the pages of 'The Zoologist.' Destined to spend fifty-three years of his life in the small and secluded village of Lendalfoot on the Ayrshire coast, engaged in the arduous occupation of a sea-fisherman, he "found himself" in quiet, patient, and continuous natural history observations and pursuits, winning a well-deserved reputation for first-hand local knowledge and accuracy. Perhaps the proximity to Lendalfoot of the great bird-station of Ailsa Craig had some effect in making ornithology his favourite pursuit. His information was always at the disposal of inquirers, and year after year his observations and returns were amongst the most valuable included in Mr. John Paterson's "Reports on Scottish Ornithology," published in the 'Annals of Scottish Natural History.'

So far as writing is concerned, he was, however, of the "mute, inglorious" class, and it is only now, at the time of his death, that ornithologists in general have the opportunity of learning something of his work. In the 'Glasgow Naturalist' (the new journal of the Natural History Society of Glasgow, issued last month—February), an article by him on the "Birds of Lendalfoot" appears (pp. 5-23), the only writing of his ever published, I believe. It is one of the most remarkable examples of purely personal and strictly local ornithological work ever done, confined as it is to a four-mile radius and the adjoining waters, and, as the writer says, "I thought it better not to add a single bird but those I have myself seen and in most cases handled." In these circumstances, to be able to enumerate one hundred and sixty-two species, ninety-five of which nest (including the Ailsa Craig records), shows that Mr. Berry came very near making the utmost possible out of his opportunities. Unfortunately he did not live to see his work in print, but it has secured his position and repute high amongst Scottish local ornithologists.—H. B. W.

* *Pogonias cromis*?

NOTICES OF NEW BOOKS.

A Treatise on Zoology. Edited by Sir RAY LANKESTER, M.A., LL.D., F.R.S., &c. Part I. Introduction and Protozoa. First Fascicle by S. J. HICKSON, F.R.S., J. J. LISTER, F.R.S., F. W. GAMBLE, D.Sc., &c., A. WILLEY, M.A., D.Sc., &c., H. M. WOODCOCK, D.Sc., the late W. F. R. WELDON, F.R.S., and E. RAY LANKESTER, K.C.B., &c.

THIS volume contains the first fascicle of part i., and is just published; the second fascicle appeared in 1903, and was then reviewed in these pages. The two fascicles fully bear out the claim made for them by their Editor, that they "give a more complete account of the Protozoa than is to be found in any similar work hitherto published."

To the ordinary biologist and evolutionist this volume is of the greatest importance, for in the Introduction Sir Ray Lankester discusses "The Dividing-line between Plants and Animals." For the main difference we are directed to the fact that "animals are unable to assimilate—that is, to utilise as food the simpler chemical compounds of carbon or of nitrogen. They can only take their nitrogen from food which is in the elaborate form of combination which is called a proteid; they can only take their carbon either from a proteid or from a carbohydrate or a hydrocarbon." "Plants, on the contrary, are (with certain exceptions) able to take up as food the compounds of carbon and of nitrogen, which may be called the stable or resting condition of those elements—namely, the simple oxide of carbon—carbonic acid gas, and the simple compound of nitrogen and hydrogen which is called ammonia, or the oxide of nitrogen which forms nitrates." "The obvious and predominant difference in the make and habit of plants as compared with animals is thus connected with the very great and definite difference in the nature of the food of the two groups." The debatable ground is limited to the chlorophyll-forming Flagellata, including some for which "it is not possible to draw a sharp line and assign them

definitely either to the Animal or to the Plant series." This question, which lies on the very bedrock of biology, is not only very fully discussed, but is enunciated by an authority whose judgment on such questions should be *nulli secundus*.

Our space precludes reference to the many separate contributions by the different authors who have produced this volume, but sometimes a particular subject is focussed in biological consideration, and eventually filters through the press to the "man in the street." Such is the topic of minute animal parasites which are admittedly negotiators in disease, and readers who would desire to have an adequate idea of this terrible animal organization—worse than the army and navy of a competitive nation, more to be feared and less easily conquered—may be directed to Dr. Woodcock's chapter on "The Haemoflagellates or Trypanosomes, to which is attached [a gift to Zoologists] a List of known (Natural) Hosts of Trypanosomes and Allied Forms." This, with the literature relating to these creatures, brings the subject up to date, and is a timely and valuable contribution.

The Life of Philibert Commerson, D.M., Naturaliste du Roi; an Old-World Story of French Travel and Science in the Days of Linnæus. By the late Capt. S. PASFIELD OLIVER, R.A., and edited by G. F. SCOTT ELLIOT, F.L.S., &c. John Murray.

CAPT. OLIVER did not live to publish his book; he, however, before his death handed over all his material to Mr. Scott Elliot, who has worthily completed the task, and taken us back to the early days of modern zoology.

Commerson was a botanist first and an ichthyologist to a somewhat less degree, while his life's work centres round the well-remembered voyage of De Bougainville, whom he accompanied as naturalist, though in the second vessel of the expedition. He died at the age of forty-six years, on the Island of Bourbon, thus not returning to France, where he was assured of much honour, as eight days after his death (1773) he was, in Paris, elected a member of the Academy of France by a unanimous vote in a full assembly, and at the same time the Cordon of the Order of St. Michael was conferred upon him, appreciations of which he was destined to remain in ignorance. In these old days before

the advent of steam-power, much more was found to interest a naturalist on board a sailing-vessel—with the greater expanse of ocean covered by her erratic wind-dependent course, and the opportunities afforded by calms—than is experienced nowadays on the straight high roads of the ever-speeding liners; and those of us who have made an early voyage under sail can well realize the altered conditions which so greatly limit the observations of a travelling zoologist. A curious proposition was enunciated by Commerson in relation to the shoals of *Scomber* which followed his vessel: “The surface of the sea, exposed to the glare and fierce heat of the tropical sun, becomes disagreeable to them, so they seek the neighbourhood of a high coast-line, where, under lofty rocks and promontories, they can play and gambol in full shelter.” This suggested the shelter they find on the shady side of vessels, and may thus account for much of their presence in some latitudes.

The results of Commerson’s collecting on this voyage were prodigious; the work he loved gave him no rest, wore him out, and practically caused his early death. His achievements in botany are well known to all followers of that science, and in that he excelled. As regards his other discoveries, we may use the valuation of Mr. Scott Elliot:—“As a geologist, the value of his mineralogical specimens and his account of the Bourbon volcanoes have been justly acknowledged by Bory de Saint-Vincent. M. Duméril discovered his collections and drawings of fishes still unpacked in an attic of Buffon’s house. These form a very large and valuable proportion of Lacépède’s ‘Histoire Naturelle’ (published in 1801). His manuscripts on the mammalia of Madagascar and the Mascarenes were unearthed in the library of M. Hermans at Strasbourg, and freely used by Cuvier, who also generously acknowledges his indebtedness.”

Commerson was reared in a country and in an age when dreams of a noble savage and the freedom and moral excellence of primitive races were being freely propagated. His estimate of his “dear Tahitians” and his argument as to “What constitutes robbery?” may probably meet the views of some extreme thinkers of to-day. He was a born naturalist and a self-made martyr to natural science; his economical views would have gained the approval of Rousseau, but his great contributions to

botany and zoology should not, and never will be, forgotten while those sciences are studied, and the thanks of all are due to Mr. Scott Elliot for giving us an excellent sketch of the naturalist and his environment.

Catalogue of the Noctuidæ in the Collection of the British Museum.
By Sir GEORGE F. HAMPSON, Bart. Published by the Trustees of the British Museum.

THIS is vol. vii. of the author's great monograph of the moths of the world, and is another instalment to a knowledge of the *Noctuidæ*, and relates to the large subfamily *Acronyctinæ*, which comprises some three thousand species belonging to over three hundred genera, and are calculated to occupy three volumes of the Catalogue. As we are told that the manuscript dealing with the remainder of the subfamily is ready for press and will be issued in two volumes probably in 1909, we must congratulate Sir George Hampson on his energy and determination, for to produce a single volume is no light task, the present one occupying no fewer than seven hundred and nine pages.

With the large amount of material at hand, the habitats or localization of the species is most extensive, so that we have here the facts for the study of the geographical distribution of the *Noctuidæ*. To those writers who conclude that a fairly wide separation in latitude and longitude must also denote specific difference, the tabulated distribution of some of these moths will appear as a disturbing element for consideration.

Thus, to take a single species, *Perigea capensis*: this insect is described as common to the Ethiopian region, including Madagascar and Mauritius; by Egypt and Sokotra distributed throughout British India and the Malay Archipelago; recorded from the Solomon, Marshall, and Fiji Islands; and found in Queensland. In the synonymy we are not surprised to find that it has been described under different names no fewer than fourteen times! And this is not a unique example to be found in these pages. We also have a thorough generic revision, with keys to the genera, and also to the species when the genera are sufficiently extensive to require that aid, with numerous blocks in the text to illustrate the structural characters and

general appearance, accompanied by a further instalment of coloured plates, which now reach the respectable figure of one hundred and twenty-two. Sir G. Hampson is writing a monumental series of volumes the contents of which will take long to grow old.

EDITORIAL GLEANINGS.

THE 'Evening News' recently sent a special correspondent to Darwin's village, and from his report we extract the following statement that should be preserved:—I had been told to look up Mr. John Lewis in the village, who used to do all the carpentry and joining work for the house. I found him in his cottage, a short hale man with white hair and beard and a rare smile. "I hear you are quite an old friend of Mr. Darwin's." He straightened himself at once. "I went to him sixty years ago as a page for two years. I was fifteen then. Now I am seventy-five. I made Mr. Darwin's coffin" (this with a look of important affairs). "They buried him in Westminster Abbey, but he always wanted to lie here, and I don't think he'd have liked it. I made his coffin just as he wanted it; all rough, just as it left the bench, no polish, no nothin'. But when they agreed to send him to Westminster they had to get another undertaker. And my coffin wasn't wanted, and they sent it back. This other one you could see to shave in. I kept the coffin by me a long time. I thought I might sell it. I got several bids of fifty poun', but didn't part with it. One gentleman I told about it said, 'Ask two hundred, you'll get it easy.' But I never did. I can show you letters from America and Germany about it." "What became of the coffin?" I asked, "I sold it for ten pounds to a young chap that kept a beerhouse out at Farnborough. He's dead since then." I gathered that the coffin is still in the "beerhouse." "Darwin laid in that coffin thirty-one and a half hours exactly. I put him in myself."—*Evening News*, Feb. 12th, 1909.

A REMARKABLE case claimed the attention of the medical staff at the West Norfolk and Lynn Hospital on Sunday. A twelve-months'-old infant named West, whose parents reside in Attoe's Yard, Norfolk Street, Lynn, was received into the institution suffering from severe wounds, as a result of being attacked by rats as it lay in bed. Portions of the child's feet were eaten away by the animals, and the infant was also bitten about the face, arms, and body.—*East Anglian Daily Times*, Jan. 26th, 1909.





Illustration by J. W. Wainwright (Sialia mexicanus)

THE ZOOLOGIST

No. 814.—April, 1909.

ORNITHOLOGICAL REPORT FOR NORFOLK (1908).

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

(PLATE II.)

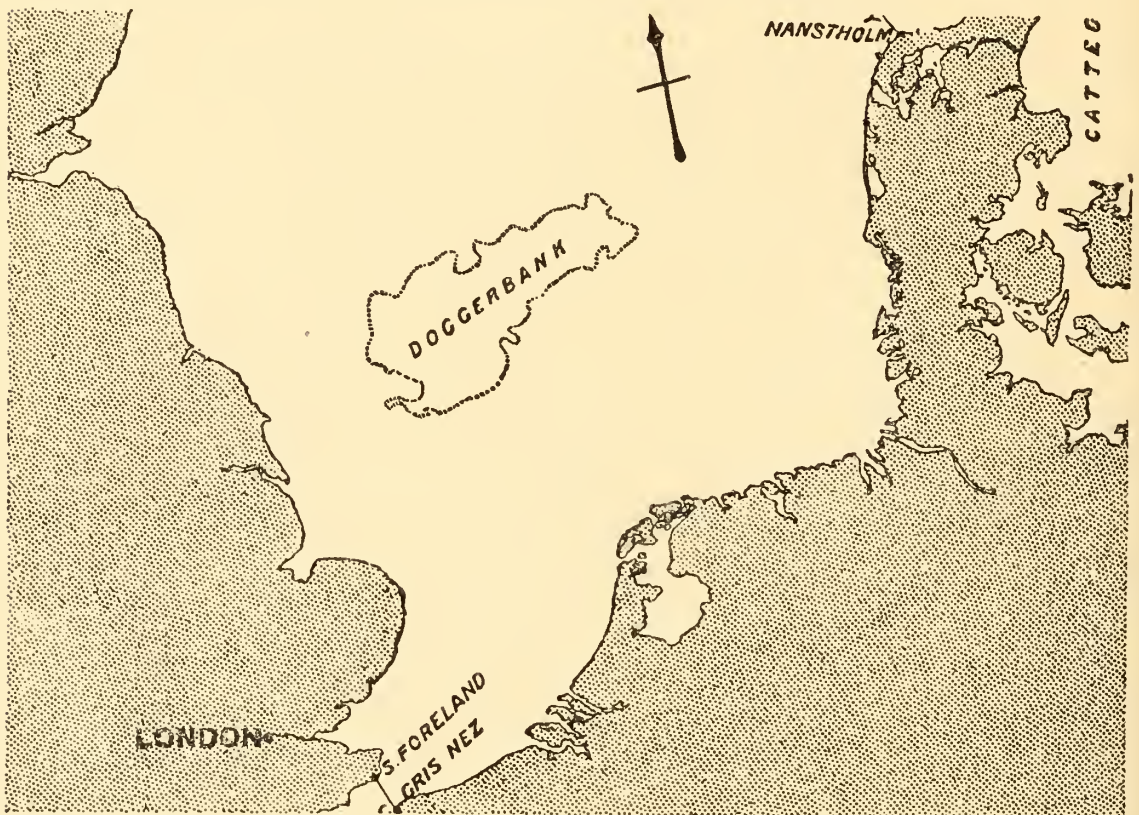
THANKS to the Rev. M. C. H. Bird and other correspondents there is again a liberal budget of Notes from which to compile a Report for 'The Zoologist,' and, as usual, the subject of migration comes to the front; this will always apply to the East Coast, and to Norfolk in particular, where the advent of our oversea migrants attracts so much attention. As a rule these autumnal birds probably leave the Continent of Europe after dusk, *i. e.* between 7 p.m. and 11 p.m., and if they have a wind behind them they fly very rapidly, we may be sure. If these migrants start from Holland it may be only a transit for them of four or five hours, if from Denmark nine or ten, if from the south of Norway about twelve. This is crediting them with the power of flying forty miles an hour, which, with a favourable wind, I feel sure they would do.

The map (p. 122) shows comparatively, how short is the distance from the Continent to England, and how easy it must be to birds in fine weather to effect the passage.

What delays migratory birds and makes their journey from the east a long and often dangerous one are mist, rain, headwinds, and unsettled weather generally. Yet these are the conditions under which we repeatedly find them on the coast of

Norfolk, for it is such weather which, by retarding their passing on, brings them under the cognizance of Norfolk naturalists.

The Vernal Migration.—Many persons remarked on the scarcity of Nightingales during the summer; Spotted Flycatchers also, Willow-Wrens, and every kind of Warbler were far short of their usual numbers, Whitethroats were not to be seen, and the deficiency in Reed- and Sedge-Warblers was pointed out to Mr. Bird on the Broads. Something must have befallen them, and in all probability the cause was the snow which fell on April 23rd, and which, although not so deep in Norfolk as in



MAP OF THE DOGGER BANK.

many counties, began to freeze again while it was still melting, and the next morning greenhouses exhibited rows of icicles.

The Autumnal Migration.—There were three features in the autumn migration which call for remark, firstly, the great numbers of Redstarts on Sept. 23rd—but these were concentrated on a small area; secondly, the wave of Rooks, Crows, and Starlings on Oct. 18th and 19th; and, thirdly, the abundance of Woodcocks, which also occurred in many other counties, and the chief part of which, as usual, did not arrive until December. It is inter-

esting to compare our migration notes with those kept by Mr. J. L. Bonhote, on the opposite side of the North Sea, between Sept. 15th and Oct. 10th (see 'Ornis,' 1909, p. 162). Mr. Bonhote's station was on Texel Island, on the north coast of Holland, but on the whole there is less agreement between our Norfolk observations and those kept by him than might be expected. His first observations on the Starling are "large immigrations took place between Sept. 20th and 22nd," but not many of them came to Norfolk. It is true that, rising early on the 20th, I noted, at 5.30 a.m., the presence of several Starlings, which I concluded had come in during the night, and at 8 a.m. I rode down to the cliff, but could not see any more coming in, nor in the afternoon, when the wind had got up and was S.S.E. Again, Mr. Bonhote's October dates of immigrations of Starlings to the Dutch coast do not fit in with ours very well, but his dates for the Redstarts do, the large increase noticed on Sept. 24th coinciding with the rush between Wells and Cromer on Sept. 23rd and 24th. But the greatest discrepancy, and one which is very suggestive, is in the case of the House-Martin, which was so very abundant in Norfolk, and of which Mr. Bonhote only saw one individual, thus indicating that Martins follow the west coast-line of the North Sea and not the east when they go south. His remarks on the Bar-tailed Godwit show, although dates do not quite coincide, that these birds were just as abundant in Holland as upon our East Coast, for on Sept. 15th and 16th, Mr. Bonhote tells us, enormous numbers were present, but most of them left on the 17th, by which time they had diminished in Norfolk. There was nothing in Norfolk to coincide with the incredible numbers of Oystercatchers and Great Black-backed Gulls seen by him; indeed, the latter is always rare with us in comparison with the Lesser Black-backed Gull.

Diphtheria in Wood-Pigeons.—The diphtheric affection which decimated the Wood-Pigeons in some counties did not manifest itself so largely in Norfolk as elsewhere, but not a few were picked up by gamekeepers during January, February, and March. Two or three which came under examination had their mouths more or less blocked up with a viscid yellow substance, which was enough to prevent their feeding, if it did not in time kill them by suffocation. The disease, fortunately, does not appear to be

very communicable to other birds,* and no Pheasants that I am aware of took it in this part of England.

New Norfolk Species.—The county is credited with two new birds. A Little Bunting (*Emberiza pusilla*, Pall.), an Asiatic species which seems to be spreading westwards, was killed in October, and was sent to Mr. H. F. Witherby, and by him exhibited at a meeting of the Ornithologists' Club. Its small size sufficiently distinguishes it from the other Buntings, as well as the brown colour of the sides of the head. The other species is Baird's Sandpiper, *Tringa bairdi* (Coues), which was shot at Hunstanton on Sept. 16th, 1903, a month which, on referring to 'The Zoologist,' will be seen to have witnessed a great East Coast immigration (cf. Zool. 1904, p. 209). This rarity, which was not recorded at the time, and has only been recently brought to the knowledge of Norfolk naturalists, was received on the 19th by Mr. George Bristow, taxidermist, St. Leonards, and examined while still in the flesh by Mr. M. J. Nicoll, himself the shooter of the first British *T. bairdi* ('British Birds,' i. p. 15), and it has since passed into Sir Vauncey Crewe's collection at Calke Abbey. This Sandpiper is closely allied to Bonaparte's Sandpiper (*T. fuscicollis*), but is slightly larger, and its ash-grey colour is not so uniform in winter, and there is rather less white on the upper tail-coverts. These two additions bring the Norfolk list up to three hundred and eighteen, only seven short of Mr. Nelson's total for Yorkshire.

The rainfall for 1908 was 24·31 in.

JANUARY.

1st.—The New Year began with the arrival of two Pintails on a protected pond at Marsham (Miss Buxton), a Gadwall (W. Lowne), and some other commoner fowl. On the 5th Mr. B. Dye notes three Tufted Ducks, and on the 6th twenty-seven were counted at one end of Fritton Lake, where they mixed freely with Miss Buxton's pinioned wildfowl, and showed their tameness by diving for wheat thrown to them, a food they highly relish, while paying but little regard to the distributor standing on the bank.

On the 12th the lake was frozen over, and Mr. Buxton had a

* It was some disease of this nature which affected the Tawny Owl described in 'The Zoologist' for 1902, p. 84.

fine view of a Peregrine Falcon, which stooped twice at a drake Pochard on the ice, at the second stoop felling it as it rose, and at the same time recovering with wonderful adroitness, just when it seemed as though it must dash itself to pieces on the ice.

FEBRUARY.

7th.—Twelve Long-eared Owls counted by Mr. Bird as they flew out of one Scotch fir-tree adjoining Calthorpe Broad, near the sea; this was a notable number to see in one flock.

17th.—*Luminous Barn-Owls*.—Under this date Mr. L. C. Farman writes from Haddiscoe about the shining Owl which was seen there last December (Zool. 1908, p. 135):—"I have again seen the luminous Owl; this time it was on a marsh near where I first saw it [on Dec. 25th, 1907]. I endeavoured to get to it, but the ditch was wide, and whilst going round to the gate it moved off across the marshes." The identical bird had been seen shining in the same locality by another observer on Feb. 12th, the week before Mr. Farman encountered it. In a second letter, describing its appearance more fully, Mr. Farman says:—"The light was exceedingly bright, resembling an electric light, but of course more dim as distance widened, but even at a great distance at times it showed very bright." Sufficient evidence has been brought forward to prove that luminosity in nocturnal birds is after all not so very rare a phenomenon, though seldom approaching the exceptional brilliancy of these Norfolk Owls, but often enough to be the origin of a good many will-o'-the-wisp stories. As has been pointed out by Sir Digby Pigott, who was the first to bring these circumstances before naturalists, similar birds have been seen before. It will be remembered that it was the pair at Twyford, some thirty miles from Haddiscoe, which aroused the chief interest in 1907. They seem to have covered a great deal of ground in their nocturnal wanderings, for one of them was twice seen in March, 1908, at Dereham by Mr. H. Wormald, glowing with exceptional brilliancy. At Twyford a luminous Owl was seen as late as May, 1908. On May 3rd Mr. R. Purdy and Mr. Hegg watched its shining light as it hunted the meadows about 11 p.m. for field-mice; but it was never seen again though searched for, and Mr. Purdy is of opinion that it moulted its feathers, and with

them its luminosity disappeared, and the same was doubtless the case with the one at Haddiscoe, of which no more has been heard. Soon after this I was informed by Lord Lindley that he had an ash-stump in his grounds displaying a superficies of about eight inches of luminosity. That there is some connection between luminous trees and luminous Owls is the general opinion here, and is highly probable. The fact that it was the Owl's breast which emitted the chief glow would be thus accounted for, as that part would come most in contact with the decaying wood of a hollow tree.

22nd.—A very high wind, which began in the south-west, and at 4 p.m. had mounted to a gale (force, 4–5), and which in Scotland rose to a hurricane (force, 11 at Wick), did some damage to timber. An arm came off an elm which contained a Tawny Owl's nest and a rotten egg, while among other trees which suffered was a tall silver-fir at Stratton Strawless, on which a large flock of Rooks and a few Jackdaws had taken refuge from the force of the wind. These were all whipped to the ground with the falling fir-tree, and no fewer than sixty-two dead ones, as I am informed by the owner, were found by his keepers lying on the ground amongst its branches next morning. Another curious thing which came under the cognizance of my friend Mr. Bird was that during the gale a tree in falling knocked off the head of a Wood-Pigeon. It appears to have brought Swans to Breydon, as Mr. B. Dye informs me of three Bewick's Swans being shot.

MARCH.

12th.—By the 12th Kestrels were paired, and Mr. Lowne was told of five Wood-Larks being seen on Yarmouth Denes.

23rd.—Rooks and Thrushes have begun to nest. This is the first warm day since the snow, and Mr. Bird reports Bittern booming, Snipe drumming, and Frogs croaking, on the authority of the marshman.

31st.—N.W. strong. The first Spoonbill to visit Breydon Broad came to-day, and stayed five days (Jary), and it is the first our Society's watcher has ever registered in March, the next earliest date being April 8th, 1898. This year has also given us the latest occurrence of the Spoonbill, *viz.* on Nov. 21st.*

* See p. 135.

APRIL.

2nd.—Mr. Lowne reports three Black Redstarts seen, but fortunately not shot, at Yarmouth, and on the 12th three more appeared, which were considered to be different ones.

12th.—Bittern heard booming (Bird), and a few days afterwards three Garganey Teal were seen by the broadman, and another sign of summer was a Greater Spotted Woodpecker investigating a hole in a large sycamore at Northrepps. At Dereham a pair of these Woodpeckers chose a wild cherry, and nested in a hole only six feet from the ground (H. Wormald). The young from this nest were hand-reared by Mr. Wormald.

22nd.—Four young Tawny Owls in one of my tubs. A young one was found as early as March 16th at Langham (N. Rippingall).

29th.—A Stilt reported to Mr. Bird on our largest Broad; as far as we know it was not shot. It flew within a few yards of the broadman.

MAY.

1st.—Osprey seen at Hickling, and about a week afterwards another at Barningham, and on the 19th a third was caught on a smack only a few miles out to sea in hazy weather, and taken alive to Mr. Bunn.

13th.—W.N.W. Four Spoonbills were seen by Jary to fly over Breydon, but being high tide they did not alight. One of them, however, returned on the 19th (S.W.), and remained until the 27th, about which time Mr. C. Borrer saw one at Cley (date unnoted).

27th.—Fieldfare at Mundesley (B. Riviere).

28th.—E.N.E., 3-4. An Avocet pitched on Breydon Broad, and was seen on three or four days by the birdwatcher. Another, or the same, was seen, as I learn from Mr. Bird, on the 28th, at Hickling, and some time during the month a small flock visited the north coast of the county, which were believed by Mr. Ram to number seven.

JUNE.

3rd.—Mr. Bird announces the presence of a Porphyrio at Horsey, where one of the principal broadmen saw it on June 3rd, and afterwards it was seen again on the Barton Broad, five miles away, where it remained so late as Aug. 7th.

11th.—An Osprey was seen by Mr. Cole to pass over Cromer, and about this time the same or another appeared on the Broads. The occurrence of a Red-footed Hobby at Sandringham (date unnoted) has already been put on record by Mr. Tuck (Zool. 1908, p. 394), as also the watching of a pair of Marsh-Harriers by Mr. W. P. Pycraft, the same, no doubt, which Mr. Bird reports as being observed playing together in the air. It is sincerely to be hoped that they escaped the gun and snare.

28th.—Two Pallas's Sand Grouse seen at Brancaster golf-links by Mr. F. H. Partridge ('Field'); a large flock had also been seen about the end of May at Blakeney (C. Ram).

JULY.

7th.—The keeper at Horsey tells Mr. Bird that there have been eight or ten Grey Crows on his beat, probably only on passage, as they could hardly have been residents.

8th.—Shortly after this a pair of Garganey Teal were seen by the watcher on Breydon, and Mr. Bird heard of a nest being unintentionally mown out at Hickling, the Duck hurt and the eggs spoilt, which was all the more to be regretted, as it was the only nest known to the men this year.

29th.—A flock of ten Scoter Ducks in Yarmouth roadstead (A. Patterson).

AUGUST.

31st.—A young Shag which had lost its way was so tame or so foolish as to perch on the hand-rail of Cromer Pier, where it was an object of considerable attention until one of the visitors knocked it into the sea (H. Cole). Shortly after this three Shags were offered to Mr. Roberts, one of which was possibly the example above mentioned, and two more were seen flying up and down the pier at Hunstanton, as if they wished to settle on it.

SEPTEMBER.

1st.—W.S.W., 5. Following on last night's gale, to-day was wet and stormy with high gusts of wind, and it may have been on that account that my son and I saw many waders along the shore, including more Bar-tailed Godwits than I ever remember. Mr. Patterson and Mr. Dye announced the presence of these birds in similar abundance on Breydon mud-flats, where the former a

few days later saw about three hundred in one flock ; and, as has been already said, they were equally abundant on the north-east coast of Holland, according to Mr. Bonhote. It has often struck me, when looking over some Norfolk shore-shooter's bag of Godwits, Dunlins, Turnstones, Redshanks, and Knots, how enormous was the preponderance of birds of the year in the first week of September, the percentage of adults, as proved by their plumage, being often only about two or perhaps three. It was the case this year with the Bar-tailed Godwits. Now, as these young waders have never been south before, it is clear that they have not the aid of memory to travel by, but the sight of coast-lines, coupled with an instinct that they must go south, probably does avail them. Continuing our walk, two lots of Teal got up, and a fine adult Richardson's Skua chasing Terns gave us an unusual pleasure. Although adult Skuas are rare, young ones are always to be seen at the beginning of September. The next day the wind had gone down (N.N.W., 1 ; one thunder-squall), and Mr. E. C. Arnold writes that he visited the Morston Marshes, but saw little except Curlew. A gunner on Breydon was more fortunate, for an adult Sabine's Gull in full summer plumage was obtained on the Broad, and taken to Mr. E. C. Saunders, who made the following note while it was still warm:—" Eyes a very dark brown, eyelids crimson, bill black but bright yellow at the tip, the black colour of the head coming well down the neck, where it was so black as to form a collar." Although young Sabine's Gulls have several times occurred, Norfolk has never before had an adult.

4th.—A young Shag,† taken at Cley, and the following day one† was caught alive on Cromer beach, which, being put on a pond, fed well for a time, and then died. On examining its anatomy I could find no air-cells such as the Gannet possesses, or any indication of internal cells. On the 11th another† was taken alive by a boy at the foot of Overstrand cliff, where it had probably been left by the receding tide.

7th.—N.W., 1. Mr. E. C. Arnold notes a migration of Tit-larks, also a Chiffchaff and two Sedge-Warblers near the shore, and at least one Blue-headed Wagtail, and a Pectoral Sandpiper, which he saw at intervals up to the 17th. Yesterday a Hoopoe was seen on the cliff by Mr. Hoare, and other birds are reported,

e. g. a Waterhen standing much out of place on a road, a Barn-Owl which had just come over, and forty Mistle-Thrushes on an "olland," where they had not been before. It is evident, therefore, that migration was going on with many species. The great quantity of House-Martins and the many Swallows to be seen in the vicinity of Cromer was certainly remarkable, although this annual gathering to the coast has been often observed. This autumn the assemblage was very marked; House-Martins largely preponderated, and as they keep constantly passing on the question is, Where do they all come from? How far the coast is supplied with them it is difficult to say, but apparently for a long way they are to be seen. Although this wave of *Hirundines* is strongest by the seaside, a great many are to be seen inland, and the total number which travel across East Norfolk must be something prodigious. In the spring there is again a corresponding coast movement, which Mr. Ram tells me assumes large proportions at Blakeney and thereabouts. September is always a likely month for Honey-Buzzards, and Mr. Masefield is quite right in thinking that this year marks an incursion of these inoffensive Hawks, whose presence quickly roused wrath in the mind of the unthinking Norfolk gamekeeper. I believe the first to come to Norfolk was on the 7th, on which day a large raptorial bird† was flying over Runton golf-links, with eight little birds in attendance. Nine or ten more were accounted for, but I hope only four were killed; neither of the three† submitted to me were in adult plumage, which is rarely met with. We have also had more Kestrels than usually come over.

11th.—N., 1. Mr. E. C. Arnold has made the clever accompanying drawing (Plate II.) of an immature Barred Warbler, shot on the 11th by a friend of his among the salt-wort bushes on the shore. The next day another occurred at Wells to Mr. F. G. Penrose ('British Birds,' p. 200); wind still N., 1. It is hardly likely that these two were the only ones.

15th.—W., 1. An evident arrival of Kestrels† this week at Cromer, and the week after more came, four being seen to make the beach one day, but no Merlins were seen.

17th.—W., 1. A great flock of Lapwings† on the salt-marshes.

19th.—S., 1. Ninety House-Martins,† as near as they could be counted, on the south of my house.

20th.—S.S.E., 1. Considerable quantities of Pied Flycatchers reported to be on the coast by Mr. Borrer and Mr. Knights (date unnoted).

22nd.—W., 1. Very thick and misty all day by the sea, while near Norwich there was a very heavy fall of rain, amounting at Keswick to 1.75 in. in a few hours. This state of things, I am informed by Mr. Barclay, drove the Bearded Tits from their recesses in the reeds, so that in going round Hoveton Broad he saw thirty or more sitting on the reed-tops, a number which the broadman had never seen exceeded in that particular locality.

23rd.—S., 1, fine. This was a day of migration, or rather a reaping of the fruits of yesterday's would-be migration, which was an abortive one, being retarded by a thick mist which for nearly twenty-four hours enveloped the coast of Norfolk. It might be safely predicted that such a state of the atmosphere would cause a congestion in the stream of migratory birds converging on Blakeney, some of which may have started from inland places on the Continent when it was quite fine; accordingly observers had their chance. I wish I had had the luck to have been on the shore, but a good observer was there in Mr. F. J. Richards, who has given some account of what transpired on this and the two following days. About 10 a.m. the first signal of a movement was the presence of an immature Red-breasted Flycatcher and a Ring-Ouzel, but the chief migration set in during the afternoon, when a variety of foreign migrants deployed on a line of coast of a little more than a mile. One feature of the inrush was the suddenness with which these various species demonstrated their presence in the salt-wort bushes, which Mr. Richards and his son and Ram knew to have been empty a short time before. Apart from great numbers of Redstarts, the newcomers consisted of Pied Flycatchers, Blackcaps, Garden-Warblers, Yellow-browed Warblers (2), Willow-Warblers (?), Ring-Ouzels, Bluethroat (1), Blue-headed Wagtail, and other commoner birds. Mr. Ram told me that some of these little birds seemed to drop down into the salt-wort bushes from the sky, but one or two at a time, and so small are they that no one sees them until they are already in the shelter of the bushes. It is just, he says, as if they had sprung out of the earth by magic, but there they are, and delighted to be on land again.

24th.—S., 1. An adult male Red-breasted Flycatcher†—a species which was added to the county list in 1890—in exceptionally rich plumage, was detected perched on a smack anchored inside the bar, the same ship, I am told, that the Desert Wheatear alighted upon last year, and, having afterwards the imprudence to fly to shore, was presently shot, as recorded by Mr. F. J. Richards in 'British Birds' (p. 200). Another Yellow-browed Warbler was identified by a reliable observer, and among other birds seen were several Bluethroats, two Siskins, one Wryneck, one or two Blackcaps, some Garden-Warblers, a few Ring-Ouzels, a good many Pied Flycatchers, and hundreds of Common Redstarts. The Redstarts were especially numerous over about four miles of coast, and a good many spread much further (Sir D. Pigott); for three days their numbers had abated but very little.

25th.—No wind at all; looked out at 5.30 a.m., 7.30 a.m., and 9.30 a.m.; no migrants visible; distance from the sea one mile. Another Red-breasted Flycatcher in the salt-wort bushes, and more Bluethroats met with (Richards). Spotted Crakes reported from Breydon (B. Dye) and Ruston (Bird). A Willow-Warbler shot at Cley (date unnoted) is assigned by Mr. C. B. Ticehurst and Mr. H. F. Witherby to the northern race, *Phylloscopus trochilus eversmanni*.

26th.—W., 1, very fine. Two or three small parties of Sandwich Tern† at no great distance from the beach, apparently in pursuit of sand-eels. A good many Wheatears and Redstarts, but no Bluethroats. We also saw six or seven Gannets,† all of them immature, being probably from three to four months old, which repeatedly plunged from a good height into the sea for fish.

28th.—S., 3, cold. A Swift seen on the salt-marshes by Mr. T. E. Gunn, and another by Mr. Pinchin, and a third at Wells by Mr. Fox, as well as one the day before at Yarmouth by Mr. Knights—all of them very late birds, perhaps to some extent benumbed by cold, and so retarded in their southward flight. The 29th was much warmer, and they probably took advantage of it, as no more were seen.

30th.—Maximum shade temperature 76.6° (A. Preston). At Yarmouth Mr. Saunders had a Fork-tailed Petrel, and on

Oct. 6th Mr. Bird notes one at Hickling Broad. [These dates do not synchronise with the large numbers blown on to the north-west coast of England, but one is recorded on Oct. 9th at Doncaster.]

OCTOBER.

2nd.—Very warm, the temperature rising to 78.4° , the highest October reading Mr. Preston has known. Yesterday a Bittern was heard booming by Mr. Nudd, and there were one hundred and twenty Martins counted on my house. The Bittern is one of the seven birds which are now protected in Norfolk throughout the whole year. To-day another Yellow-browed Warbler occurred.

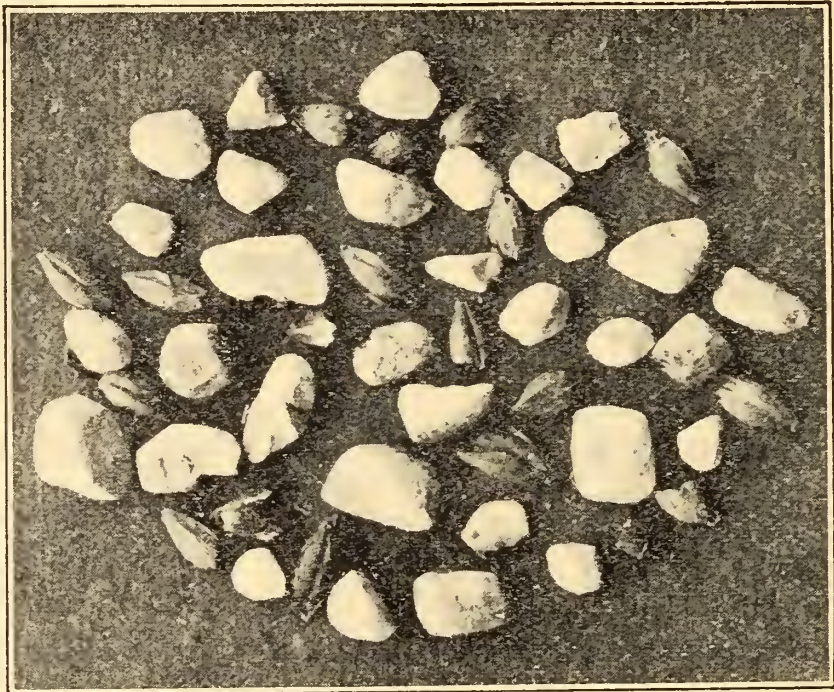
6th.—S.S.E., 1. [My nephew, who was on the North Sea, saw Thrushes, Linnets, &c., and one Wood-Pigeon, when about one hundred miles from Hull, which easily distanced the steamer, flying round it as it went along.]

14th.—A Spoonbill seen on the Broads by Mr. Nudd was joined by another on the 18th.

16th.—A Great Crested Grebe picked up on the road at Pulham Market by Mr. J. Burstall. Great change in the temperature from yesterday.

18th.—Misty all day by the sea, with a high wind from the east, registered in the 'Weather Report' as "E., 5, overcast, fog; Yarmouth." Owing to this wind thousands of Starlings, which are not infrequently day-migrants, arrived, Mr. Patterson tells me, at Happisburgh during the evening, the earlier flocks reaching land about 5 p.m. As soon as the lighthouse was lit up great numbers crowded round the lantern, so that its rays began to be obscured by such masses. Mr. Gentry, the principal of the lighthouse, who has on previous occasions sent me notes, could not form an estimate of their numbers, but in answer to some queries replies:—"There were immense numbers round the light all through the night; the air was full of them, and between the lighthouse and the coastguard station, a distance of about a hundred yards, they were one mass. The coastguards reckoned they had about eighty down the chimneys, making the walls and ceilings of the rooms in a terrible mess, and I had about forty down our chimneys." Mr. Patterson also says that many small flocks passed over Yarmouth, and that numbers

came on board the 'Leman and Ower' lightship, on which his nephew was stationed, so that he and his mate had no difficulty in filling two large buckets with what they caught; so many Starlings also got into the lantern of the lightship, the door of which had been left open to cool the lamps, that they extinguished two of the lights. Although the Starlings seem to have migrated by themselves, this was also the time of the first coming of the Rooks. The 19th was cold, wind S., 3, when the annual October flight set in, and continual flocks of Rooks were to be seen flapping along, with a large admixture of Jackdaws and Hooded Crows; nor had all these sable travellers passed for



STONES IN THE GIZZARD OF A HOODED CROW (p. 135).

quite forty hours in the vicinity of Cromer. Many birds beside *Corvidæ* were to be seen, and in particular Norfolk received many Thrushes and Blackbirds, but the chief rarity was a Little Bunting, which was sent to, and subsequently exhibited by, Mr. H. F. Witherby. [Mr. Caton Haigh, who reports it as being the second big general rush in North Lincolnshire, picked up a dead Yellow-browed Warbler in that county, and saw three Black Redstarts.]

Marked Crows.—A few days after this a Hooded Crow was caught on the North Sea, on the Danish ship 'Sejrskrausen,'

and then released with a letter tied round its neck. This bird, as I learn from Mr. G. Smith, flew to Yarmouth, where it was shot on Nov. 8th, the letter on its neck being dated Oct. 23rd; the edge of the letter was pecked, as if the Crow had tried unsuccessfully to get it off. [It is remarkable that none of the Crows ringed at Rossiten, in Prussia, by Mr. Thienemann have so far turned up in East Anglia, as, judging from the Crows' line of flight when they arrive, that might well be the country from which they come to Norfolk. I have not heard if any were turned off last autumn, but I know that in October, 1904, Mr. Thienemann released one hundred and fifty-one.]

Hooded Crows are not much molested on migration, but somebody shot one which, being taken to Mr. E. T. Roberts, was found to have in its gizzard a number of stones, the size of which is shown in the photograph (p. 134), together with several kernels of wheat.

28th.—Hen Black Redstart seen at Swardeston by Mr. B. B. Riviere, catching flies from the roof of a big barn. A day or two afterwards Mr. Borrer met with a Richard's Pipit on the sea-bank at Salthouse, and Mr. Witherby tells me of another one shot there on Nov. 18th. It will be remembered that last year five were seen.

NOVEMBER.

5th.—Mr. Roberts has also obliged me with a photograph of the contents of the stomach of a Heron which he stuffed to-day. This may be worth reproducing (see fig. p. 136).

21st.—A Spoonbill shot on Breydon Marshes, which Mr. Lowne says was a very small one; it certainly was one of the latest occurrences that has been recorded. Mr. Dye thinks it must have been the same bird which was reported to him on Aug. 8th, and, as it may have been wounded, its emigration would be thereby delayed. Five Bewick's Swans were seen to-day at Hickling by Mr. Nudd, and on the 24th, he says, there were as many as twenty Wild Swans on the Broad, forming a fine flock.

DECEMBER.

1st.—Misty. A Swallow at Haddiscoe (L. Farman), and three or four House-Martins at Dunston, where they were last

seen on the 4th. Such delayed birds as these probably always perish.

8th.—Gadwall near Ingham (R. Gurney). Some seen last month on Hickling Broad.

27th.—This was the day of the first snow, and Wood-Pigeons quickly left us for the south. Many Mallard and Wigeon were put in motion by the rapid change of weather, and the presence of six Wild Swans, four Goosanders, and about a hundred Pochards was announced to Mr. Bird by Nudd. The next day



CONTENTS OF THE STOMACH OF A HERON (p. 135).

the Whoopers had been reinforced, and were increased to two large flocks, and Mr. Bird was informed by the marshman that everywhere the great Broad seemed to be alive with wildfowl. The 28th was the day of the earthquake at Messina, which it is likely was precipitated by the change of weather. On the 29th and 30th it snowed all day and froze hard. Goosanders were reported at Breydon (Dye), Potter Heigham (Saunders), Gressenhall (H. Wormald), Lexham (S. Long), Holkham, and Norwich.

Two Smews were also shot, and a goodly bag of Woodcocks made.

December Woodcocks.—More Woodcocks were shot in Norfolk this autumn than for many a year, and December in particular was very productive. Other counties shared in this welcome invasion, and it appears from Mr. F. Boyes' communication to 'The Field' that Yorkshire was greatly favoured with them, but the most remarkable bag was made at Fair Island, N.B., where one hundred and twenty-seven were killed in a day. Their abundance was probably owing to an extra good breeding season in Sweden and Norway, where, Mr. Buxton tells me, the close-time in the latter country runs from May 31st to August 25th. I took some trouble to make a list of the best bags in Norfolk, some of which were:—

Nov. 11th. Twenty-five shot at Sheringham. Dec. 1st. Forty-two; 3rd, nineteen; 4th, twenty-four; all shot at Swanton. 5th. [A large number seen at Northrepps, none shot.] Twenty-two at Felbrigg. 14th. Twenty-five at Hanworth; seventeen at Gunningham. 25th. Seventeen at Stratton. 30th. Thirty-six on this and two other days at Sheringham; nineteen at Witton. 31st. Sixteen at Runton. Jan. 5th, 1909. Twenty-two at Swanton. 8th. Seventeen at Grimston. 9th. Fourteen at Swanton (besides the above there were many smaller bags which are not here included). 18th. Up to this date one hundred and thirty-three had been killed at Somerleyton, and ninety-six at Felbrigg, including the twenty-two already mentioned. With us the Woodcock is more of a winter than an autumn migrant; not many come to the Eastern Counties before November, and the biggest arrival is as often as not late in December, and even in January some come to us from over the North Sea. These very late flights of Woodcocks probably precede severe weather in Norway and Sweden.*

* The above list compares favourably with the great Woodcock season of 1869-70, when, according to a card printed at the time for Mr. Johnston, Hempstead, Holt, and Bodham produced 142, Northrepps 54, Runton 38, Trimmingham 38, Hanworth 26, Siderstrand 25, Gresham 22, and Barningham 22.

VARIETIES IN PLUMAGE.

Mr. H. Wormald tells me of one of the singular chocolate-coloured Partridges being near Dereham in April, and two more of the same breed were seen at Hockering in September (W. Boyle), and one of a cream-colour at Crostwick in June (W. G. Clarke). No other varieties of birds call for special remark during 1908, except that on Dec. 30th what may be described as a fawn-coloured Moorhen† with silver-grey under parts was received by Mr. Wormald from Gressenhall, where he and Sir T. Hare had noticed this same bird some six weeks previously. On its back there was a beautiful tint of golden brown, which soon faded. The texture of the plumage was rather hair-like, but hardly to the extent of the one figured in the 'Transactions' of the Norwich Naturalists' Society (iii. p. 581).

AGED BUZZARDS.

A Common Buzzard, twenty-five years old, if not more, was pulled to pieces by a Caracara Carrion-hawk which inhabited the same cage in July. This is a considerable age, but there is an account in 'The Field' of Feb. 2nd, 1867, of a Buzzard which lived nearly forty years. We have also lost a Hawfinch which has been in a cage for seven or eight years.

LINCOLNSHIRE GULLERIES (*LARUS RIDIBUNDUS*).

BY THE REV. F. L. BLATHWAYT, M.A., M.B.O.U.

IN the days before the draining of the swamps and fens, Lincolnshire must have been a veritable paradise for wildfowl, and the Gulls which nested in those days had as companions many species of birds which no longer breed in the county. Among the records of vanished nesting species we find those of the former abundance of Black Terns, Ruffs, Bitterns, and Avocets. Pennant, writing about 1771, states that Black Terns, making an incessant noise, are found during spring and summer in vast numbers in the fens of Lincolnshire. Colonel Montagu, in his 'Dictionary' (1802-1813), records that he "observed great numbers of Black Terns in the fens of Lincolnshire during the breeding season"; while Lubbock, in his 'Fauna of Norfolk,' 1845, declares he had received news of Black Terns' eggs recently obtained at Crowland Wash, South Lincolnshire.

Montagu found the Ruff resting in fair numbers in the fens about Spalding and Boston in the early years of last century, and John Cordeaux thinks they still nested in the North Lincolnshire marshes about the same period. On the boggy heaths and swamps in the north-west of the county they continued to nest sparingly about 1860, the last eggs being taken so lately as 1882.

From a letter to 'The Zoologist,' 1865, we learn that Bitterns were very abundant in the Isle of Axholme about 1834; we find also records of their breeding there, and from the fourth edition of Yarrell's 'British Birds' we learn that at the beginning of the nineteenth century these birds could be heard "booming in the warrens and swamps of Manton and Twigmoor."

The Avocet also formerly nested in Lincolnshire. In Camden's 'Britannia,' Gough's edition, 1806, we read:—"Opposite Fosdyke Wash during summer are vast numbers of Avosettas, called there 'yelpers,' from their cry as they hover over the

sportsman's head like Lapwings." This locality is near Boston. The last eggs of this species were taken on an island at the mouth of the River Trent about the year 1837.

"*Laudator temporis acti*," thinks the impatient reader; so enough for the present of the birds which have gone. But it is hard for the naturalist, when writing of the present, to avoid a digression into the glories of the past. The fens, indeed, have vanished, and with them many an interesting species, but there are still boggy heaths and waste sandy warrens in the north-west corner of Lincolnshire, where flourish such plants as the marsh-gentian, sundew, bog-asphodel, butterwort, grass of Parnassus, and bog-myrtle, and where Lapwing, Snipe, Redshank, Coot, Moorhen, Wild Duck, Shoveler, Teal, Sheld-Duck, Pochard, Little Grebe, and Black-headed Gull may be found nesting in varying numbers.

The Black-headed Gull has probably from time immemorial nested in Lincolnshire. Montagu, writing from report in 1802, says: "The Black-headed Gull is said to breed in Lincolnshire on the fens"; and, writing from personal knowledge in 1813, he adds: "In some of the fens of Lincolnshire they are plentiful in the breeding season, inhabiting the most swampy parts along with Snipes, Redshanks, and Ruffs, whose nests are intermixed amongst the high tufts of bog-grass." Gough, in the work already mentioned, writing of birds which inhabit the fens, says: "Peewit Gulls, and Black Tern abound." A gullery formerly existed on Thorne Waste, near Crowle, just over the north-west Lincolnshire border. It appears from records that this settlement was on the decline in 1844, and ceased to exist about 1895, the birds probably migrating to swell the numbers in the north-west Lincolnshire gulleries, some few miles away.

At the present time three main colonies of the Black-headed Gull exist in Lincolnshire, all in the north-west of the county. These are situated at Twigmoor, Crosby Warren, and Scotton Common.

(1) The Twigmoor gullery, on the estate of R. N. Sutton-Nelthorpe, Esq., of Scawby Hall, is perhaps the largest in England, and the founders of the colony seem to have migrated to the spot about the year 1843 from a gullery which then existed on Manton Common, two or three miles distant, which

shortly afterwards became extinct. I have learnt from reliable sources that when, about the middle of last century, Twigmoor was planted with trees and the small natural ponds converted into a considerable lake by the foresters of the late Sir John Nelthorpe, Bart., the Manton Gulls, being much persecuted in the nesting season, migrated to Twigmoor, and have now, owing to careful protection, grown into a mighty host.

I have on three occasions visited this gullery, which for beauty of situation can hardly be surpassed. The birds for the most part inhabit a large sheet of shallow water, surrounded by birch and coniferous trees, the ground rising picturesquely on the east side. Another smaller but densely packed colony inhabits a pond close to the main lake. In June the plantations are ablaze with rhododendrons, and the scent of the "sweet-gale" embalms the air. On approaching the colony the ever-watchful flying sentinels sound the alarm, and the intruder finds himself in the midst of a vast multitude of whirling white wings, and is almost deafened by the wild chorus of shrieking, chattering, laughing cries. The eggs are laid in very scanty nests on projecting spits of peaty soil, or in more substantial nests among the beds of reeds and rushes which surround the lake, some of the birds even building on the branches of fir-trees overhanging the water. Early in March the birds begin to arrive, and reconnoitre their breeding quarters, but in early spring most of their time is spent in following the ploughmen in the fields for many miles around the gullery, and scrambling and quarrelling for the worms and grubs laid bare by the ploughshare. The time for egg-laying varies somewhat according to the weather, but the first eggs are usually laid during the first half of April, the young appearing in numbers in the middle of May. As soon as the young can fly they are taken away to the coast by their parents, and by the end of July all the vast concourse have left for the Humber mud-flats and other maritime haunts, not to appear again in force until the following March. I once tried to make a rough estimate of the number of Gulls breeding in this famous colony, and set it down at five thousand pairs, but counting being a sheer impossibility, my figures may have been very wide of the mark in either direction. Moorhens, Coots, Little Grebes, a pair or two of Mallard and Teal, and several

pairs of Pochard and Sheld-Duck may be seen on the ponds in spring and summer among the Gulls. I have seen the two latter species followed by their newly-hatched broods, the Pochards bringing off their young about the middle of May, the Sheld-Duck early in June. All these are perfectly wild birds.

(2) The gullery near Crosby, some five miles further north, is in all probability an offshoot of the Twigmoor colony, and appears to have been founded somewhere about the year 1865. It is situated on the estate of Sir Berkeley Sheffield, Bart., M.P., who in response to inquiry has kindly written to me (March, 1909) about this colony, stating that the birds "have been there now for a considerable number of years, with an interval of some seven years, which took place about fifteen years ago, when some of them were wantonly shot by some poaching gentleman. They are now decreasing in number, owing to the fact that the mining going on round about them has been a means of tapping the springs which supplied the ponds with water." A visitor to this colony in 1905 writes that the number of nests in that year was enormous, and that the boggy and willow-covered tract was an ideal spot for a gullery, with its ponds and peaty tufts of grass and sedge rising above and about the water. It is to be feared that the days of this colony are numbered, owing to the steady encroachment of the workings for iron ore. This district was once a famous one for rare birds, and in 1869 the Stone Curlew, though decreasing in numbers, was still quite common on the sandy warrens in the neighbourhood (*cf.* Zool. 1869, p. 1738). This species is now probably extinct in Lincolnshire so far as breeding is concerned.

(3) A third colony of Black-headed Gulls exists on Scotton Common, about six miles south-west of Twigmoor, the birds breeding on the pools and "flashes" of water scattered over a swampy heath not far from the River Trent. By far the greater number congregate on one of the pools near the middle of the common, and the colony in all consists of perhaps one thousand pairs of birds. This settlement is also almost certainly an overflow colony from Twigmoor, as I am told on good authority that there were no Gulls on the common in 1860, a few pairs arriving as founders of the present colony about the year 1870 or a little later. I have known this gullery for the last nine

years, and have visited it on frequent occasions, having spent many pleasant hours watching the habits of the birds, or discussing them with the keeper over a substantial tea of fried Gull's eggs and home-cured ham. Besides the Gulls, many interesting species have made this common their home. Ruffs and Reeves bred here in 1860 and even later, and Stone Curlews until 1886, and Short-eared Owls until about 1882; these Owls are at the present day often turned out of the heather by winter sportsmen in the district, and possibly a pair or two will some year remain to nest in the home of their ancestors. Nightjars at the present time flit about the common on summer evenings like giant moths, and Stock-Doves clatter from under the intruder's feet off their two eggs laid in rabbit-holes among the heather. Lapwings breed abundantly, and from two to three hundred eggs are taken by the keeper during some seasons. In spring and summer the "drumming" noise produced by the nesting Snipe is heard on every side, and the shrill warning cry of the Redshank strikes the ear. Many pairs of the latter species nest in the neighbourhood, and I have seen the eggs in May laid in the middle of a tuft of grass on a little mound rising from a shallow pool.

Mallard, Teal, and Shovelers breed in some abundance near the Gull-ponds, and in some seasons a pair or two of Sheld-Duck. I have caught here in my hands newly-hatched Sheld-Ducks, and have wondered at the marvellous agility these little mites of a few days old can display at swimming and diving. The parent bird would fly close round my head while I was handling the young, and showed great concern until these were released. The Shovelers conceal their eggs among the dry grass and long heather, and when almost trodden on the sitting duck shuffles away and tries the broken-wing trick. I should think that quite a dozen pairs of Shovelers nest some seasons in various parts of the common. The nests of Little Grebes, Coots, and Moorhens may also be found by wading in the shallow water.

It will be seen from this account that the Black-headed Gull nests abundantly at the present day in three main colonies in North-west Lincolnshire, in company with other species of birds scarce during the nesting season in many parts of our islands. These gulleries are probably overflow settlements from each other,

or from formerly existing colonies in other parts of the district, and it seems probable that in the near future one at least of the existing three will be broken up. But the Twigmoor colony, now some seventy years old, is safe from persecution, and will in all probability long flourish to gladden the eyes of future naturalists.

Although this colony is situated on private property, permission to visit it can be obtained (after the young are hatched), on payment of a small fee, which is, I believe, devoted to some charitable object. These birds are great friends to the farmers around and suffer little direct persecution, so it is probable that so long as suitable nesting haunts remain the birds will continue to inhabit the district.

THE VOCAL AND INSTRUMENTAL MUSIC OF INSECTS.

BY A. H. SWINTON.

(Continued from p. 25.)

THE females of other Leaf-Crickets have ovipositors shaped like scimitars. When the National (Natural History) Collection was at Bloomsbury, Mr. Frederick Smith used to say that the *Tettigonia** *verrucivora*, known in Sweden as the "Wart-Biter," and a common insect in Europe and Northern Asia, was to be found among the sea-buckthorns on the Deal sandhills; on an unusually clear day, when the cliffs of Dover could be seen, I have sat down at Sangatte, on the opposite coast of France, and, as the warm sun climbed upward to the meridian, listened to their dizzy murmur. The music of the males began with a few chirping "screets!" or "sweets!" which quickly ran into a harsh sound of knife sharpening that rang like a cadence of little bells over the fields of barley gay with the poppies and bluebottles that the young ladies of Calais were wont to work in embroidery, and shimmering in sunshine. Pleasant reveries awoke such as stir when a pleasure steamer about to start disgorges a cloud of whistling steam, and the females came and gathered round me entranced on the hem of juicy clover; when a male left the eager choir and came to pay his attentions, another was seen wandering about, displaying the excellence of his instrumentation. Presently two males began to perform in rivalry, in the manner of the peasants of Theocritus and Virgil, and, as they emulated the Christy Minstrels, the idyll proved to be within the compass of a little *Stenobothrus*, who struck up his own romantic tune. No doubt the apparel of the female was an attraction; when the Wart-Biters first appeared in the second week of July they were grassy green, with invisible spots on their elytra, but the sun soon bleached their verdant hue and developed the brown chessboard pattern of a Scotch tartan. In

* *Tettigonia* = *Decticus*, auctt.

confinement, like the rest of their kind, they became cannibals, and one morning I found a female, who had devoured its male, standing up like a rabbit on her hind legs and suffering all the miseries of indigestion. Placed in the same cage, the males of a Wart-Biter and Great Green Leaf-Cricket played an agreeable duet, but as the habits of one were diurnal and those of the other nocturnal it was always a little difficult to arrange. On leaving the blue waters of Rhodes, famous in the days of the Colossus for its roses and promenaders, and heading northwards, the sailor beholds, as the melon flush of evening dies away, strange islands resembling cinder-heaps passed by in the indistinct light. The Greek islanders were wont to keep diurnal and nocturnal Crickets that drove away their cares, and in this wildly desolate night Aristodicus the Rhodian bewailed the Leaf-Cricket that made the villa of Alidus ring with merriment when the sun drove its chariot out of the sea; for it had flown away to devour "the dewy flowers of golden Proserpine and meadows of Clymene." With the husbandman the species of *Tettigonia*, short and thick-set, with broad and thoughtful heads, long enjoyed an evil reputation; but as they delight in every green thing it is only right to say, in pronouncing judgment, that they prefer the juicy leaves to the dry seeds and ears of corn. The locusts of the Apocalypse that came out of the bottomless pit, if allusion be made to any Orthoptera existing in Patmos or other islands of the volcanic archipelago, were probably some species of *Tettigonia*, for "Their shapes were like unto horses prepared unto battle; on their heads were crowns like gold; their faces were as the faces of men; they had hair-like antennæ, as the hair of women; their teeth were as the teeth of lions; they had breast-plates, as it were—breast-plates of iron—and the sound of their wings was as the sound of chariots of many horses running to battle; their tails, or ovipositors, were like unto the stings of scorpions," literally and metaphorically. They had a king over them, whose name was Abaddon or Apollyon, the destroyer. A species—*Tettigonia albifrons*, I think—has still this reputation in Cyprus, where it is known as *Sacro acrida* or *Lauro aurida*; thence Mr. S. Brown, who was destroying locusts in 1885, sent me, on May 16th, some immature specimens. It frequents marshy spots on the shores of the Mediterranean,

where its resonant "zig-zig" sounds incessantly like the jingle of horse-bells and rattling of harness. We are given to believe that a dense cloud of Leaf-Crickets, and, judging by the illustration, the species in question, wafted on Aug. 23rd, 1711, from the sea opposite the Island of Elba and settled down on the Italian marshes of the Piombina, where for five years they regularly deposited their eggs in August, and a young brood appeared the following April to continue the work of destruction. *Chelidoptera albopunctata*, a smallish greyish or brownish Leaf-Cricket that lurks, spider-like, in the nettle-clumps, is omnipresent in Europe, and I found it at home on the ferny declivities around the Gouffre in the Island of Guernsey, not yet exploited for house-building; among the Calais sandhills I have seen a belated individual chirruping on the tops of the reeds in the sunshine, but its habits are vespertine. When staying at Nantes in August, 1891, I had a male in my bedroom as a distraction from the uncongenial drama of the hostelry, and in the small hours of the night I studied its instrumentation, which consisted of a series of "cricks," from fifty to five hundred, which resembled the winding up of a watch. Near Vienna *Chelidoptera bicolor* sustains the reputation of its kind for nutmeg-grater music; its female has no ovipositor; in the course of ages she probably made no use of it, and so lost the use of it. *C. tessellata* I have found at Valladolid as early as July 12th, and I met with it at Leon and Nantes in August.

In the seventies General Twemloe, a geologist of the old school, was lecturing on the chalk-flints that had been washed into his garden at Guildford, which he was then trying to convince Professor Owen were antediluvian monkeys and cocoanuts, ladies' boots and chignons, from the aromatic bowers of Persia; and about the same time a notice appeared concerning seams of pipe-clay containing the leaves of trees that overshadowed the banks of our Eocene river at Poole Harbour, recently discovered by Mr. Starkie Gardner. Hearing of this, I joined a party of excursionists to Bournemouth, and, digging about in the face of the cliff with a pocket-knife, I unearthed what to my understanding seemed to be the impressions of some willow-leaves. This discovery was sufficiently prosaic, and, as the sun was hot, I lay down to slumber on a heathery slope where the cooling sea

air wafted its gathered fragrance. On awaking I recall seeing the purple bloom alive with a horde of the *Chelidoptera brachyptera*, whose short greenish elytra look like a pair of nippers, and whose leaping legs are marked with a band of crêpe. Gaily they waved their hair-like antennæ in the zephyr, and sounded out their calls of "reu-reu!" oblivious of the princely mansions that were rising on their solitary domains. The browner *brevipennis*, common in the Vaudois, I met with on the flowery lea at Montreux, in Switzerland, where are fairy formed and many coloured things; its overtures of "ree-ree!" that resembled in miniature the dirl of the Great Green Leaf-Cricket, lasted in the sunshine for twenty-one seconds. The larger *C. affinis* I found in plenty among the Mediterranean heath on the northern coast of Spain. The male of the nut-brown *Pholidoptera griseoptera* whose cup-shaped elytra resemble a little purse or spider's egg-bag, chirps a laconic "zick-zick!" or "sprink-sprink!" according as the echo rebounds concealed in the interlacing brambles of the country lane. First heard in July, it tolls slow and solemn the dirge of departed summer in August, September, and October; and even in November of the dismal 1879, during the first touch of frost, I saw numbers of the males out on the hedge-banks that encompassed the now enclosed common of Warsash, in Hampshire, lukewarm in the slant sunshine, raising at long intervals the sound of woe. To perform it it is necessary they should lower their heads, when the thorax stands up like a collar, and they are able to unlock their cymbals. When the males get together their notes come a bit more hasty, and sound like a saw; when alarmed they drop to the ground. *P. aptera* may be heard on the shores of the Lake of Geneva. One morning I went to explore the Pool of Siloam, which proved to be a very common looking rectangular tank on the declivity below the walls of Jerusalem, supposed to indicate the site of the gardens of the Kings of Judah. When I came to its north-western angle I suddenly disappeared into a hole concealed by pellitory, and it came to mind that this was the celebrated conduit that led to the intermittent fountain of the Virgin hewn in the rock under the temple area, that I believe to be the Pool of Bethesda, and as great a mystery as when the delicate foot of an angel troubled its waters. On emerging from the pitfall

I saw a large Leaf-Cricket come out from a cavity in the earth, where it had lain among the potsherds. I took it to my lodgings, but while I had it in captivity it could, but, like the children of Zion by the rivers of Babel, would not sing. When Herr Brunner was asked its name he could only say that he had specimens of both sexes, and that it was intermediate between the genus *Thamnotrizon* and the genus *Paradrymadusa*, a new link in being's endless chain.

Yersin says that the portly brown *Orphania denticauda*, with greenish elytra, sounds out in glee " zeea-zeea ! " when it perambulates in the sunshine the grassy slopes of the Vaudois Alps, where the cow-bells tinkle. The tiny *Leptophyes punctatissima*, green with black specks, is found in Central and Southern Europe. When the leaves commence to fall from the old chestnuts I have often, during a stroll in Kensington Gardens, noticed the males climbing up the tree-trunks, but, although they have the neatest little raised comb imaginable on their left elytron and a glassy resonant patch on the right, I could never induce them to strike up their fairy music such as the frequenters of the Albert Hall never dreamt of. Their enormous, portly female I did not happen to see until a day or two ago, when I sat down to write their family history. I then beheld her sitting like a speckled gooseberry on my window-sill at Totnes. I at once placed her in a glass jar, when with a grace and an action she condescended to eat a hole in a rose-shoot, using her palpi as chopsticks, and afterwards she delighted to bask in the sunshine of the heat-wave that ushered in October, remarkable for its clustered apples and acorns, sitting head downwards with legs akimbo, and turning towards me her eyelets red, like sealing-wax that took a golden gleam. Clean paws seemed with her a maxim, for she periodically licked them in the manner of a cat. Now, at the end of October, she is still alive.

Phaneroptera falcata, whose under wings project like tails from under its mossy haricot-green elytra, lurks like a robber among soft foliage of the acacia that overshadows the porch of the wayside inn among the vineyards, where from time to time it indulges in a low thrilling chirp, as the matron sips her cherry-brandy and a thimbleful of gin goes round. I have seen it near Turin and Geneva in July, and by some chance it has

been introduced into Cornwall; as ships come to Cardiff from the South of Europe and elsewhere, it probably arrived with foreign produce. A similar species is noticed in Cashmere and Northern India, but its female has a longer ovipositor. *Scudderia curvicauda*, found in North America, is mostly heard at night, but it is wont to cheer the day with a subdued "vree!" The beautiful little *Meconema thalassina* that seems to be carved out of green ivory, which is often seen on the rose-bush and in the lime-tree avenue in September and October, is unfortunately not musical.

A Leaf-Cricket (*Amblycorypha rotundifolia*), inhabiting trees in North America at the fall of the year, September and October, flies with the "whiz" of a weaver's shuttle. "Like the noise of chariots on the tops of the hills shall they leap," says the prophet Joel, and this squib-like flight is noticeable in many of the grasshopper kind. *Leptodermis gracilis*, a small brownish inconspicuous kind, with a silvery gloss at its wing-tips, opens its wings with a "burr" as it takes a leap over the sticks and straws among the minute white and purple flowers of *Daucus aureus*, when the glaring sun in June and July has parched the ground at Jerusalem. The sound is, I think, caused by a raised arched vein at the base of the elytra catching on the prominent veins of the under wings. The larger *Psophus stridulus*, with brick-red under wing, found in wood-clearings on the mountains of Italy, France, Sweden, and Russia, and which I have surprised in September among the pine-trees on the heights above Montreux, makes quite a rattle when it displays the flaunt of its wing to leap away; and on the Calais sandhills *Ædipoda cerulescens* starts up before the footsteps with a rustling arrowy sound. In Canada the yellow-winged *Æ. sulphurea* that appears in the autumn makes a loud snapping noise like a watchman's rattle as it flies; "a spot on the road to Compton at the foot of a hill a little beyond Stafford's Bridge is its beat," remarks an entomologist. The coral-winged locust that frequents dry pastures at the close of April also makes a loud noise in flying. Among the smaller European grasshoppers, *Stenobothrus melanopterus*, *miniatu*s, and *viridulus*, as well as the larger *Acyoptera variegata*, have been accused of emitting these alarming rattlesnake noises.

The European grasshoppers of common parlance make their

melody with a row of round knobs that run along the lower end of a raised edge on the inner surface of the usually flattened hinder thighs, which they rub briskly, like the cranks of an engine, to and fro, over the raised veins on the fore wings or elytra that resound like a violin and sound out like a musical box; their music can be rarely reproduced when they have been dried on the setting-board, as the hind legs are wont to break off, but it is always possible to examine the inner surface of one with a magnifying-glass, and ascertain whether the row of knobs is present and the species a performer. Yersin attempted to set the grasshopper tunes to musical notation, but Mr. McLachlan mentioned when the score was played it did not confer much delight. Hearing this, I gave it to a musical lady, who asked many questions, and then rattled off on the piano what did not sound like the songs of the grasshoppers; perhaps she would have succeeded better with the violin. As a rule the male grasshoppers are the musicians, and after one has sent forth its trill it lowers one or both of its hind legs so as to expose one or other of the two cavities situated on either side at the base of the hind body or abdomen that are its ears, containing a membrane or ear-drum, on which are acoustic horny pieces; to them ganglions are attached, whence nerves run to the third large nervous knot of the body, which is bigger, as Johannes Muller remarks, than the grasshopper's brain. These ears are also possessed by the females, who are appreciators of grasshopper music, though it is not alone for music they are designed, for the weasel-snouted *Truxalis nasuta* that stalks, gaunt and silent in the sunshine, has its ear-cavities open, and those of the tuneful grasshoppers are closed like a cowrie to catch the innermost feeling.

It is not every year that the grasshoppers have a jubilee and celebrate their harvest festival. In 1875 their music rang out merrily over the grassy slopes at Guildford, and later on it would be hard to find any nearer than Box Hill. No doubt the damp weather was concerned. 1879 was remarkably dismal and damp, and this was a time when spots were few on the sun. Again, in 1881 and 1882, the silver writing of slug and snail covered leaf and garden-seat, and *Helix virgata*, common on arid pastures, everywhere multiplied; the next year, which, according

to Wolf, was one of most sun-spots, the bookworm took the place of the cricket and cockroach in the chinks of the kitchen-hearth. These periods of most and fewest sun-spots causing aerial disturbance appear to promote grasshopper migration in the northern hemisphere. About the year 1859 I happened, when at Bath, to attend the Proprietary College on the Lansdown Hill, where I meditated on astro-meteorological appearances. Early in the autumn a Clouded Yellow Butterfly was seen in the playground that was a perfect museum of local fossils, and later on a little flight—I think of the Migratory Locust (*Pachytylus migratorius*)—passed over it, travelling west; one alighted on the pathway at my feet, while several were caught by my play-fellows, and they were placed in bottles of spirit by Mr. Glover or one of his assistant under-masters. This, again, preceded a year when the sun was turned into sackcloth, or became black like goat's hair; so say astronomers.

The species of *Staronotus*, that vary wonderfully in size, may be recognized by the lozenges gouged out above the antennæ that give the forehead a bevel. They may be seen hopping about among *Poterium spinosum* that covers the hills of Jerusalem with a thorny tangle that caught Abraham's ram, and enjoying the fragrance of *Ononis natrix*, which no doubt was one of the spices of King Solomon, who seems to have known the moth-mullein, growing tall and lank around the town-walls, as towers of perfume. *Stauronotus genei*, no larger than the English meadow grasshoppers, may be recognized by the triangular snaky spots on its hind femora, with which it plays a bold "whip-whip!" and in the presence of its female, moving either alternately, it executes a meek and indistinct "wee-wee!" I have seen it disporting on the reddish-orange loam at Jerusalem in July, and at home on the tawny sand of Leon in August, for it and its congeners, like other creations of the desert, are protectively sand-coloured. The similar but larger *S. hauensteini*, that has its hind shins reddish, is also musical. Of a fine summer's day I have seen a thin mist spread south over the Dead Sea, which, as seen from Bethany, shines like a ribbon of smalt-blue in its sandy hollow, bordered on the east by the precipices of Moab; but fancy it must have been a flock of birds or locusts. In 1898 a horde of the Morocco Locust

(*S. moroccanus*), destructive on the coast of the Mediterranean and in the Island of Cyprus, did waft across from the vineyards of Es Salt to Jerusalem, probably on the breath of the warm sirocco that inhales from the Syrian desert when the sea breeze that brings the night dew flags. The males of this species have musical combs on their hind legs, and the prophet Joel would lead us to suppose "their noise is that of a flame of fire that devoureth the stubble." The date of their invasion is the mean year for the return of fewest sun-spots; the actual date astronomers place one or two years later. *Stethophyma turcomanum* is recognisable from its longer snout and blackish spots; its males have likewise a musical leg-comb to join in the uproar "when the sun is turned into darkness and the moon into blood."

(To be continued.)

NOTES AND QUERIES.

MAMMALIA.

The Greater Horseshoe Bat in Berks.—Another species has now to be added to the remarkable list of Bats obtained at Park Place, in Remenham parish, on the Berkshire side of the Thames near Henley. On March 14th, 1909, Mr. Heatley Noble wrote me word that he had that day captured in the caves there a pair of Greater Horseshoe Bats (*Rhinolophus ferrum-equinum*), which were found hanging from the top of the cave. I am unable, without undue delay, to consult the 'Victoria History of Berks' for later occurrences of this species in the county, but the only instance known to me is a record by the Rev. J. E. Kelsall in 'The Zoologist,' 1884, p. 483, of one shot about 1875 at the Oxford Reservoir, which is actually in Berks; and in 'The Zoologist' for 1887, p. 89, Mr. Kelsall summarized the distribution of this Bat in this country as "England south of the Thames (from Kent to Cornwall) and South Wales." This makes the tenth species of Bat obtained on the estate, which must surely constitute a "record."

The species which have occurred in the caves are:—

NATTERER'S (*Myotis nattereri*).—Probably the most numerous.

DAUBENTON'S (*M. daubentoni*), WHISKERED (*M. mystacinus*), LONG-EARED (*Plecotus auritus*).—In perhaps the order named, but taking one time with another, Mr. Noble thinks there is not much difference in number between the three.

GREATER HORSESHOE (*Rhinolophus ferrum-equinum*).—Two on March 14th, 1909.

LESSER HORSESHOE (*R. hipposiderus*).—One on March 14th or 15th, 1906, in a very small cave close to White Hill.

BECHSTEIN'S (*Myotis bechsteini*).—One on March 10th, 1901.

Other species obtained on the property, but never seen in the caves:—

BARBASTELLE (*Barbastella barbastellus*).—One found on a rain-waterpipe at the home-farm in full daylight on March 28th, 1907. Mr. H. Noble was good enough to send me this specimen (alive) for confirmation of identification.

NOCTULE (*Pipistrellus noctula*).—Quite common, sheltering in parties, in hollow trees.

PIPISTRELLE (*P. pipistrellus*).—Quite common and numerous.

Owing to the notices which have appeared of the occurrence of various species of Bats in these caves (by Mr. J. G. Millais in P. Z. S., 1901, and by myself in 'The Zoologist' for 1906), Mr. Noble is now inundated with requests (even from perfect strangers) for a consignment of Bats, or for permission to come and hunt personally; but, as he wishes to protect the Bats and not to exterminate them, he is now reluctantly obliged to refuse these requests. In my former note (Zool. 1906, p. 186) I considerably overestimated the length of the cave, owing no doubt to the darkness and our slow rate of progress as we examined the surface inch by inch—as I found on a subsequent visit in company with Major Barrett-Hamilton. An old-established colony of Long-eared Bats in my barn here seems to have deserted it, and the only cause I can suggest is that perhaps they disliked the rattle of a chaff-cutter I have introduced, worked by a horse-gear just outside—ALFRED HENEAGE COCKS (Poynetts, Skirmett, near Henley-on-Thames).

AVES.

Where are our Nuthatches?—I have been struck for a long time past by the absence of Nuthatches in places where they used to be common. In Oxford at this time of year they used to be abundant and noisy; of late I have not seen or heard a single bird. In this village they used to be in every garden, and would come to the window and take nuts out of a tumbler; now there is not a single pair here or anywhere near us. Lord Moreton, who lives two miles away, tells me that though he has been looking out carefully at my request, he can only find one pair; but formerly they used to be almost a nuisance in the breeding season, so abundant and vociferous were they. I wish to know whether other observers of twenty years standing or so have had the same experience. If the diminution is general, its cause should be enquired into so far as is possible. At present I am quite unable to guess it as regards our Nuthatches in this district; for the trees are as they were, and, so far as I know, the nuts, seeds, insects, &c., which form the regular food of the species are also as they were. Human beings are out of the question as a cause. An epidemic, like the recent Wood-Pigeon diphtheria, is possible, but at present, instead of guessing, I will merely ask the question which heads this note.—W. WARDE FOWLER (Kingham, Chipping Norton).

Strange Death of Kingfisher.—On March 2nd or 3rd a female *Alcedo ispida* was brought to me, with its right leg dislocated at the

thigh-joint, and the man who gave it me said he found it in the early morning hanging in a dying condition from a thick bramble-stalk, to which the injured leg was firmly frozen by a piece of ice the size of a large pea. I need not say there had been a severe frost the previous night, and, although the bird was in good plumage, it was very lean in body, and on dissecting it I could discover no other injury except the dislocated thigh, which seemed to be torn from the trunk. Possibly the poor little bird was in failing health, and the extreme cold sealed its fate. It is the first occurrence of the kind that has come under my observation.—G. B. CORBIN (Ringwood).

Roller at Cumberland. — An adult Roller (*Coracias garrulus*) was shot by a keeper at Knorren, near Brampton, Cumberland, on June 17th, 1907. The bird was reported to me by F. P. Johnson, Esq., M.B.O.U., and I saw it at Carthstand on Jan. 2nd, 1909. — LINNÆUS E. HOPE (The Museum, Carlisle).

Goldeneye (*Clangula glaucion*) in Surrey. — On March 8th last I saw an immature specimen of a Goldeneye on one of the ponds in Lea Park, Witley. It was fairly tame, and allowed a near approach. When disturbed it flew for a short distance, and on alighting on the water immediately dived. No doubt the hard weather we had then been having drove the bird so far inland. The Goldeneye is always a sure visitor to Surrey, and some four years ago an adult male was shot on the very pond that the present specimen was on.—GORDON DALGLIESH (Brook, Witley, Surrey).

MOLLUSCA.

“Vertical Distribution of the Mollusca.”—I have just read with great interest Mr. Harcourt-Bath’s paper on the “Vertical Distribution of the Mollusca of the Cotteswolds,” and I hope it may lead to a careful study of the subject in all our counties. In this county the only known habitat of several species of the Mollusca is at an altitude of about 1000 ft. above sea-level, namely, *Helicella itala* and *H. caperata* (except where introduced) and *Balea perversa*. Other species, such as *Vitrina pellucida*, *V. cellaria*, *Pyramidula rupestris*, *P. rotundata*, *Hygromia fusca*, *H. hispida*, *Helicigona lapicida*, *H. arborum*, *Ena obscura*, with its beautiful white and pellucid variety *albida*, *Vertigo pygmæa*, are all found in the limestone district in the north of this county up to and exceeding the 1000 ft. level. I have worked portions of the Cotteswolds for Mollusca, and quite agree with Mr. Harcourt-Bath as to there being two distinct forms of *Helix pomatia*, which he aptly names “*arborea*” and

"*petrea*," the latter having a sun-washed appearance. It would be interesting to know what the natural enemies of *H. pomatia* are in the countries of the Continent; the absence of any natural foes which feed upon this mollusc would seem to support the theory that it is not indigenous in England. — JOHN R. B. MASEFIELD (Rosehill, Cheadle, Staffordshire).

Notes from South-western Hants.—Taken as a whole, in the valley of the Avon, the past autumn and winter have not been productive of matter for record, as the weather was so very uncertain and changeable from day to day. In the game-rearing districts I heard of a fair amount of sport with the hand-bred birds, Pheasants and Partridges—in fact, the season was more satisfactory than had been anticipated—and on one or two occasions a considerable number of Snipe and comparatively few Woodcock were killed, but the wildfowl shooting on some parts of the river at least was below the average, a lack of Teal being very noticeable, and Wigeon were not so abundant as they are some winters; this, however, may have arisen from the continued lowness of the water, as it is well known the active and handsome little Teal likes a flooded meadow and its production. Possibly, too, the "guns" were a trifle to blame for the apparent paucity, as on one part of the stream from which I obtained statistics respectable bags were made, considering the general scarcity. True, I did not hear of any Pintail or Gadwall, and only one Goldeneye, in anything like adult plumage; the Shoveler, too, was in much fewer numbers than for the last three or four years, but I was more than gratified to know that at least one full-plumaged male Goosander and two or more Smews, more or less adult, were seen in the old locality (after an absence of the former species for seven or eight years), and possibly there were others of the same species in less adult plumage which were not detected amongst their older relatives. Pochards were not scarce, and a few Tufted Duck, which latter possibly might have nested near, were seen or shot; two small flocks of Wild Geese frequented the neighbourhood for several weeks, but I heard of only one being killed at quite the end of the shooting season, and that was the white-fronted species. On one stretch of water in four or five "shoots," averaging five guns, the following bags were made, *viz.* Wild Duck 402, Wigeon 120, Teal 83, Pochard 9, Tufted Duck 3, Smew 2, Goosander 1, Goose 1, Snipe 28, Coot 240, Moorhen, 165.

Soon after the shooting commenced in early August an immature male Garganey was shot near here, and is only the third occurrence

that has come under my observation for over thirty years, and these were all in the autumn, although it is said to nest occasionally near the river farther down towards the sea, but I have no positive proof of the truth of such a statement. A local paper reported Hoopoes as having been seen several times, but I knew of two broods—one of three and the other of five cygnets—of the Mute Swan that were bred upon the river, and the birds seen were undoubtedly referable to this species, as I believe they escaped all local sportsmen. I heard of only one Bittern having been killed, about Christmas, but since that time two of this interesting and beautiful species frequented a quiet part of the river for several weeks, where they were protected, and I trust are now alive enjoying the freedom they deserve. For a short time two or three small parties of Golden Plover were seen passing to and fro, but at the same time unusually large flocks of Lapwings were observed, and apparently accompanying them Peregrine Falcons; one or more of the latter were often in attendance, and it was an interesting spectacle to see how the Plovers, by some wonderful instinct and foreknowledge, seemed to anticipate the arrival of their enemy long before it came into view, the whole flock, with screaming commotion, soaring to a great height, knowing that to be the safest position from the deadly grip of their powerful pursuer. Notwithstanding the cruel persecution waged against this noble Falcon it is far from extinct about this locality, where wildfowl or Pigeons are plentiful. I may also note that in the autumn an Osprey was seen on more than one occasion, and keenly sought after unsuccessfully by local gunners, but for three consecutive days in December it or another was seen on a certain part of the river, and being unmolested, let us hope it is still seeking its finny prey elsewhere. I also knew of one Hobby being killed on Sept. 5th, and another seen at the same time, in the usual habit of following the migratory Swallows to their roostings in the reeds prior to their departure southwards. In November a "very large brown Hawk" was shot—I expect it was a female Hen-Harrier—but I did not see it, although some exaggerated notes were sent me regarding its supposed weight and measurement, and how it had disturbed the peace of mind of a gamekeeper, who attributed the thinning of his Partridge coveys to its depredations. In February a fine bird (female) of this species was killed by a man who was Pigeon-shooting, and he told me it was in pursuit of the quick-flying Doves, but if the statement is wholly correct it seems somewhat at variance with my own scanty experience of past years, as none of the Harriers seem adapted for rapidity of flight, or power of legs and claws for

such strong and robust quarry. I did not hear of any Merlin until the first cold days in January, when a female was shot near Fording-bridge; and in another locality a very small blue hawk (which probably was a male of this tiny Falcon) was seen to capture and carry off a Sky-Lark almost close to the man who informed me of the occurrence. The Short-eared Owl formerly visited us every winter, and I have old records of it in every month except June, but of late years it has been scarce or entirely absent from this particular neighbourhood, and this latter remark applies equally to such species as the Fieldfare, Siskin, Lesser Redpoll, and others, which I may safely say are not half so abundant as they were in my younger days. Birds like the Brambling and Crossbill were always more or less uncertain, depending no doubt upon the severity of the weather, and possibly the last-named species would not find the food and shelter that they did formerly, the very extensive fir-woods having virtually disappeared.

It is an interesting fact that the elegant little Goldfinch is increasing in numbers, as the following cruel incident will prove. On the first fall of snow a farmer's son cleared a space in the rickyard, that the hungry birds—Sparrows, Chaffinches, &c.—may be more easily brought together for slaughter; the lad, having fired into the midst of the community, picked up no fewer than three Goldfinches amongst the slain.

The long-continued drought was not altogether favourable to the angling community, but some rather fine fish were caught by those who persevered. Pike from 16 lb. to 21 lb., Perch from 2 lb. to 3 lb., Chub from 5 lb. to 7 lb., and a number of Roach well over 2 lb. were landed; I saw eight Roach taken from the same water varying from 2 lb. 3 oz. to 2 lb. 13 oz. each. Arising no doubt from the lowness of the pools, the Salmon-fishing in the Ringwood water has hitherto been a comparative failure, although a number of rods have flourished over the stream, but only one fresh-run fish of nineteen pounds has been caught, and that in the early days of February, when the fishing began, although down nearer the sea fairly good hauls have been made with the nets, and one very fine fish turning the scale at forty-four pounds was skilfully brought to bank with a rod.—G. B. CORBIN (Ringwood).

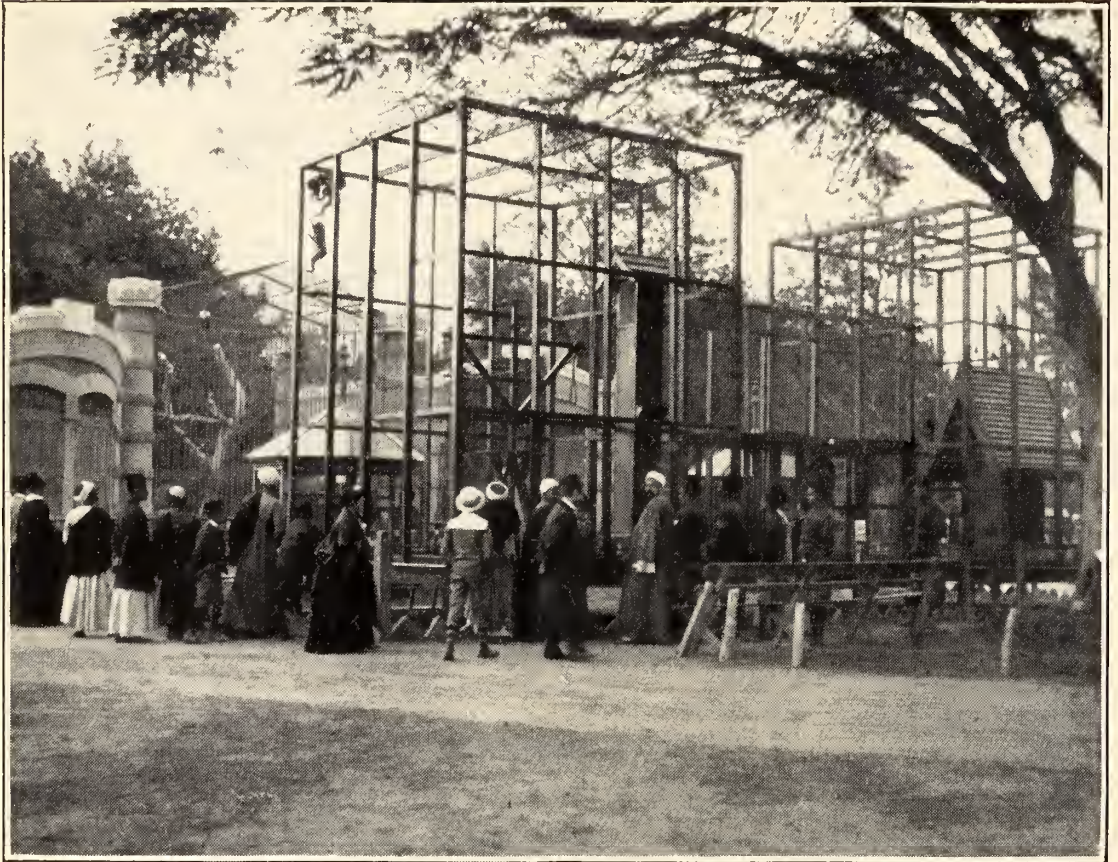
P.S.—Since penning the foregoing a gentleman, who is fond of birds and resides near the river, told me that during the rough weather at the beginning of March, after the shooting had ceased, he saw, with the aid of a glass, six or seven Scoters upon a piece of

water near his house, and identified them from 'Morris's Birds,' to which he pins his faith, and he felt chagrined when I suggested Coot. At the time indicated the wind blew hard from the north and north-east, which would be against such a sea-loving species being "blown in" from the southern coast; yet, if no mistake was made in identification, it is interesting, as I have but one previous record, many years ago, of its occurrence near here. We are not many miles from the sea in a direct line, and as I have known such species as the Guillemot and Razorbill to be met with on rare occasions, the presence of Scoters was a possibility, but I have not heard that any other person saw them.—G. B. C.

EDITORIAL GLEANINGS.

MR. JAMES DRUMMOND, in a contribution to the 'Lyttelton Times' (Christchurch, N.Z.), of January 23rd last, has found his subject in "Eels and their Movements." He states, on the authority of Mr. R. C. Bruce, of Ngaruru, Hunterville, in the Rangitikei District, that much of our present knowledge "supports the observations of the ancient Maoris, who, as he says, like other races who are wrongly called 'savages,' were close observers of Nature. The Maoris, indeed, were in possession of knowledge in this respect for many generations. A few years ago, he says, some difficulties arose amongst Wairarapa Maoris in connection with the outlet to the Wairarapa Lake. To settle the dispute, the Maoris referred, with a confidence that showed their familiarity with the subject, to the Eels' annual movements towards the sea. A friend of Mr. Bruce, who was present at the discussions, told him that the Maoris stated that there were annual migratory movements, with intervals between, by three different kinds of Eels. Old Maoris on the west coast of the North Island state that when the Eels go towards the sea in a large body they are led by two individuals of an enormous size. Mr. John R. Macdonald, of Levin, told Mr. Bruce that he once saw one of these migrations, with two large Eels in the van. Overland journeys at night, which is characteristic of some Eels, have been noted in New Zealand. Mr. Bruce has been told by some very old Maori friends that they have known Eels to undertake fairly long land journeys by night. On one occasion the Maoris had camped for the night on a spur that is the watershed between the Wangaehu and Manguhero Rivers. About midnight their attention was arrested by their dog, which was much excited, and was barking furiously. When they went out to ascertain the cause of the disturbance they found that the dog was following up an enormous Eel, which was on one of its land journeys."





VIEWS IN THE GIZA (EGYPT) ZOOLOGICAL GARDENS.

THE ZOOLOGIST

No. 815.—May, 1909.

A LIST OF THE ZOOLOGICAL GARDENS OF THE WORLD.

BY CAPTAIN STANLEY S. FLOWER.

(PLATE III.)

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| I. Preface. | III. Modern Zoological Gardens. |
| II. Early Zoological Gardens. | IV. Bibliography. |

I. PREFACE.

CONSIDERING the wide interest taken in Zoological Gardens, not only by zoologists but also by the general public, it seems remarkable that no list of these institutions, with any pretension to completeness, appears to have been published.

It is hoped that the publication of this present list will call attention to the subject, and may be the means both of bringing to light historical notes of other old menageries, unknown to me but perhaps familiar to some readers of 'The Zoologist,' and also be of present and future use to the executive officers of Zoological Gardens in exchanging notes and publications, and especially in making that personal acquaintance of each other which is so important for mutual help and improvement in professional knowledge.

Of the existing Zoological Gardens, the senior appears to be the Imperial Menagerie of Schönbrunn, Vienna, founded in 1752, then that of Madrid 1774, and then Paris 1793.

Early in the nineteenth century a quite new departure was made in the British Isles by the establishment of standing menageries that were neither the appendages of Royalty nor Government institutions. Between 1828 and 1836 five Zoological Gardens, owned by societies of private individuals, were started: four of which (London, Dublin, Clifton, and Manchester) still exist.

This example was followed by the Low Countries; societies were formed, and the Zoological Garden of Amsterdam was founded in 1838, and that of Antwerp in 1843.

The idea was then taken up in Germany, resulting in the opening of the Berlin Zoological Gardens in 1844.

In 1850 the Zoological Gardens of the World thus consisted of eleven institutions:—Schönbrunn, Madrid, Paris, London (Regent's Park and Surrey), Dublin, Clifton, Manchester, Amsterdam, Antwerp and Berlin.

But in the second half of the nineteenth century such institutions began to be quickly established, not only in Europe, but also in Australia, America, Asia, and, finally, Africa. Although from time to time some of these have closed, others are always coming into existence, and the aggregate number continues to increase. The number of fairly large public Zoological Gardens existing in 1908 may be, approximately, taken as fifty-seven, but including smaller collections of animals, kept up in Botanical Gardens and Public Parks, it reaches a total of ninety-five: but as there are probably a certain number of institutions of the existence of which I may be, unfortunately, ignorant, it may be calculated that the total number of standing menageries exceeds one hundred.

Many fine private collections of living wild animals also exist, notably that of His Grace the Duke of Bedford at Woburn Abbey, but these do not come within the scope of this present article.

I would like to be allowed to take this opportunity of acknowledging my sense of obligation to the many kind friends in many lands by whose help I have been enabled to collect the material for this compilation: especially am I indebted to my brother, Mr. Victor A. Flower, who when travelling in Europe, Asia and America, has been so good as to always send me notes on the various Zoological Gardens that he has visited.

II. EARLY ZOOLOGICAL GARDENS.

The ancient Egyptians, as is profusely demonstrated by inscriptions and mummied remains, kept various species of wild animals in captivity, but the first Zoological Garden properly so called appears to have been established in very early times in China. This institution was founded by Woo-Wang (Wong-Wang), the first Emperor of the Chow (Tscheu) Dynasty, who ruled over the northern parts of China rather more than a thousand years before the Christian era. It is noteworthy that the Chinese, thus early realizing the educational value of such an institution, called it "The Intelligence Park."

In Greek and Roman times, as is well known, collections of wild beasts were made in foreign lands and brought to the chief towns for exhibition. This was not done however from purposes of interest in the animals themselves or for the cause of science, but for display and public slaughter. It is recorded that Lions, Leopards, Bears, Elephants, Rhinoceros, Antelopes, Giraffes, Camels, Hippopotamus, Ostriches and Crocodiles, in incredible numbers, were killed in the arenas of Rome: killed either in mutual combat, or at the hands of professional gladiators or condemned criminals and slaves, in order to gratify the popular appetite for sensation.

An exception to this brutality can however be made in the case of Alexander the Great (356-323 B.C.) who, it appears, caused extensive collections of rare and unknown animals to be transmitted to his old tutor, the great philosopher and zoologist Aristotle (384-322 B.C.).

In later times Royal Personages frequently kept menageries of wild animals, aviaries of birds and ponds of fish: partly for sport, partly as pets and partly for exhibition to their personal guests and visitors.

In these collections, many of which still exist, was the origin of the modern Zoological Gardens.

In Europe the public Zoological Garden may be said to have gradually evolved from the Royal menagerie, but in America a period of three hundred and thirty-eight years intervened between the overthrow of the Imperial Mexican Menagerie in

1521, and the foundation of the Philadelphia Zoological Society in 1859.

In England the first recorded Royal Menagerie was at Woodstock, Oxfordshire, in the time of King Henry I. (1100–1135). This was transferred to the Tower of London, apparently in the reign of Henry III. (1216–1272), and kept up there till after 1828. A second English Royal Menagerie existed at Windsor. Kew should perhaps also be mentioned here: the famous Botanical Gardens, founded privately in 1551, which are now about two hundred and fifty acres in extent, at one period contained a menagerie. In a book entitled ‘The Picture of London for 1808’ are the following particulars concerning the collection of animals then kept in Kew Gardens:—“The Aviary contains a large collection of birds of all countries. In the Flower-garden are to be seen all kinds of beautiful flowers, and in its centre a bason of water, well stocked with gold fish. The Menagerie contains Chinese and Tartarian pheasants, and various large and exotic birds, with a bason stocked with waterfowl, in the centre of which is a pavilion in the Chinese manner” (*vide* S. Goldney, ‘Kew Gardens,’ London 1907).

In France King Philip VI. (1328–1350) had a menagerie in the Louvre at Paris in 1333. Charles V. (1364–1380) had menageries and aviaries at Conflans, Tournelles and in Paris (*vide* E. T. Hamy). Louis XI. (1461–1483), who is said to have introduced and established the Canary-bird in Europe, formed a menagerie at Plessis les Tours in Touraine. After the death of Louis XI. the Royal French Menagerie was re-established at the Louvre, special missions were sent to North Africa &c. to obtain specimens, and the collection was rapidly growing, when on the 21st of January 1583 the entire menagerie came to a violent end: Henry III. (1574–1589) saw in a dream Lions, Bears and Dogs tearing himself to pieces, and in consequence “had all the Lions, Bulls, Bears &c. killed with shots of arquebus” (*vide* E. T. Hamy). Henry IV. (1589–1610) kept up a very small menagerie, but one which included an Elephant. Louis XIII. (1610–1643) kept some mammals and birds at his hunting lodge at Versailles, and his son Louis XIV. (1643–1715) in 1663 founded the celebrated Versailles menagerie, the “Menagerie du Parc.” During the first twenty-five years of its existence this collection received

very numerous additions, particularly from the French Consul at Cairo. The stock of animals during this period is said to have reached "several thousands."

For nearly a hundred years this Versailles menagerie appears to have been kept in good order, and was of the greatest value to the zoologists of those times. But during the later years of Louis XV. (1715-1774) it fell to a very low ebb of efficiency, and abuses were prevalent. It is said that a Camel was supplied, at the cost of the State, with six bottles of Burgundy wine daily, and that when the animal died a soldier of the Swiss Guard petitioned to be given the vacant billet of Court Camel.

In October 1789 the menagerie was almost destroyed by the Parisian mob: the only animals that survived this attack were a Senegal Lion, a Dalmatian Hound, an Indian Rhinoceros, a South African Quagga, an Algerian Hartebeest and a Moluccan Pigeon (*vide* E. T. Hamy).

The idea of forming a collection of live animals in the old-established Botanical Garden of Paris is apparently due to Buffon, but he died in 1788 without seeing the realization of his plan.

By the law of the 10th of June 1793 the Paris Museum of Natural History was reorganized, and later in the same year the Jardin des Plantes menagerie was started. The animals were first lodged under the galleries of the Museum, and later on were housed in that part of the Garden between the great Chestnut Avenue and the street now called the Rue Cuvier, known as *La Vallée Suisse*: where their successors still remain.

The first animals reached the Museum on the 4th of November 1793; they were a Sea-Lion, a Leopard, a Civet-Cat and a Monkey, and were at once taken charge of by Étienne Geoffroy Saint-Hilaire, then twenty-one years old. The next day the arrivals included a White Bear and two Mandrills, and in the following spring the few surviving inhabitants of the Versailles menagerie were brought to the Garden.

Of the early German menageries I have been able to obtain but little information. Herr Schoepf mentions, in his 'Gedenkblätter,' 1552 as the earliest date when an Imperial menagerie existed, and says that the Dresden menagerie was started by Kurfurst August I. in 1554: up to 1737 the only animals mentioned as having been kept at Dresden are Mandrills, Lions,

Tigers, Leopards, Indian Cats, Bears, Swine and Porcupines, but in 1747 a young Rhinoceros from Bengal was exhibited alive there.

The first recorded Zoological Gardens in the New World were those of King Nezahualcoyotl, the "Hungry Fox" (born about 1403, died about 1475) at his capital of Tezcuco, on the east side of the lake, in Mexico. Prescott, 'History of the Conquest of Mexico' (edition of 1878, p. 85) mentions these Gardens as containing basins of water "well stocked with fish of various kinds, aviaries with birds glowing in all the gaudy plumage of the tropics," and also states that "many birds and animals which could not be obtained alive were represented in gold and silver."

In the following century there were two such Gardens in America: Iztapalapan and Mexico itself. On the 7th of November 1519 Hernando Cortés entered Iztapalapan, then governed by Cuitlahua (Montezuma's brother), and saw its celebrated gardens in their prime. Prescott, p. 261, mentions the "aviary, filled with numerous kinds of birds, remarkable in this region both for brilliancy of plumage and of song," and also the basin "with different sorts of fish."

Montezuma II., Emperor of Mexico (born about 1479, elected King 1502, died 1520), appears to have maintained large Zoological Gardens at his capital (see Prescott, pp. 286, 287). There were extensive gardens "filled with fragrant shrubs and flowers, and especially with medicinal plants." Among the buildings "was an immense aviary, in which birds of splendid plumage were assembled from all parts of the empire. . . . Three hundred attendants had charge of this aviary, who made themselves acquainted with the appropriate food of its inmates, oftentimes procured at great cost, and in the moulting season were careful to collect the beautiful plumage, which, with its many-coloured tints, furnished the materials for the Aztec painter."

"A separate building was reserved for the fierce birds of prey." For the feeding of which Prescott (p. 286) says that five hundred turkeys were allowed per day; but from Oviedo's original account in Spanish, in Prescott's Appendix (p. 679) it appears that these five hundred birds were the daily rations of not only the fifty "Eagles," but also of the carnivorous mammals and of the great Snakes, as bulky as a man's leg.

The main menagerie building was a great hall 150 "feet" long, by 50 wide. Oviedo, in his contemporary account (*op. cit.* p. 679), writes:—"En entrando por la sala, el hedor era mucho é aborrecible é asqueroso" (on entering the hall the stench was detestable and loathsome), a detail which Prescott does not mention, but that we can well imagine to have been true.

Prescott tells us that "The serpents were confined in long cages lined with down or feathers, or in troughs of mud and water. The beasts and birds of prey were provided with apartments large enough to allow of their moving about, and secured by a strong lattice-work, through which light and air were freely admitted." "Ten large tanks, well stocked with fish, afforded a retreat on their margins to various tribes of water-fowl, whose habits were so carefully consulted that some of these ponds were of salt water, as that which they most loved to frequent." There was also "a strange collection of human monsters" and dwarfs.

The destruction, by fire, of the House of Birds, in 1521, is graphically told by Prescott (p. 515).

III. MODERN ZOOLOGICAL GARDENS (*arranged alphabetically under Continents, and in Europe under Countries*).

AFRICA.

1. ALEXANDRIA, EGYPT.—Since 1907 a small menagerie has been maintained by the Municipality in the Nouzha Garden, a beautiful park just outside the city. Entrance is free. The collection is under the care of Monsieur Louis Monfront, Directeur des Parcs et Plantations de la Ville.

2. DURBAN, NATAL.—Municipal menagerie in Mitchell Park.

3. GEZIRA, CAIRO, EGYPT.—His Highness the Khedive Ismail Pasha established a collection of live animals in the gardens of his palace at Gezira. The late Sir William Flower records in his diary of the 2nd of April 1874 seeing there:—"Two African Elephants, seven Giraffes, sixteen Lions (of all ages), three Leopards, two Servals, one Spotted Hyæna, three Nylghaies, four Hartebeests, two Leucoryx, smaller Antelopes, Deer, Kangaroos, Secretary Birds, Flamingos, good collection of Pheasants and fowls, Emu, &c." All that now remains is the Aquarium, built by Ismail Pasha, adjoining his menagerie, which, after having

been untenanted for about a quarter of a century, was reconstructed by the Egyptian Public Works Department and opened to the public in 1902.

4. GIZA, CAIRO, EGYPT.—Ismail Pasha also had magnificent Gardens laid out round his palace at Giza. In one of these Gardens, known as the "Haremlik," which was constructed in about the years 1867–1872, were several aviaries for birds, and, I believe, a few mammals were also kept; but it was not a zoological garden nor were visitors ever admitted to it. In 1891 however, when it was decided to have a Zoological Garden for Cairo, the Government allowed this garden to be used for the purpose, and later in 1898 the area was more than doubled by the addition of part of the adjoining "Selamlik" Garden. The Giza Zoological Gardens are now a Government institution administered by the Public Works Department. The present writer is the Director of these Gardens and of the Giza Aquarium, with Mr. Michael J. Nicoll as Assistant-Director. Annual and special reports are published.

5. KHARTOUM, SUDAN.—The Khartoum Zoological Gardens were started in 1901 in the centre of the city, but moved to their present site on the tongue of land between the White and Blue Niles in 1903. The gardens, which are free to the public, are under the Municipality, but the collection of live animals is under the Game Preservation Department, of which Mr. Arthur L. Butler is Superintendent.

6. PRETORIA, TRANSVAAL.—The Transvaal Zoological Gardens originally started in a yard near Market Square in 1898, and were moved to their present site in 1899. The Director is Dr. J. W. B. Gunning, who is also Director of the Transvaal Museum, which post he has occupied since 1896. An illustrated Guide-book is published.

7. TUNIS.—Dr. P. L. Sclater has recorded (P.Z.S. 1898, p. 280) visiting "the private collection of living animals belonging to the Bey of Tunis at the palace at Marsa." At the time of Dr. Sclater's visit there were some interesting exhibits, but whether this menagerie is still kept up, and if so to what extent it is open to visitors, I have been unable to ascertain.

AMERICA, NORTH.

8. BALTIMORE.—There is said to be a small Zoological Garden in Druid Hill Park, the latter being seven hundred acres in extent.

9. BUFFALO, NEW YORK. — The Buffalo Zoological Gardens started in a small way in 1895, under the supervision of the Park Superintendent. They were reorganized in 1898, and are now under the Park Commissioners, the President in 1908 being Mr. George C. Ginther, and the Secretary Mr. George H. Selkirk. The present Curator of the zoological collection is Dr. Frank A. Crandall, who has been in charge since the 1st of March 1898. An annual report is published.

10. CEDAR RAPIDS, IOWA.—Zoological Gardens established in City Park, 1908.

11. CINCINNATI. — A privately owned Zoological Gardens started in 1875, said to contain a very fine collection. Mr. S. A. Stephen is the Director.

12. CHICAGO.—I am told that the Zoological Garden in Lincoln Park, Chicago, is one of the largest in the world. The Superintendent is Mr. R. H. Warder, who is assisted by Mr. C. B. de Vry as Head Keeper of the Animals.

13. CLEVELAND, OHIO.—The zoological collection was started about 1903; it is situated in Wade Park and managed by the Cleveland Park authorities.

14. DENVER, COLORADO.—Privately owned Zoological Gardens, first opened in 1889. The proprietress for some years was Mrs. Elitch Long. The Gardens are now managed by Mr. E. P. Horne.

15. DETROIT, MICHIGAN.—A small Zoological Garden, and, I am told, an excellent Aquarium, maintained by the State in Belle Isle Park, under the direction of the Commissioner of Parks and Boulevards. Mr. M. L. Hurlbut is Secretary to the Commissioner.

16. KANSAS CITY, MISSOURI. — The Kansas City Zoological Society was organized in December 1907, to maintain a big menagerie in Swope Park. Mr. W. V. Lippincott is President, Mr. H. R. Walmsley Secretary, and Mr. I. S. Horne Director.

17. LOS ANGELES, CALIFORNIA. — Zoological Gardens established in Idora Park, 1908.

18. MEMPHIS, TENN. — Zoological Gardens established in Overton Park, 1908.

19. MILWAUKEE, WISCONSIN. — The Zoological Gardens in Washington Park were started in 1905 with two Bears, three Foxes and some Virginian Deer. In the three years 1906, 1907 and 1908 extraordinary progress seems to have been made, a large collection of animals has been formed, and sufficient financial support has been forthcoming to admit of spending over £12,000 on cages and paddocks. The governing body is the Board of Park Commissioners. Mr. Daniel Erdmann is President, Mr. Frank P. Schumacher is Secretary, Mr. Ed. H. Bean is the Director ; he has had charge of the collection since March 1906, when it was still in its infancy.

20. NEW ORLEANS. — A zoological collection was started a few years ago in Audubon Park, but I have been unable to obtain any information as to its progress.

21. NEW YORK (CENTRAL PARK). — The Zoological Gardens in Central Park were founded in 1865 ; they are supported by the Municipality. This collection is famous for its success in breeding animals, notably Hippopotamus.

22. NEW YORK (BRONX PARK). — The Zoological Park in Bronx Park, under the management of the New York Zoological Society, was founded in 1898. This Society also looks after the New York Aquarium. The present officers are :—Secretary Mr. Madison Grant, Director Dr. William T. Hornaday, Scientific Assistants Messrs. Raymond L. Ditmars and C. William Beebe, Director of Aquarium Mr. Charles H. Townsend. The publications of this Society, bulletins, annual reports, and guide-books are remarkable for the excellence of the photographs of animals by Mr. Elwin R. Sanborn.

23. OKLAHOMA CITY. — Zoological Gardens established in City Park in 1908.

24. PHILADELPHIA. — Zoological Gardens in Fairmount Park, belonging to the Zoological Society of Philadelphia (incorporated 21st March 1859), and managed by a board of twenty "directors," of whom eighteen are elected by the Society and two by the City Councils. The Secretary and General Manager is Mr. Arthur Erwin Brown, and the Superintendent of the Gardens is Mr. Robert D. Carson. An annual report is published, a special

feature of which is the classified list of autopsies made during the year in the Pathological Laboratory.

25. PITTSBURG, PENNSYLVANIA. — Highlands Park is said to contain a good zoological collection.

26. PORTLAND, OREGON.—Zoological Gardens established in City Park in 1908.

27. SAN FRANCISCO, CALIFORNIA.—I have been unable to obtain any recent news of this institution, the existence of which I only know of from an illustrated guide-book that a friend lent me about eight years ago.

28. SPRINGFIELD, MASS.—A small collection in one of the City Parks. Mr. C. E. Ladd, Superintendent.

29. ST. LOUIS, MISSOURI.—Zoological Gardens started in 1903, under the Park system.

30. TACOMA, WASHINGTON.—Free Public Gardens, with a growing zoological collection.

31. TOLEDO, OHIO.—The Zoological Garden, started in 1900, is under the Park and Boulevard Department of the City. Mr. M. L. Moore is Superintendent of Parks and Boulevards. The Board of Park Commissioners is contemplating the removal of the present menagerie to a larger park, and housing it in a permanent fashion.

32. TORONTO, CANADA.—Zoological collection, started about 1900, in charge of the Commissioner, City Parks Department.

33. VANCOUVER, CANADA.—Public Park with small zoological collection (*vide* W. H. D. le Souëf, Zool. Soc. of Victoria, 44th Annual Report (1908), p. 13).

34. WASHINGTON, D.C.—An important collection in the National Zoological Park, founded in 1890, under the management of the Smithsonian Institution. Dr. Frank Baker is the Superintendent.

AMERICA, SOUTH.

35. BAHIA, BRAZIL.—A small zoological collection in a public park just outside the town. Mr. M. J. Nicoll visited this garden on the 26th of December, 1902, and tells me that the menagerie then only contained some Peccaries, Parrots, Curassows and a Peacock.

36. BLUMENAU, BRAZIL.—Zoological Gardens opened in 1870; no longer existing.

37. BUENOS AIRES.—Municipal Zoological Gardens. Founded by General Sarmiento in 1874. The present Director is Signor Clemente Onelli. This institution publishes an illustrated guide-book, and a quarterly scientific journal.

38. GEORGETOWN, BRITISH GUIANA.—A menagerie existed at one time in the Botanical Gardens of Georgetown. Manatees, Anteaters and other interesting South American animals were exhibited here.

39. PARA, BRAZIL. — An interesting menagerie attached to the Museum of Natural History and Ethnography, named the "Museu Goeldi," after its well-known former Director Dr. Emilie A. Goeldi. The present Director is Dr. Jacques Huber, and the Superintendent Dr. Emilia Snethlage. A periodical "Boletim" is published by the Museum.

40. RIO DE JANEIRO.—Zoological Gardens under the directorship of Mr. Kirschnur.

ASIA.

41. BANGKOK, SIAM.—In 1896–1898, when I lived in Bangkok, there was a Zoological Garden there, the property of His Majesty the King of Siam, open free to the public on certain days. The collection contained mammals, birds, some fairly large Crocodiles, and small aquaria for fish. From time to time very interesting local animals were exhibited (see P. Z. S. 1900, pp. 369 and 371). I am told that this menagerie no longer exists.

42. BARODA, INDIA.—A zoological collection in the Park, owned by the Maharaja of Baroda, who allows the public to visit it freely.

43. BOMBAY, INDIA.—Zoological collection in the Victoria Gardens. Mr. C. D. Mahaluxmivala, Superintendent. These Gardens are round the Victoria and Albert Museum; the best thing is the enclosure for Lions, an irregular oval space of grass and trees, perhaps about one hundred feet long by sixty wide, surrounded by a railing, but with no roof, and a small sleeping place at one end. The railings are about fifteen feet high, curved inwards at the top, and of very light appearance.

44. CALCUTTA, INDIA.—The large Zoological Gardens at Alipore, Calcutta, were founded in 1875. They are well known throughout the world to zoologists, who have not personally visited India, by two useful publications:—

(i). 'Guide to the Calcutta Zoological Gardens,' by the late Dr. John Anderson, F.R.S., 1883.

(ii). 'Handbook of the Management of Animals in Captivity in Lower Bengal,' by Ram Bramha Sányál, 1892.

Rai R. B. Sányál Bahadur, who died on the 13th of October, 1908, will always be remembered in connection with the Calcutta Zoological Gardens, in which he worked for thirty-three years.

This institution is managed by an Honorary Committee, of which Lieutenant-Colonel E. H. Brown, of the Indian Medical Service, is Secretary. Mr. Bejoy Krishna Basu, Veterinary Inspector, was appointed Assistant Superintendent of the Garden by the Government of Bengal on the 25th of February, 1907. An annual report is published.

45. COLOMBO, CEYLON.—A small menagerie is maintained in the Gardens of the Museum, of which Dr. A. Willey is the Director.

46. HANOI, TONKIN.—A collection of live animals is kept in the Botanical Gardens. Monsieur Louis Jacquet, Directeur Jardin botanique de Hanoi, Monsieur Farant, Chef du Jardin.

47. JAIPUR, INDIA.—Small zoological collection.

48. KIOTO, JAPAN.—Municipal Zoological Gardens "which are situated right in the city, the Gardens are nicely laid out and have a splendid Flight Aviary, as well as a good Carnivora House." There is also a Deer Park, with very fine old cedar and pine trees at Nara (*vide* W. H. D. le Souëf, Zool. Soc. of Victoria, 44th Annual Report (1908), p. 12).

49. KURRACHEE, INDIA.—Zoological Gardens of which great things were expected about eleven years ago, but which apparently have not progressed during recent years.

50. LAHORE, INDIA.—A small Zoological Garden is said to exist at Lahore.

51. MANILLA, PHILIPPINES.—Under the Government of Spain a few animals were kept in the Botanic Gardens, but these Gardens became the site of a battle and were completely destroyed.

A certain number of mammals, birds and reptiles are now exhibited alive in the Public Gardens, and it is proposed to have a regular Zoological Garden in Manilla.

52. OSAKA, JAPAN.—When the menagerie in the Singapore Botanic Gardens closed, the Tiger, Crocodile and some other large animals were sent to Osaka: but I have been unable to obtain any information as to what sort of menagerie or garden exists at Osaka.

53. PEKIN, CHINA.—Zoological and Botanical Garden, recently started, or re-started.

54. PUKET, JUNKCEYLON, MALAYA. — The Puket (Tongkah) Government maintains a small Zoological Garden, open free to the public. The collection is said to consist of a Tiger, two Leopards, two Black Panthers and two Crocodiles.

55. RANGOON, BURMA.—The Zoological Garden in the Victoria Memorial Park is managed by the Park Administration. The Secretary is Mr. W. Shircore of Barr Street, Rangoon. I understand that the ground was given by the Government, and the park, &c., laid out with funds subscribed by the public as a memorial to Queen Victoria. The institution was opened by His Royal Highness the Prince of Wales, when in Rangoon, on his last Indian tour.

The Zoological Garden is about fourteen acres in area (but there is already some talk of an extension), and adjoins the Royal Lakes. In the Elephant House there is said to be one of King Theebaw's "White" Elephants.

56. SAIGON, COCHIN-CHINA.—A large garden, botanical at one end, zoological at the other. Monsieur E. Haffner, Director.

57. SINGAPORE, STRAITS SETTLEMENTS. — A very interesting account of the Menagerie at the Botanic Gardens of Singapore, from its foundation in 1859 to its end in 1905, has been written by Mr. Henry N. Ridley, F.R.S., Director, Botanic Gardens, Singapore, and published in the 'Journal' of the Straits Branch, Royal Asiatic Society, No. 46 (December, 1906), pp. 133-194. It is greatly to be hoped that a Zoological Garden may be re-started in Singapore.

58. SOURABAYA, JAVA.—Some sort of a collection of animals appears to have been in existence at Sourabaya, but I have no definite information concerning it.

59. TIMOR DILLI, PORTUGUESE MALAYA. — In the Public Gardens there is a collection of live animals. Mr. W. H. D. le Souëf, Zool. Soc. of Victoria, 44th Annual Report (1908), p. 11, men-

tions that he saw there Monkeys, Deer and Birds, including Cassowaries.

60. TOKYO, JAPAN. — The Japanese Government Zoological Garden is in the large Uyeno Park, where are also situated the Imperial Museum, Observatory, Library, &c. Dr. K. Tayama, of the Tokyo Imperial University, acting for Prof. Ishikawa, was good enough to inform me in August 1908 that the Directorship was vacant: I have not yet heard if an appointment has been made. Mr. Henry Scherren, in the 'Field' for the 14th of September, 1907, has given a short account of this collection.

Mr. W. H. D. le Souëf, Zool. Soc. of Victoria, 44th Annual Report (1908), p. 12, mentions that there are also to be seen at Tokyo freshwater Fish and Turtle hatcheries, a small but good Aquarium, and, in the Imperial Botanical Gardens, many aviaries for birds and some waterfowl on the ponds.

61. TRIVANDRUM, TRAVANCORE, INDIA.—The Trivandrum Museum and Public Gardens, of which the menagerie forms part, were founded in 1859. A sketch of the origin and progress of these combined institutions has been written by Mr. H. S. Ferguson, the late Director, and published in the Report on the Trivandrum Museum for M. E. 1075 (A.D. 1899–1900). The present Director, who was appointed on the 2nd of July, 1904, is Lieutenant-Colonel F. W. Dawson.

AUSTRALASIA.

62. ADELAIDE.—The Gardens of the South Australian Zoological and Acclimatisation Society were founded in 1879. The present Director is Mr. Alfred C. Minchin. An annual report is published.

63. MELBOURNE.—The Gardens of the Zoological and Acclimatisation Society of Victoria were founded in 1857. Mr. W. H. Dudley le Souëf is the present Director. An annual report is published.

In Melbourne there is also an Aquarium, where aquatic mammals, birds, and reptiles are kept as well as fish, in the Exhibition Buildings, under the control of the Exhibition Trustees. Mr. James E. Sherrard is the Secretary. This Aquarium was commenced in 1884 and opened in 1885, and is apparently the oldest institution of its kind in Australia. Others have

subsequently been established at Sydney, at Bondi, and at Coogee.

64. PERTH.—The Zoological and Acclimatisation Gardens at South Perth, Western Australia, were founded in 1898. The President is the Honourable J. W. Hackett, and the Director is Mr. E. A. le Souëf.

65. SYDNEY.—The Gardens of the New South Wales Zoological Society were founded in 1879. The executive officer, whose duties correspond with those of the Directors of the other Australian Gardens, is Mr. A. Sherbourne le Souëf, the Secretary. An annual report is published.

66. WELLINGTON, NEW ZEALAND. — A Zoological Garden has been started at Wellington in 1908. Mr. A. E. L. Bertling is the Superintendent.

EUROPE.

AUSTRIA.

67. CRACOW.—A small menagerie in the Park Krakowski, under the care of the Director of the Botanical Gardens.

68. SCHÖNBRUNN, VIENNA.—The Imperial Menagerie of the Palace of Schönbrunn was founded by Francis I., Emperor of Germany (1708–1765) and Maria Theresa (1717–1780) in 1752.

These Gardens are the property of, and kept up at the expense of, His Imperial Majesty the Emperor of Austria, who allows the public free admittance to the greater part of the grounds. It is not only the oldest Zoological Garden in the world, but one of the very best, and has reached its present high state of efficiency under the charge of Inspector A. Kraus.

69. TROPPAU, AUSTRIAN-SILESIA. — This town has not got a zoological garden, but a trading menagerie, founded in 1867, now owned by Herr Joseph Pilz.

70. VIENNA.—The citizens of Vienna have from time to time been able to see other collections of live animals besides that of Schönbrunn. In 1802 a government menagerie was established, which was accidentally destroyed by fire in 1848. A zoological garden was founded in 1863, but closed in 1866. The "Vivarium," built in 1872, came to an end from want of financial support about December, 1898. Finally in 1901 the Institute of Experimental Biology came into being, and, being assisted by

annual subventions from the Government, will have, we hope, a long and successful career.

The "Tierpark" at Brunn belonging to the Viennese firm of Carl Guderer (established 1867) must also be mentioned.

BELGIUM.

71. ANTWERP.—The beautiful garden and large menagerie of "La Société Royale de Zoologie d'Anvers" are well known. They were founded in 1843. The present Director is Monsieur Michel l'Hoëst.

72. BRUSSELS. — Zoological Gardens founded 1851, closed 1878.

73. GHENT.—The Zoological Garden of Ghent was founded in 1851. I knew it well at one time, and was very sorry to hear that it had been closed in 1904.

74. LIEGE.—A small Zoological Garden on an island in the river, founded in 1861, which has been recently closed (1904?).

BRITISH ISLES.

75. BIRMINGHAM. — A zoological garden has existed in the suburbs of Birmingham at some time during the last twenty-five years, but no definite information is at present available.

76. BLACKPOOL.—No zoological garden, but a large menagerie and very fine Aquarium in the "Tower," under the management of Mr. James Walmsley.

77. BRIGHTON.—About ten years ago a prospectus was issued concerning a Zoological Garden about to be started at Brighton, but apparently the idea was not carried out.

The Brighton Aquarium is well known.

78. CARDIFF.—The only public collection of live animals in Wales appears to be a small Zoological Garden recently started by the Municipality of Cardiff.

79. CLIFTON. — The Bristol, Clifton and West of England Zoological Society owns the small but excellent Zoological Gardens on the edge of Clifton Downs, which were founded in 1835. This institution is managed by a Committee of twenty-seven members, Dr. A. J. Harrison being Treasurer and Chairman, Mr. W. C. Beloe Honorary Secretary and Mr. E. W. B. Villiers

the executive Superintendent. Illustrated guide-books and annual reports are published.

80. CRYSTAL PALACE, SYDENHAM. — An aquarium, a small menagerie and some waterfowl in the gardens have been long maintained in this institution: this collection has recently (1907) been augmented by the loan of the large private menagerie belonging to Mr. Robert Leadbetter of Hazlemere Park, Buckinghamshire. An illustrated guide-book of this latter is published.

81. DUBLIN. — An account by Prof. D. J. Cunningham, F.R.S., of the origin and early history of the Royal Zoological Society of Ireland, which was founded in 1830, was published in 1901. The Society is governed by a Council, the President for 1908 being the Right Honourable Jonathan Hogg, the Honorary Secretary is Dr. R. F. Scharff, of the Dublin Museum. Mr. Thomas Hunt, who had been resident Superintendent since February 1890, retired in 1907, and Captain L. C. Arbuthnot was appointed to succeed him, and took over the duties from the 1st of December, 1907. Illustrated guide-books and annual reports are published.

82. EDINBURGH. — A Zoological Garden formerly existed in the capital of Scotland; a short account of what it contained in May 1858 by "W. C. M." was published in the 'Scotsman' for the 15th of September, 1908.

A movement is now on foot to re-start a Zoological Garden in Edinburgh, a provisional Committee has been formed, Messrs. James Anderson and T. H. Gillespie have been appointed Joint-Secretaries and Mr. W. Burn Murdoch the first Treasurer.

83. GLASGOW. — The so-called "Scottish Zoo," founded about 1901, in the New City Road, Glasgow, which belongs to Mr. Bostock (Bostock and Wombwell's Menagerie), is reported to be closing this year.

Mr. William Nicol, ex-Bailie, has recently, in the 'Glasgow Herald' for the 4th of February, 1909, made practical suggestions for a Municipal Zoological Garden in Glasgow.

84. IPSWICH. — The Municipality of the county-town of Suffolk have a small collection of live animals, I am told, in a public park.

85. LIVERPOOL. — A Zoological Garden was founded, if my

information is correct, in Liverpool in 1884 with a capital of £30,000, but closed in 1886.

Two exhibitions of live animals now exist in Liverpool: the Aquarium in the Museum, and Mr. W. S. Cross's trading menagerie in Earle Street.

86. LONDON (REGENT'S PARK).—The Zoological Society of London is *par excellence* the leading institution of its kind in the world, both by reason of its invaluable scientific publications, and for possessing *the* Zoological Gardens. *The* Zoological Gardens which from their foundation in 1828 to the present time have proved of such immense value and pleasure to generations of visitors, and which during the many years that they were administered, with such extraordinary ability and energy, by Dr. Philip Lutley Sclater, F.R.S., and the late Mr. Abraham Dee Bartlett obtained the great reputation which they now hold among the practical naturalists of all countries.

The origin and history of the Regent's Park menagerie can be learnt from the 'Record of Progress' published by the Society in 1901, and from Mr. Henry Scherren's book 'The Zoological Society of London' which was published about 1906. The present executive officers are Dr. Peter Chalmers Mitchell, F.R.S., Secretary, Mr. Reginald Innes Pocock, Superintendent, and Mr. Arthur Thomson, Assistant Superintendent.

87. LONDON (SURREY).—The Surrey Zoological Gardens were founded about 1829 by Mr. Edward Cross, the proprietor of the famous Exeter Change menagerie. They were closed in 1856.

88. LONDON (BATTERSEA PARK).—A small collection of deer and birds is maintained in this park, on the south side of the Thames, by the Municipality "London County Council."

89. MANCHESTER.—The Zoological Gardens, Belle Vue, Manchester, are the property of the Messrs. Jennison. The Jennison family have owned and managed this institution since its foundation in 1836.

An illustrated guide-book is published.

90. SOUTHEND.—A few years ago a menagerie was maintained at the "Kursaal" at Southend in Essex, but apparently no longer exists.

I have heard that there was one also at Margate in Kent.

91. SOUTHPORT.—A Zoological Garden was started at South-

port in Lancashire in 1906, under the joint proprietorship of Mr. Nathan Yates and Mr. W. Simpson Cross. Since 1908 Mr. Yates has been sole proprietor.

DENMARK.

92. COPENHAGEN.—The “Zoologisk Have” of Copenhagen was founded in 1859, and is this year celebrating its “Jubilæum.” Mr. Julius Schiött is Director.

FRANCE.

93. LYONS.—The beautiful Parc de la Tête-d’Or, 114 hectares* in area, was laid out in 1857, but apparently the menagerie was not stocked till 1872. This zoological collection belongs to the Municipality of Lyons and is open free to all visitors. The present Director is Monsieur P. Didier, Médecin Vétérinaire.

94. MARSEILLES. — These Zoological Gardens, founded in 1855, were originally connected with the Jardin d’Acclimatation of Paris, but in, or about, 1898 were taken over by the Municipality of Marseilles, to whom they now belong. They are under the care of Monsieur Pierre Illy, Directeur des Travaux Neufs et Plantations de la Ville.

95. NICE-CIMIEZ.—A small, privately owned Zoological Garden was opened to the public on payment towards the end of the nineteenth century, and was closed about 1906.

96. PARIS (JARDIN DES PLANTES).—As mentioned earlier in this paper the famous menagerie attached to the French Government Museum of Natural History was started in 1793. The present Director of the Museum is Prof. Edmond Perrier. Prof. Edouard Louis Trouessart is in charge of the menagerie (mammals and birds), assisted by Monsieur L. E. Sauvinet. Prof. Léon Vaillant has charge of the reptiles.

97. PARIS (JARDIN D’ACCLIMATATION).—The Jardin zoologique d’Acclimatation is not a government institution, but is owned by a society, and occupies a site, in the Bois de Boulogne, lent by the Municipality of Paris in 1858. This site has to be handed back to the Municipality on the 31st of December, 1962. The buildings were commenced in 1859, and the garden was formally opened by the Emperor Napoleon III. on the 6th of October, 1860. The present Director is Monsieur Arthur Porte.

* A hectare = nearly 2½ acres.

GERMANY.

98. AIX-LA-CHAPELLE.—A small Zoological Garden was opened at Aix about 1886, and closed about 1903.

99. ALFELD-ON-LEINE.—This little town in the Province of Hanover does not possess a zoological garden, but contains two important trading menageries, those of Herr C. Reiche and of Herr Ruhe.

100. BERLIN.—The famous Zoological Gardens of Berlin were founded in 1844. The wonderful collection of mammals and birds that they now contain is too well known to require more than mention here. The Director is Prof. Ludwig Heck, and Dr. O. Heinroth is scientific Assistant.

The Berlin Aquarium is a separate institution.

101. Breslau. — One of the chief Zoological Gardens of Europe. Founded 1865. Director, Herr F. J. Grabowsky.

102. CASSEL.—No longer existing. I am not aware of the dates when this garden started or was closed.

103. COLOGNE.—A large Zoological Garden founded in 1860. The site being involved in the scheme of fortification for the defence of the city, the garden authorities were restricted by military conditions in erecting buildings in various parts of the grounds. Certain of the animal houses had to be so constructed that, if necessary, they could be completely cleared away within a given number of hours so as to afford a clear field of fire for the guns of the fortress. Within the last few years however these regulations have been relaxed. The present Director is Dr. L. Wunderlich.

The Aquarium of Cologne is not connected with the Zoological Gardens, but is situated in the neighbouring "Flora" Gardens.

104. DRESDEN.—Zoological Garden in the Grosse Garten, founded in 1861. Director, Comm. Rat. Adolf Schoepf.

105. DUSSELDORF.—Zoologischer Garten "Scheidt-Keim-Stiftung." Founded 1874. Dr. Hermann Bolau, Director. As is the case with several of the German Zoological Gardens, a very short annual report is published.

106. ELBERFELD.—A small Zoological Garden, founded in 1879. Herr Keusch has been Director since about 1903.

107. FRANKFORT-ON-MAIN. — Zoological Gardens founded in 1858. The area of the grounds is small, but the collection of animals is very rich. There is an Aquarium in the gardens. The present Director is Dr. Kurt Priemel.

108. HALLE-ON-SAAL. — Zoological Garden founded in 1901, and rapidly growing under its first Director, Dr. G. Brandes. An illustrated popular periodical is published.

109. HAMBURG. — One of the chief Zoological Gardens of Europe. Founded 1863. Director, Prof. Dr. J. Vosseler. Besides guide-books and annual reports, an illustrated popular periodical is published. There is an Aquarium in the gardens.

110. HAMBURG-STELLINGEN. — Herr Carl Hagenbeck's very original Tierpark was formally opened in 1907 at Stellingen; his well-known trading menagerie had long been established in Hamburg.

111. HAMBURG-GROSSBORSTEL. — The Tierpark of Herr August Fockelmann is a trading menagerie established in the grounds of a country house.

112. HANOVER. — Zoological Garden in the Eilenriede, founded in 1863. Director, Dr. E. Schöff.

113. JENA. — A small Zoological Garden started in 1901, but closed in 1906. Herr Hugo Hahn was the proprietor.

114. KARLSRUHE. — Zoological collection, started in 1864, in Stadt Garten. Herr F. Ries is Garden-director.

115. KÖNIGSBERG. — The Königsberger Tiergarten (founded in 1896), like that of Cologne, has, I am told, had to be laid out in such a manner that in case of war its buildings will not mask the defenders' guns. The collection is said to be a good one, and a large number of fish are kept. The Director is Geh. Comm. Rat. H. Claass.

116. KREFELD. — Zoological Garden founded in 1887, since closed (1884?).

117. LEIPSIG. — A very nice Zoological Garden founded in 1876. The former proprietor and present Director is Comm. Rat. E. Pinkert.

118. LIMBURG-ON-LAHN. — This town has no zoological garden, but is the headquarters of Herr J. Menges, the well-known dealer in wild animals.

119. LÜBECK. — A small Zoological Garden about which I am

in some doubt, as I have been told it was closed in 1904, but also heard it "well spoken of" in 1907.

120. MÜLHAUSEN.—A small Zoological Garden founded in 1868, but nearly destroyed in 1870, when it became the site of an encounter between the French and German troops. It is now under the Municipality, Herr H. Schwantge being the Superintendent.

121. MÜNCHEN-GLADBACH.—A small Zoological Garden formerly existed at this town.

122. MUNICH.—The Zoological Garden founded in 1863 appears to have come to an end in 1866. A new institution is now in process of formation.

A collection of deer and waterfowl has long been maintained at Nymphenburg, in the neighbourhood of Munich.

123. MÜNSTER.—The Westphalian Zoological Gardens were founded in 1875. Herr Heinrich Goffart is the Inspector in charge. Dr. H. Recker, the Director of the Natural History Museum of the Province, and other local gentlemen form an honorary committee of management.

124. POSEN.—Zoological Garden started in 1881. Herr Max Meissner is Director.

125. SOLINGEN.—A small Zoological Garden owned by Wittwe G. Bayer.

126. STETTIN.—The small Zoological Garden of Stettin appears to have had a chequered career; originally opened in 1882, it closed in 1884, was re-started, but closed again in 1903, but was open in 1907 with however a collection of only about six mammals and a few dozen birds, and these mostly domestic, I am told.

127. STUTTGART.—The Zoological Gardens of the capital of Würtemberg have had various changes both of management and of site. The old Royal Menagerie dates from 1812. The garden that became so well known under the Directorship of Herr A. Nill from 1870. The existing garden of which Herr Theodor Widmann is proprietor is only a few years old.

128. ULM-ON-DANUBE. — There is no zoological garden at Ulm, but at Donautal is the trading Tierpark and wild animal depôt of Herr Julius Mohr, jun.

GREECE.

129. ATHENS. — Zoological Gardens. Dr. W. Germanos, Director.

HOLLAND.

130. AMSTERDAM. — The Society "Natura Artis Magistra" owns the great institution, founded in 1838, which comprises not only a large menagerie and gardens, but also a museum of general zoology, a museum illustrating the fauna of Holland, an ethnographical museum, a very good library, and one of the chief aquariums of the world. The present Director is Dr. Coenraed Kerbert, and the Librarian Mr. G. Janse.

131. HAGUE.—Small Zoological Gardens, founded in 1863, belonging to the Koninklyk Zoölogisch Botanisch Genootschap. A peculiar feature of the organization of this society is that the resident executive officer may only hold office for a very limited period; thus in the last nine years the Directorship has been held in succession by Major D. N. Dietz, Mr. L. J. Dobbelmann and Mr. J. W. van de Stadt. A detailed annual report is published.

132. ROTTERDAM.—The Rotterdamsche Diergaarde was founded in 1857. The present Director of this well-known institution is Dr. Johannes Büttikofer.

HUNGARY.

133. BUDA-PEST. — Zoological Gardens founded 1867, temporarily closed 1907.

ITALY.

134. FLORENCE.—In 1487 "Malfota, Envoy of the Sultan of Egypt, Kaitbai," brought a Giraffe alive to Florence for Lorenzo de Medicis (*vide* E. T. Hamy); and other foreign animals have been kept in captivity there from time to time. In recent years I have heard the "Zoological Gardens" of Florence spoken of, but have no definite information on the subject.

135. GENOA.—In 1903 I saw a small collection of animals, that might be almost called a Zoological Garden, in the beautiful Di Negro Gardens at Genoa, adjoining the famous Zoological Museum of which the Marquis Doria is Director.

136. PALERMO, SICILY. — I have been told that there is a collection of wild animals in a garden, or park, near Palermo, but from information kindly supplied by the Zoological Museum of Palermo, I learn that there is no zoological garden there.

137. ROME.—A Zoological Garden is now being formed.

PORTUGAL.

138. LISBON.—Jardim Zoologico e de Acclimação em Portugal. Sociedade Anonyma de Responsabilidade Limitada. The collection is in the Parque das Laranjeiras at Lisbon. Conselheiro José Joaquim Ferreira Lobo is the President of the Board of directors.

RUSSIA.

139. HELSINGFORS, FINLAND.—Zoological Garden founded in 1888. Kapten M. Tamslander is the present Director.

140. MOSCOW.—Imperial Zoological and Botanical Gardens founded in 1864. Monsieur Vladislav Andrevitch Pogogersci is the present Director.

141. ST. PETERSBURG.—Zoological Gardens founded in 1871.

142. WARSAW, POLAND.—I have been unable to obtain any information about this collection, and imagine that it no longer exists.

SPAIN.

143. BARCELONA.—Municipal Zoological Park started in 1892. Senor Francisco de A. Darder y Llimona is the Director.

144. MADRID.—The venerable Zoological Gardens of Madrid date from 1774. Senor Luis Cavanna is the present Director of the "Parque Zoológico del Retiro."

145. XERES.—Zoological Garden founded in 1864, owned by a society or company. This institution was apparently still going in the "eighties," but I have no certain news of when it ceased to exist.

SWEDEN.

146. SKANSEN, STOCKHOLM. — Zoological Gardens, in connection with the Museum, started in 1891. Dr. Alaric Behm is the Director. Illustrated guide-books are published.

SWITZERLAND.

147. BALE.—Zoological Gardens founded in 1874. Dr. G. Hagmann is the present Director. Annual reports and guide-books are published.

148. ST. GALLIEN. A small collection chiefly of European animals.

149. ZURICH.—A small collection, chiefly of foreign animals, was formed in 1902, but came to an end in 1906 (*vide* G. Loisel).

TURKEY.

150. CONSTANTINOPLE.—A collection of live animals in a garden belonging to His Imperial Majesty the Sultan. I do not know to what extent visitors are admitted.

Addenda.

Four Zoological Gardens should be added :—

1. BUCHAREST, ROUMANIA.
2. HALIFAX, YORKSHIRE, ENGLAND.—To be opened in May 1909 at Chevinedge, Salterhebble, near Halifax.
3. JOHANNESBURG, SOUTH AFRICA.—Zoological Garden in Herman Eckstein Park.
4. SZECHUEN, CHINA.—Zoological Garden in newly laid out public park.

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NATURAL HISTORY RECORD BUREAU (1908):
THE MUSEUM, CARLISLE.

By D. LOSH THORPE & LINNÆUS E. HOPE, Keepers of the Records.

MANY notes continue to be sent in to the Bureau, and though the number of contributors is not large—that is to be expected—a knowledge sufficient to enable an observer to identify at sight our local fauna, either mammal, bird, reptile, or fish, is not to be gained in a few hours. The tendency in some quarters to accept nature notes and records unreservedly has nothing to commend it, but is greatly to be deprecated.

The majority of our records naturally relate to ornithology, birds being perhaps the most attractive class to the nature student, and many interesting notes are herewith given.

We are glad to note that the Cumberland County Council, realizing the need for a more detailed order respecting the protection of the smaller wild birds, has curtailed the season during which these birds may be caught, and also given protection to their eggs. We also note with satisfaction that the charming but now somewhat rare Goldfinch is placed under complete protection (neither bird or egg may be taken at any season), and that birdcatching is prohibited on Sundays.

A most interesting feature of bird-life occurred in the early months of the year, following a spell of fairly seasonable weather in March and early April, during which many of our resident birds paired, and some few summer migrants arrived. Winter again set in on April 24th, when we had four inches of snow followed with frost for several days, with cold east and north-east winds.

On April 24th we had the unusual phenomenon of Swallows flitting over the snow-covered ground, and young Thrushes hopping amongst the snow. During the night of April 23rd eighteen to twenty degrees of frost were registered, and at Head's Nook two nests of young Thrushes were reported to be frozen to death.

With the approach of May the wind changed, and the weather

became mild, a change which was quickly noted by all wild life. On the nights of April 30th and May 1st the largest migration of birds recorded for many years passed over Carlisle. Migration had been retarded during the previous cold and stormy weather, and birds appeared to be passing over in one great mass migration. Between eleven and twelve o'clock of the night of May 1st the air seemed full of birds; there was an incessant chorus all round, and from out the babel were recognized (D. L. T.) the notes of Curlew, Oystercatcher, Redshank, Black-headed Gull, Geese, Mallard, Wigeon, Twite, and Warblers; even the House-Sparrow was on the move, one flying against the house-wall at Loshville as Mr. Thorpe was entering. During the following few days the Blackcap, Garden-, Sedge-, and Willow-Warblers were noted, and also Lesser Tern, Redstart, Swift, Spotted Flycatcher, Common Whitethroat, and Yellow Wagtail; the Cuckoo and Corn-Crake were also heard.

On May 6th the Whooper Swan, which had returned to the Eden on Feb. 1st, appeared to be restless; on the following day it was missing. We have in previous reports commented upon this interesting and most unusual occurrence.* The bird has now returned in 1909 for the fifth time, the date of its arrival being Feb. 28th, exactly four weeks later than last year (1908), which in turn is two months later than the date of its arrival in the previous winter. The dates of its arrival and departure up to the present are as follows:—Arrived (in young plumage), December, 1904, left May 8th, 1905; returned Nov. 16th, 1905, left April 29th, 1906; returned Nov. 30th, 1906, left May 7th, 1907; returned Feb. 1st, 1908, left May 6th, 1908; returned Feb. 28th, 1909. Thus it is seen that, although the dates of leaving are fairly uniform, the dates of arrival vary considerably, and have been later each year since its first arrival in December, 1904. On the last two occasions (Feb. 1st, 1908, and Feb. 28th, 1909) its arrival was followed by cold wintry weather, though previously the weather had been comparatively mild, tending to show that its arrival is to a great extent controlled by climatic or atmospheric conditions.

Strangely enough, its return was reported to us in December, 1908, but the bird was not afterwards seen. It was subsequently

* Cf. Eric B. Dunlop, *Zool.* 1906, p. 193.

thought that the bird had arrived but had been killed; happily this rumour proved incorrect, when the bird actually arrived in February of this year.

We are frequently asked, "Where does this bird spend its summer?" A most difficult question to answer; but we know that the summer breeding range of the Whooper is bounded on the south by Iceland and Lapland.

This bird has probably not yet paired or bred, and it will be interesting to find what occurs when that does happen. We are sometimes asked if it is not likely to pair with the Mute Swans. We do not consider it likely, as it is a purely wild bird, and the migratory instinct will be too strong for it to resist so far as to spend the summer on the Eden. Pinioned birds have been known to breed in captivity, and Cuvier (Ann. Mus. Hist. Nat. xii. p. 119) describes a case of hybridisation between a pinioned Whooper and a Domestic Goose.

In August and September most of our usual autumn visitors made their appearance, perhaps not in such large numbers as usual, an exception being the Spotted or Dusky Redshank (*Totanus fuscus*), a flock of seven being seen at one time by Mr. Nicoll, the most he has ever seen together. The same good observer saw on April 8th a Great Skua, the fourth example he has seen on the Solway; it was also seen by other observers, and, like the one recorded by T. C. Heysham, was seen in the act of killing a Gull.

In June a large number of Common Scoters spent several days on the Solway; on June 4th we estimated the number of birds in mid-Firth at over one thousand birds. Redwings were very numerous in October.

During the last few weeks of the year cold wintry weather prevailed, and on Dec. 29th snow fell, accompanied by stormy conditions; on the 30th Mr. W. Nichol saw a fine sight for a wildfowler, Bewick's Swans, Bean Geese, Barnacle Geese, Mallards, and several thousands of Oystercatchers being huddled together for shelter on a small patch of sand at Cardurnock, on the Bowness promontory.

A new Batrachian—the Palmate Newt (*Molge palmata*)—was added to the Lake District list, being recorded for the first time for Westmorland in February, 1908.

We append a selection of the notes and records sent in to the Bureau :—

1908.

January 1st.—A Shag was picked up dead at Crosby-on-Eden (T. H. Hodgson).

4th.—A Red-throated Diver on Windermere (W. E. B. Dunlop).

8th.—Common Scoter (pied variety) shot at Silloth (W. Nichol).

14th.—Green Sandpiper near Silloth (W. Nichol).

18th.—A flock of eleven Bewick's Swans near Silloth (W. Nichol). A Great Crested Grebe shot near Silloth (W. Nichol).

February 2nd.—Sky-Lark singing near Stanwix (D. Losh Thorpe).

3rd.—Palmate Newts (larval stage) obtained near Windermere (W. E. B. Dunlop).

23rd.—Four Shore Larks seen at Silloth (W. Nichol).

March 2nd.—Lapwings seen near nesting ground, Lake District (W. E. B. Dunlop).

12th.—Flock of one hundred White-fronted Geese, some Bean Geese, and a Grey Lag Goose seen at Skinburness (W. Nichol).

17th.—A single Common Scoter on the Solway, also many Wigeon and Mallard on northward migration (W. Nichol).

19th.—A flock of Bean Geese flying north-east over the Solway (W. Nichol).

28th.—A Mistle-Thrush's nest had four eggs at this date near Stanwix (J. B. Cairns).

April 4th.—First Wheatear of the season observed at Skinburness (W. Nichol).

6th.—A Thrush's nest had four eggs near Stanwix (L. E. Hope).

8th. A Great Skua, the fourth recorded, seen on the Solway (W. Nichol). Two Wheatears seen on the golf-course, Silloth (D. Losh Thorpe).

9th.—Sand-Martin seen at Carlisle (W. H. Little).

10th.—Wheatear seen at Windermere (W. E. B. Dunlop).

12th.—Swallows and House-Martins seen at Silloth (D. Losh Thorpe). A Thrush's nest with four eggs at Blackhall (W. Marchington). A Peregrine Falcon's eyrie has four eggs, Lake District (W. E. B. Dunlop).

14th.—Whinchat seen at Silloth ; a Peregrine flying across the Solway (D. Losh Thorpe). Redshanks in a field near Stanwix (L. E. Hope).

17th.—Chiffchaff heard at Windermere (W. E. B. Dunlop).

20th.—A pair of Hawfinches seen in a garden at Wetheral (Rev. A. Scott). Long-tailed Tit nesting at Head's Nook (Mr. Armstrong).

21st.—Goldeneyes seen on Thirlmere (W. E. B. Dunlop).

22nd.—A pair of Willow-Warblers seen at Windermere ; snow fell heavily on this date (W. E. B. Dunlop). A fully-built nest of Golden-crested Wren at Head's Nook (Mr. Armstrong).

23rd.—A Mistle-Thrush's nest at Windermere contained four newly-hatched young (W. E. B. Dunlop). Six Swallows seen at Etterby (W. H. Little).

24th.—Two nests of young Thrushes frozen to death at Head's Nook ; eighteen degrees of frost registered (Mr. Armstrong).

25th.—A small flock of Swallows and Sand-Martins arrived at 2.30 p.m. at Caldew Foot, on the Eden. They had gone again at 5 p.m. (D. Losh Thorpe).

26th.—About a dozen Swallows at Caldew Foot (D. Losh Thorpe).

27th.—Swallows and Sand-Martins at Caldew Foot to-day (D. Losh Thorpe).

28th.—Swallows seen at Head's Nook (Mr. Armstrong). About one hundred Barnacle Geese are on Skinburness Marsh (W. Nichol).

29th.—Cuckoo heard near Silloth (W. Nichol). Common Sandpiper seen near Windermere (W. E. B. Dunlop). Willow-Warbler seen at Head's Nook (Mr. Armstrong). Cuckoo heard at Head's Nook (J. Sewell).

31st.—Wigeon breeding at Bassenthwaite (W. J. Farrer).

May 1st.—Swallow, House-Martin, and Yellow Wagtail seen near Windermere ; Goldeneyes still on Thirlmere (W. E. B. Dunlop). A Buzzard's nest near Windermere has three eggs (W. E. B. Dunlop). Common Sandpiper and a single Willow-Warbler noted at Wetheral (T. Harrison). Great migration of birds over Carlisle ; notes of Curlew, Oystercatcher, Redshank, Black-headed Gull, Geese, Mallard, and Warblers were heard (D. Losh Thorpe). Lesser Terns have arrived on the Solway ;

Turnstones and Whimbrel are passing north (W. Nichol). Willow-Warbler seen at Botcherby (W. H. Little).

2nd.—Blackcap, Garden-, Sedge-, and Willow-Warblers observed on Etterby Scaur (D. Losh Thorpe). Willow-Warblers numerous at Wetheral; the day previous only one bird was seen (T. Harrison). Redstart seen; Cuckoo heard at Windermere (W. E. B. Dunlop). Yellow Wagtail seen in Carlisle (D. Losh Thorpe). Seven Swifts seen at Botcherby (W. H. Little). Corn-Crake heard at Bulgill (W. Little). Cuckoo heard near Carlisle (D. Losh Thorpe).

4th.—Cuckoo heard near Chatsworth Square, Carlisle (J. Steele). Swifts seen near Windermere (W. E. B. Dunlop). A Cuckoo heard calling in the Abbey grounds (Rev. Canon Bower).

5th.—Two Swifts seen at Carlisle (Major Ferguson).

6th.—The Whooper Swan on the River Eden appeared restless; the following day it was missing (D. Losh Thorpe). Field-fares are still in the Lake District (W. E. B. Dunlop). The Peregrine's eggs noted on April 12th are now hatching (W. E. B. Dunlop). The Spotted Flycatcher and Common Whitethroat have arrived near Windermere (W. E. B. Dunlop). Corn-Crake heard near Carlisle to-day (D. Losh Thorpe).

15th.—Sand-Martins first seen near Windermere (late date) (W. E. B. Dunlop).

16th.—Young Ravens are nearly ready to leave the nest, Lake District (W. E. B. Dunlop).

18th.—Grasshopper-Warbler heard at Burgh to-day (W. Tremble). A flock of about thirty Whimbrel are on the Solway (W. Nichol). A pair of Shovelers and a pair of Wigeon were seen on Burgh Marsh (W. Tremble).

21st.—A pair of Shovelers nesting near the River Esk (L. E. Hope). A nest of the Lesser Tern on the Solway had one egg (W. Nichol).

22nd.—Two White Wagtails were seen at Skinburness (W. Nichol).

28th.—A Richardson's Skua was on the Solway to-day (W. Nichol).

June 4th.—A large flock of Common Scoters were on the Solway to-day; we estimated their numbers at over one thousand birds (L. E. Hope).

9th.—Two Skuas were seen on the Solway, too far off to identify the species (W. Nichol).

10th.—A fine adult Buffon's Skua was seen on the Solway; also six Velvet Scoters near Silloth (W. Nichol).

14th.—The young Peregrine Falcons in the eyrie noted April 12th and May 7th have now left the nest, Lake District (W. E. B. Dunlop).

26th. — Garden-Warbler sitting on five eggs in Wetheral Woods; the fifth year in succession I have seen this species there (T. Harrison).

July 10th.—A flock of Bar-tailed Godwits are now on the Solway, many of them in summer dress (W. Nichol).

15th. — Great Spotted Woodpecker (immature bird) near Windermere (W. E. B. Dunlop).

19th.—Three Dotterel seen in Lake District to-day (G. F. Saul).

23rd.—A Jackdaw built a nest in the carriage-house at Eden Brow, which reached from the floor to a loophole, a height of seven feet; it partly rested against a carriage, and filled up the space between it and the wall with nesting material (J. H. Martindale).

31st.—Red-necked Grebe seen at Anthorn (James Smith).

August 1st.—A pied Rook and an albino Starling seen near Windermere (W. E. B. Dunlop).

5th.—Curlews were last seen on the hills to-day (W. E. B. Dunlop). Three Greenshanks seen at Silloth (W. Nichol).

31st.—Wild Geese on migration were passing over Carlisle this night (T. L. Johnston).

September 12th.—Two Peregrines are frequenting the vicinity of Skinburness, and many autumn visitors have arrived, including five hundred Bar-tailed Godwits, three hundred Knots, Sanderlings, and Curlew Sandpipers (W. Nichol).

19th.—A flock of about fifty Teal are on the Solway (W. Nichol).

22nd.—Two Red-breasted Mergansers and a Greenshank seen on the Solway (W. Nichol).

27th.—A flock of seven Spotted Redshanks near Skinburness, and a small flock of six Curlew-Sandpipers (W. Nichol).

30th.—The Barnacle Geese have arrived on Long Newton Marsh (W. Nichol).

October 5th.—A flock of about forty Bean Geese seen near Silloth. I found the remains of a pied Lapwing, which had apparently been killed by a Falcon (W. Nichol).

7th.—Three Red-breasted Mergansers seen near Silloth (W. Nichol).

12th.—Fieldfares seen at Stanwix (L. E. Hope).

14th.—Two Little Stints seen near Skinburness (W. Nichol).

17th.—Redwings arrived at Windermere (W. E. B. Dunlop).

19th.—Pied Lapwing seen near Skinburness (W. Nichol).
Bramblings arrived at Windermere (W. E. B. Dunlop).

21st.—Male Goosander in change of plumage near Bowness (Rev. L. D. Mitton).

22nd.—Large numbers of Redwings in a wet field near Stanwix (L. E. Hope).

23rd.—A Honey-Buzzard was shot at Scotby to-day. This species has not been reported in Cumberland for about forty years (A. Sutton).

30th.—Snow-Bunting and several Bewick's Swans reported near Silloth during October (W. Nichol).

November 5th.—Beautiful pied Lapwing, almost wholly white, near Silloth (W. Nichol).

7th.—A Swallow was seen at Silloth (Mr. Romney).

8th.—A small flock of Bramblings at Silloth (W. Nichol).

17th.—A Fork-tailed (Leach's) Petrel was picked up in an exhausted condition at Stanwix. It died the following day (A. Sutton).

24th.—Several Fork-tailed Petrels noted in the Lake District (W. E. B. Dunlop).

December 7th.—A flock of eight Grey Lag Geese were seen near Silloth. Large numbers of Wigeon are on the Solway (W. Nichol).

12th.—Great Phalarope shot on the Solway (O. Wilde).

28th–29th.—Tens of thousands of Lapwings flying from north to south across the Solway during snowstorm (W. Nichol).

29th.—A Smew was obtained on Windermere (W. E. B. Dunlop).

30th.—About fifty Bewick's Swans, eighty Bean Geese, twenty Bernacle Geese, several thousands of Oystercatchers, and a few Mallards were congregated on a small patch of sand near An-thorn, sheltering during the storm (W. Nichol).

NOTES AND QUERIES.

MAMMALIA.

Weasels caught in Mole-trap.—On April 4th, seeing a Mole-trap off, I pulled it up, and was surprised to find a Weasel caught in it. I took the Weasel out and reset the trap. On April 16th I happened to pass the same place, and noticed that the trap was sprung again. On pulling it up I was astonished to find another Weasel caught.



They were both females. I took the enclosed photograph of the second Weasel in the exact position it was caught in.—F. BARBER-STARKEY (Aldenham Park, Bridgnorth, Shropshire).

AVES.

“Where are our Nuthatches?”—With reference to Mr. Warde Fowler’s query (*ante*, p. 155), I may state that Nuthatches have of late years become very scarce in certain woods of Hampshire where

formerly they were abundant. I only refer to woods where human interference is out of the question, and the timber is as it was of yore. In referring to my notes I find that in May, 1892, they were nesting in considerable numbers, and continued common for a few years; but in 1901 I only found one nest; again in 1903 only one nest; the last and only nest in 1904. Since then I have made diligent inquiries about them, as I wanted to photograph the parents at the nesting-site, but have failed in locating a single nest. This very marked falling off in numbers has puzzled me greatly, and I cannot account for it in any way.—J. E. H. KELSO (Holmwood, Hayling Island, Hants).

REFERRING to the reports from Oxford and Hants that there is a scarcity of Nuthatches, I do not notice any difference here, but perhaps, on the contrary, they are even more in evidence than usual. You can see and hear them everywhere, and six out of thirteen nesting-boxes in the garden here were occupied by them, and I know of other nests in trees. I went over to my other place this afternoon (May 4th), and out of twenty-three boxes I examined, eleven were occupied by Nuthatches. I also saw two nests in trees and three in rocks, but I have noticed that most years some species predominate in boxes; one year it is the Great Tit, another the Blue Tit, this year the Nuthatch; some years several Coal-Tits (but they never predominate), others almost none.—E. G. B. MEADE-WALDO (Hever Warren, Hever, Kent).

Late Stay of the Brambling (*Fringilla montifringilla*).—I saw a small flock of Bramblings, about a dozen in all, being birds of both sexes and accompanied by a few Chaffinches, in a fir-wood on the moors near here to-day (April 24th, 1909). — WALTER GYNGELL (13, Gladstone Road, Scarborough).

***Linota linaria* at Hampstead.**—A flock of Mealy Redpolls consisting of some thirty or more birds frequented the Heath here daily from the middle of January till early in April, when they took their departure. They appeared to spend the whole of their time during the day feeding on the ground under the birch trees, and only flying up into the branches on being disturbed. On April 20th I saw and watched here for some time a male Pied Flycatcher (*Muscicapa atricapilla*). The occurrence of this Flycatcher in Middlesex does not appear to have been very often recorded. — H. MEYRICK (Holly Cottage, The Mount, Hampstead, N.W.).

Early Appearance of *Cypselus apus*.—In the evening of April 15th, after a not very bright day, I saw a Swift—I may almost say a

pair of Swifts, but I am not quite certain about the second specimen, as I lost sight of it behind some houses—(I believe the species usually emigrate in pairs), and on the following day I saw a half-dozen or more, the numbers daily increasing until the morning of the 25th, when a very large congregation were careering hither and thither very high in the bright sunshine. The main body seem to have passed on, and those remaining are about their old nesting-places, around which they sweep on rapid wing, with an occasional scream, but not so jubilant and excited as they probably will be shortly when their two, long, rough, white eggs rest securely beneath the thatch.—G. B. CORBIN (Ringwood).

Correction. — On page 158, line four, "Hoopoes" should read "Whoopers," as the context indicates.—G. B. C.

Red-legged Partridge at Yarmouth. — In 'The Zoologist' (1905, p. 186) I contributed a note querying the possibility of a spring movement made by the Red-legged Partridge (*Caccabis rufa*). I have not yet found a satisfactory solution of this debated question; certain it is that in April, and sometimes well into May, this species appears *on our sandhills* both north and south of Yarmouth at this period of the year, where it provides no small excitement for those who prowl by the seashore and on the sand-dunes. Occasionally, like the Woodcock, this Partridge drops down in most unlikely places, even in crowded localities, and great is the scramble to secure them. Since the 1st of this month (April) four or five have been reported to me as seen near the beach. One was stunned by a stone and secured by the thrower; on the 5th Whiley, a noted Gull-shooter here, picked up a dead bird that had been drowned at sea and washed up by the tide. I saw and examined the bird, sandy and bedraggled, soon after he had found it; it was in good condition, and must have been drowned during the previous night. Whiley told me on the 6th that he had plucked the carcass, and his wife had made a pie of it in company with a savoury morsel of beef; that day he had eaten it for dinner, and declared it "most excellent tack," and he intended "following up" the sandhills with his dog each morning at daybreak in hope of procuring others, dead or alive. He humorously remarked that he should do this in spite of the game laws, for surely they must be immigrants! The prevalent winds for several days past had been easterly and south-easterly, varying in force.—A. H. PATTERSON (Ibis House, Great Yarmouth).

Ædicnemus scolopax in Cumberland. — When passing along a portion of the River Eden, near Carlisle, on the morning of March

27th last I noticed, standing upon a small piece of exposed shingle a bird which on closer examination proved to be a Thicknee. After watching the bird's movements for some time I returned to my house (which was close by) for my binoculars to enable me to observe the bird more easily. On my return the bird flew, but pitched again in a field about one hundred yards distant. I had a good view of it through the glass, and also saw it very clearly when resting on the shingle. A second gentleman saw the bird at the same time, and although not sufficient of an ornithologist to identify the species at sight, did so upon seeing a specimen in the Museum. The bird appeared somewhat exhausted, and from its movements and general appearance was a bird on migration, resting and refreshing itself at the river. It is the first record of this species in Cumberland. I have kept this species in confinement, and have also seen it in Norfolk.—D. LOSH THORPE (Hon. Curator, Carlisle Museum).

Goldeneye (*Clangula glaucion*) in Surrey: Correction.—*Vide Zool. ante*, page 156, line 22, for "sure" read "rare."—GORDON DALGLIESH (Brook, Witley, Surrey).

A NATURE STUDY EXHIBITION, organized by the Nature Study Society, will be held at the Royal Botanic Gardens, Regent's Park, N.W., on Friday and Saturday, June 4th and 5th. Open each day from 10 a.m. to sundown. It will include Aquaria, Vivaria, and other means of observing animals, with photographic and microscopic illustrations. Entrance one shilling. Tickets and all particulars may be obtained of Miss Winifred de Lisle, Hon. Sec. of the Exhibition Committee, 58, Tyrwhitt Road, Brockley, S.E.

OBITUARY.

HASTINGS CHARLES DENT.

WE regret to have to announce the death of Mr. Hastings Charles Dent, which took place on March 6th, 1909. He was born in 1855, and was brought up as an engineer, studying at Owens College, Manchester, and subsequently becoming tutor and examiner at the Royal School of Engineering at the Crystal Palace. He laid down the first tramway in Manchester, and also went out to Brazil to make surveys for railways. He visited several other countries, and, being a man of

wide reading and of many interests, he made observations and collected specimens wherever he went. The last few years of his life were spent at South Godstone, Surrey, where he occupied himself in farming. He was a Fellow of the Linnean, Zoological, and Royal Geographical Societies, &c., and his principal work, 'A Year in Brazil,' published in 1888, includes a scientific appendix, containing extensive notes on Meteorology, Zoology (especially Entomology), Botany and Geology, lists of shells, Lepidoptera and Coleoptera, and remarks on Evolution and Mimicry. Several species enumerated are rarities of some scientific interest. Personally, Mr. Dent was a man of extremely generous and straightforward character, and his loss is much regretted by his friends and neighbours.—W. F. K.

NOTICES OF NEW BOOKS.

A Naturalist in Tasmania. By GEOFFREY SMITH, M.A.
Clarendon Press, Oxford.

THIS book is based on a stay of six months in Tasmania during the spring and summer of 1907-8, and the expedition was undertaken at the suggestion of Prof. G. C. Bourne with the object of studying especially the fresh-water life of that island. That this small fauna is of the most interesting and important character is perhaps known better to specialists than to more general naturalists. The Tasmanian Mountain Shrimp (*Anaspides tasmaniæ*) finds its nearest allies in some marine shrimps "which have come down to us as fairly common fossils in the sand deposited round the Permian and Carboniferous seas of Europe and North America," but to judge by external appearance there is very little difference in organization between the primitive forms of the Carboniferous period and the present-day *A. tasmaniæ*. When Mr. Smith first saw the Mountain Shrimp—to use his own words—"walking quietly about in its crystal-clear habitations, as if nothing of any great consequence had happened since its ancestors walked in a sea peopled with strange reptiles, by a shore on which none but cold-blooded creatures plashed among the rank forests of fern-like trees, before ever bird flew or youngling was suckled with milk, time

for me was annihilated, and the imposing kingdom of man shrunk indeed to a little measure."

The Great Lake possesses two abundant crustaceans—*Paranaspides lacustris* (a new genus and species discovered by Mr. Smith) and *Phreatoicus spinosus*, which stand "in somewhat the same relation to the other Crustacea as the Platypus does to ordinary mammals"; while in the same water, anglers may be interested to learn, there are found Trout which have been captured scaling twenty-five pounds. These, however, are considered by the author as certainly the English Brown Trout (introduced in 1864), attaining these gigantic proportions by the absence of predatory fish such as Pike, and by the superabundance of ground food. It seems, however, that they have increased in size with a diminution in pluck, for "they seldom show any great fight; indeed, the large fish which I saw near the bank of the Shannon were so sluggish that one could poke them with a stick before they would make off."

Mr. Smith naturally could not ignore the peculiar anthropology of Tasmania and its extinct aborigines; the unfortunate Truganini, the last of the true Tasmanians, died in 1876, and her skeleton is preserved in the Museum at Hobart. An excellent plate illustrating crania preserved in the University Museum, Oxford, shows the dissimilarity of those from Tasmania to those of Australia, and their affinities with those from New Guinea and the Andamans. These last affinities are further pronounced by their woolly or "negritic" hair.

Other natural features are lost besides that of man; the vegetation in places is considerably modified, as our author bears witness when he speaks of the bush "which must have clothed Mount Wellington before that mountain was partially tamed by fires and the domesticating hand of man."

This book is well illustrated, and is a tale told by a naturalist in a very excellent manner.

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No. 816.—June, 1909.

NOTES FROM MILLPORT MARINE BIOLOGICAL STATION.

By RICHARD ELMHIRST, F.L.S., Superintendent.

THE WHELK (*Buccinum undatum*) AS FOOD OF THE COD (*Gadus callarius*).

WHILE examining the contents of some Cods' stomachs from off the south end of Bute I was struck by the large number of opercula (door-plates) of the Whelk or Buckie present. It is well known that Crustacea constitute the greater part of the Cod's food (see "Second Report on the Food of Fishes" (North Sea, 1904-5, International Fishery Investigations), by R. A. Todd); although, there, two cases are recorded in which large numbers of Whelks are present. Mr. McNeil, the line fisherman, who caught them, informs me that Whelks are very abundant in that locality; certainly a great number do come up on the lines, and are used for bait. When used for bait the operculum is generally cut off, although I have found opercula inside Cod which certainly had been on bait, as they had been cut in two by a knife. Now, the number of opercula present indicated beyond all doubt that they had not all been taken as bait. On one occasion thirteen stomachs yielded fifty-two opercula, one four-pound Cod containing as many as fourteen.

Knowing the difficulty of extracting a live Whelk from its shell without breaking it, I wondered how the Cod got them

out. Dr. Malcolm Laurie suggested that the Cod seized the live Whelks and pulled them in two. To try this in the aquarium, I seized a well-expanded Whelk behind the foot and gave it a sharp shake, with the result that the Whelk broke in two, leaving the foot in my hand, just as it occurs in the Cod. The Cod then, I think, seizes the Whelks when expanded, and gives them a sharp shake, so getting rid of the shell, but losing the softer parts of the meat. Some other fish shake their prey.

FEEDING HABITS OF THE CONGER-EEL AND SOME OTHER FISH IN CAPTIVITY.

In the aquarium Congers feed readily on such fish as Saithe (*Gadus virens*), Lythe (*G. pollachius*), and Goldsinny (*Ctenolabrus rupestris*). They generally seize their prey about the middle of the body, then by a sudden snap transfer their hold to the head, and then swallow it head first. I have once seen a relatively small Saithe (about six inches long) swallowed tail first.

Congers do not take mollusc food, such as shelled Mussel or Limpet, unless very hungry. In winter they hardly feed at all, but in summer they will take a fish nearly every day.

The Ballan Wrasse (*Labrus bergylta*), in captivity, feeds readily on various Crabs, such as *Cancer*, *Carcinus*, *Portunus*, *Hyas*, and *Eupagurus*. If the Crab is a large one the Wrasse makes sudden rushes at it, and tries to snap its legs off so as to disable it. If the Crab is not too big the Wrasse seizes it and dashes it against the bottom or rockwork of the tank, thus knocking off the limbs and breaking the shell up; the limbs are eaten later. I have had two Wrasses in captivity for nearly a year and two years respectively. Last year number one resented the presence of the new-comer, but has become more friendly now. Under natural conditions I think each fish has a home in the rocks, which is guarded against strangers.

Goldsinnies (*Ctenolabrus rupestris*) behave in a similar way. I have seen them attack Fifteen-spined Sticklebacks (*Gasterosteus spinachius*), seize them, carry them about, and shake them viciously. They also readily attack Gobies and young Gadoids, even pulling pieces off the tails of fish much larger than themselves.

If single valves of Mussels with flesh attached are put into the tanks, Plaice, Dabs, and Saithe will all shake them vigorously in trying to get the flesh out. When the Lemon Dab (*Pleuronectes microcephalus*) snaps at or seizes food a peculiar noise is made, which sounds rather as though one had hit the masonry of the tank with a hammer below water. The noise made is a distinct "plunk," and might be represented by that word. Dr. J. F. Gemmill and I have succeeded in closely imitating the noise by snapping one's fingers under water. We also produced the noise, though more faintly, by putting our heads under water with the mouth shut, expanding the back of the mouth and throat and then opening the mouth suddenly. This is as nearly as possible an imitation of the action of the fish when feeding, only the fish does it much more quickly. The Ballan Wrasse occasionally makes the same noise.

Cobblers (*Cottus scorpius*) feed greedily on mollusc or crustacean food. They readily attack strangers in their tanks, and swallow Pipefish (*Syngnathus*) or Saithe as long as or even longer than themselves, although it takes three or four days to finish the operation.

Sandhoppers (*Gammarus*), which can be gathered in thousands in the higher reaches of the tidal zone, are a favourite food with most fish in captivity (*e. g.* Cobbler, Pogge, Goby, Shanny, Butterfish, Ballan Wrasse, Goldsinny, Cod, Saithe, Lythe, Rockling, Topknot, Plaice, Lemon Dab, Dab, and Sole). Shrimps and Prawns, alive or dead, are also readily taken. Lythe show a stronger taste for crustacean food than Saithe do.

Dragonets, Anglers (*Lophius*), Skate, and Dogfish do not feed at all readily. Witches and Long Rough Dabs are very difficult to keep in captivity, and generally only live two or three days.

ADDITIONAL NOTES ON FLYING-FISH.

BY LIONEL E. ADAMS, B.A.

SINCE a note of mine on the flight of Flying-Fish appeared in 'The Zoologist' (1906, p. 145), Lieut.-Col. C. Durnford has sent me copies of his two able and interesting papers on the same subject.* As his observations differed slightly from my own, I was glad of the opportunity of further careful and prolonged observation on a recent voyage to the Plate.

In describing the flight (as it appeared to me) in my previous note, I said that the tail continues to vibrate during the whole period of the flight, and that the extended wings have intervals of rigidity alternating with vibratory motion. Col. Durnford maintains that these intervals of apparent rigidity, which give the flight the appearance of that of a bird sailing with outspread motionless wings, are really periods of increased rapidity of vibration, which my eye is unable to detect, and he points out that the capacity for perceiving the vibrations differs in individuals.

It has been ascertained that an impression lasts on the retina from one-fiftieth to one-thirtieth of a second, so that a greater number of vibrations than thirty to fifty per second would cause the images to overlap and create the impression of a blur; but if the number of vibrations was exactly adjusted so as neither to overlap nor to leave gaps, the result would be an image of the vibrating object at rest. Thus it is quite possible for two observers, whose visual capabilities vary, watching the same flight to differ as to the vibration or rigidity of the wings. If this is a correct explanation of the difference in opinions, it would give the rate of vibration of the wings at not less than thirty per second, since some observers (the aeroplanists) cannot perceive any wing movement; and not more than fifty per

* 'Annals and Mag. of Nat. Hist.' January, 1906, and November, 1906.

second, since Col. Durnford (and doubtless others) can perceive vibration during the whole flight.

Mr. F. M. Duncan, the cinematograph specialist, informs me that "the number of separate images per second required to give a non-jerky motion picture on the screen averages sixteen per second; that is the speed of all ordinary cinematograph pictures, and is all right for general work of simply showing the picture as a whole; . . . of course the number would be governed by the speed of the movement. For the flight of a Flying-Fish you would probably require from twenty-four to thirty-six pictures per second." This, however, refers to the movement of the fish as a whole, and not to the vibration of the wings, as Mr. Duncan says further on in his letter: "Some four years ago I was able to closely watch the movements of the Flying-Fish, and I came to the conclusion that its 'flight' was very like that of a Swallow skimming over a pool of water, *i. e.* a swift gliding motion, with from time to time a vibratory movement of the wings of very short duration, sufficient to produce an upward movement to carry the fish over the crest of a wave." This is, of course, how the aeroplanists see the flight.

With the special object of examining what I have described as "intervals of rigidity," I spent many hours daily watching the flights with a good glass, and the result was a confirmation of my previous experience; that is to say, there were in most flights short periods of soaring with motionless wings, but sometimes I could distinctly follow the vibration of the wings throughout the whole of the flight. Possibly if Col. Durnford had been with me he could have detected vibration during the periods when I could not. I quote from my notes made at the time:—"When the fish leave the water the flutter of their wings may be seen very distinctly; this movement becomes more and more rapid till it is often difficult, though not always impossible, to distinguish movement. This movement, which is apparently a mere shimmering, sometimes seems to cease altogether for a second or two." This note relates to my experience of the large "four-winged" species, which is the more common in the Atlantic, and which is easier to observe than the "two-winged."

It may be as well to explain the terms "four-winged"

and "two-winged," which, though not scientific, are commonly understood; each may include several species as known to science.

The "four-winged" fly with the ventral fins extended, but whether these vibrate like the pectorals I cannot say; they always appear to me to be motionless. In this group the pectorals and ventrals are of an opaque indigo colour with colourless, transparent patches at or near the insertions; I have also noticed the pectorals of some to be a dull ochre mottled with dark spots.

The "two-winged" fish are smaller, and do not apparently extend the ventrals in flight; both pectorals and ventrals are of a very pale transparent blue tint.

There are several circumstances which increase the difficulty of observing the wing movement in flight.

The fact that the fish is nearly always viewed from above and that the light strikes on the glistening surface tends to confuse the sight. On one voyage, however, I was able to watch the flight from below, in very rough weather, from the deck of a small tramp steamer in the Arabian Sea, and on this occasion for several days I watched the flights, when the vibration of both fins and tail was perfectly distinct. It was on this occasion that I paid particular attention to the mode of flight for the first time, because I had always read in "the books" that the fish soared or sailed like birds, and was surprised to see anything different.

The unfamiliar direction of the vibration of the wings, which instead of being up and down as in the case of birds is almost horizontal, also tends to confuse the sight; and the fact that usually the flight is viewed from behind or nearly so (the worst position for observation) must be remembered. On the comparatively rare occasions when I have seen Flying-Fish rise in their flight towards the ship and fly on board towards me I have clearly seen the flutter of their wings, although this has generally happened as the light was failing; mostly, of course, they come on board in the dark. Moreover, the fish bursts upon the sight suddenly from an unexpected spot, and so is some way off before the observer can get a clear sight of the flight, just as a bolting rabbit is out of range before the novice can get a

straight shot. With a little practice, however, it is quite easy to bring the binocular to bear as the fish leaves the water.

If you handle a fresh specimen and open the closed wings you will find that they spread in the same plane as that in which the body lies. Col. Durnford likens the action of the opening and shutting to that of a fan, which is very nearly correct; by the way, it is difficult to see from a mechanical point of view how a purely horizontal, fan-like motion can propel the fish at all. I think the following attempt to describe the flight in detail will furnish the explanation that the action is neither quite horizontal nor quite fan-like; besides which the constant vibration of the tail must not be forgotten.

The line of the insertion of the wing is down the side of the body, and is almost perpendicular to the plane of the outspread wings; the uppermost ray of the closed wing becoming the foremost ray of the wing extended, the lowest ray of the closed wing keeping its position down to the body. The operation is difficult to describe clearly, but by actually opening and shutting the wings of a specimen rapidly it becomes evident that a certain amount of air must be caught in the closing and none in the opening, the wings acting like an oar "feathering," or like the hands of a swimmer who drives the water past him with his concave palms. However, the almost fan-like and horizontal action of the wings does not appeal to one as an ideal method of propulsion, and one cannot wonder that a high rate of wing vibration added to that of the tail is necessary to propel such a solidly built object as a Flying-Fish.

When about a hundred miles south-east of Pernambuco a rare specimen came on board, which I was lucky enough to secure, and which Mr. G. A. Boulenger was kind enough to identify for me as *Exocoetus furcatus*. Its peculiarity lay in the possession of two barbel-like appendages $2\frac{1}{2}$ in. in length. I had never previously seen a specimen, nor had any of the sailors of whom I inquired, and the "Flying-Fish with whiskers" was much discussed in certain rendezvous of skippers in Montevideo and other ports of the Plate.

SOME MUD-FLAT BIRD-NOTES.

BY A. H. PATTERSON.

THAT there is still much to be observed and noted concerning the ways and doings of our British wild birds I am strongly convinced. It seems, to me, a great pity that so little of the habits of certain additional species of small land-birds, notably of Warblers and allied forms, that will be listed in the next edition of Howard Saunders's 'Manual,' is likely to be detailed, for the uncontrollable impulse to pull trigger upon a rare straggler to this country leaves scant margin for dwelling upon its living interest. The slaughter of a rare bird and the possession of its skin principally interests one person, but there the matter may perhaps end for others who are little the wiser for its advent.

Unfortunately for myself, opportunities for watching land-birds are extremely limited; those which haunt the oozy flats of Breydon, however, come within easy range of my field-glasses, and, strange as it seems to me, all has not been yet written that might be said of common waders and equally commonplace swimming birds. Even the Gulls are prone to develop new habits, and change their tactics to suit new conditions of environment. For some years past it has been my practice, when a bit run down or in want of a mild excitement, to fling my gear into my old punt, up sail, and race away to the broad acres of mud and muddy waters, and when thereamong to push her nose into a "lump," slip in a stake to keep her from drifting, fling about me a bit of sacking, and watch the birds that muster around. On some days little is to be seen; at other times some goodly flocks of various species are about, and some hitherto unknown or unobserved incident, to me, has thrust itself upon my notice.

I was much amused one August night by watching some old and some very juvenile Herons feeding in the "drains," then fast filling with the uprising flood. Like carven figures the adult birds stood "knee-deep," not a feather moving, save the plummy streamers on their wise old heads as the west wind toyed with them. At various angles they stood, ready to thrust forth

neck and bill with lightning speed the moment a heedless little Eel or Flounder came within striking distance. There they remained for a considerable time without moving from the spot. The younger birds, less patient, marched along, seeking their prey, and, as may be imagined, with far less success. I have seldom been incorrect in judging the age of Herons by their fishing tactics. Occasionally, when conditions—the colour of the water and the direction of the wind (for Flounders frequent different sides of a stream according to winds, although not generally known)—offer a better opportunity than waiting, an adult bird will take the favourable side of a main channel or larger drain, and put out the small Flounders skulking on the sloping edge. When a Heron strikes an Eel too large to swallow with ordinary manipulation, it flies to a “rond,” or a flat barely covered by the tide, and there resorts to hammering tactics, often dropping the protesting fish upon the ooze, well satisfied that it can easily snatch at it should it attempt to wriggle away. When five or six or more Herons are feeding in a drain, on either side of which the abrupt banks rise like miniature cliffs, there will be always one head held erect, and one bird on the *qui vive* against eventualities. I have often been amused watching from a boat or from the bank this grotesque head and neck sticking bolt upright, with no water or break in the flats visible, looking for all the world like a walking-stick thrust into the ooze and left there.

The Gulls (including Black-headed, Greater Black-backed, Common, and young Herring-Gulls) are often busy on the flood-tide gleaning up trifles, and then at rest on the grassy “lumps” for two or three hours straight off on the ebb-tide. Occasionally the Greater Black-backs leave the flotsam, and on the low water start “crabbing” on the flats, marching in a row as if beating the ground in proper order, throwing over-hand, or rather beakful after beakful of *Zostera marina*, bringing to light the Shore-Crabs that have been hiding beneath the prone vegetation to await the next flood-tide. It is odd to see them separating the squirming crustaceans from the tangled “grass.” They sometimes pack their crops full of Crabs, which they kill by a deft squeeze, crushing in the middle of the carapace, where even a pin-thrust would prove immediately fatal. Sometimes they will

continue this pursuit when the next tide has floated them off their feet. It is then still more curious to see them trying hard to *dive*, performing that operation as clumsily as a woman throws (Norfolk, *hulls*) a stone. The Crab, which is seen by the keen eye of the bird with head held at an oblique angle, is seized as it tries to scuttle away, but in almost every instance with several fronds of the tough *Zostera* around it; then the bird queerly struggles to obtain its equilibrium, still holding the grass, with its prey, between its mandibles—in fact, is anchored with the head below the water. In some instances it has to let go everything to regain its breath.

Now and again, on fine August days, the Black-headed Gulls go “a-worming.” The ooze is alive with millions of small red ragworms, *Nereis diversicolor* (?). I have observed a hundred Gulls, extending a long distance, quartering the ground with some semblance of order and method. Whether they detect any movement in the ooze, or their instinct tells them that in every tiny hole a worm is to be found, I cannot say; the worms seldom show above the surface unless after a heavy downpour of rain, when thousands are to be seen, blood-red and conspicuous, upon the mud; it may be washed out, or it may be tempted by the refreshing shower. The Gulls must at such times devour myriads, but they are so easily digested that a three hours’ feed would seem to leave the birds as hungry as at the beginning. A worm is pulled out at every second or third step.

I noticed some very peculiar performances on Aug. 21st, 1907, when a couple of Greenshanks were feeding not far from my houseboat. One bird, leisurely working, persistently hopped along on one foot. It did this for so long—a score yards at a time—that I decided in my own mind it had had a leg shot away. It was presently hailed by another, that came *hopping* along to join it, and the two jogged along in this needless and silly fashion. I was still puzzled at the oddity of the coincidence, when the resting leg was dropped, and for a moment or two these birds stood listening to something that had attracted their attention. I have since seen the Greenshank exhibit the same leg-saving methods.

The Redshanks’ habits are always worth watching; many of them are so well known that I need not refer to them.

Whether it carries its young as the Woodcock does at times I am not sure, but I strongly suspect it; nor can I yet fully satisfy myself how it is that so few eggs or young birds come to grief on our East Coast marshes. It is a wonder to me that a solitary nest should escape intact, seeing that it is often planted in the midst of rambling bovines. I feel assured that a bullock will avoid treading upon a bird if possible to do so, and have observed them on a marsh deliberately step out of the way of a parcel of Gulls that refused, or did not attempt, to move out of their line of feeding.

The Redshank is a busy little bird at feeding-time. When "worming" on the ooze he likes to keep just in advance of the lifting waters that creep stealthily, inch by inch, over the flats. He makes a series of detached figure eights when stepping along, lifting his head after every thrust or twist. The Greenshank also makes figure eights, but joins them in continuous line. His favourite resort is a small tide-pool left in the mud—"lows" our Breydoners call them. Every inch of it will he work until satisfied that every hiding Shrimp has been ousted out and nabbed; he also delights to start at the beginning of a trickling-out drain just wide enough to reach on either side of him. He then pursues the drain downwards, steadily and industriously zigzagging as he goes. He is more petulant and restless than his cousin the Redshank.

The Knot is a lazy bird, very companionable, and never hurries himself, either at feeding, waking, or getting out of the way of danger. I never observed a slower bird at "worming." When feeding he will probe the mud three or four times in succession before shifting a foot to another spot. No greater contrast can be seen than when a Knot and a Ringed Plover are hunting together. The Ringed Plover probes a hole and seizes his worm, or maybe withdraws his short bill without one, and immediately trots off two or more feet and probes again. The Knot will be leisurely probing some six square yards, while the other will be scouring a good square acre.

The Whimbrel is a bonnie bird; noisy and merry, he seems as light-hearted as a schoolboy in the month of May, when he is most in evidence with us. No bird "calls" more when feeding on our flats, and in between his shrieking call-

notes chuckles his tittering trill of pleasure. I watched a flock on May 14th, 1908, feeding on a mud-flat. Several had drawn up one leg, like the Greenshanks, and were hopping about after small Crabs, their favourite prey. I noticed that whenever one overbalanced his "centre of gravity," rather than put down the other leg, he spread his wings to preserve his equilibrium. I observed, however, that when the rising water crawled up the leg, both were used to get upon the wing. The way they manipulate small (acorn-sized) Crabs is very interesting to watch. The crustacean is shaken and kneaded, and the legs dropped, either from fright or from the jerk, until the carapace is entirely denuded of them. Then with an upward lift of the mandibles the "body" passes into the gullet and disappears, each now harmless leg being carefully picked up and swallowed. By this method not only is the Crab reduced to easily swallowed dimensions, but all chances of nipping are at an end.

I will mention but one more *acquired* habit, and wipe my pen, to be resumed, I hope, at a future date upon a theme so interesting to myself. The parish steeple at Yarmouth has for some years past been tenanted by an increasing number of Jackdaws. Something like eight pairs have this year started to nest. Below the church spreads out a large open market-place, wherein, at night, a row of chipped potato stalls tempt the lover of cheap and light refreshments to speculate. Every morning, in the early hours of daylight, these birds drop down to search for thrown-away or dropped chips, finding a ready and palatable breakfast to be had for the trouble of picking it up.

Spoonbills at Yarmouth.—Early in the third week in April three Spoonbills made their appearance at Yarmouth. On one occasion they alighted in a tame and confiding way upon the edge of the Marine Parade, and for a time wandered about upon the small sand-dunes south of the town, a most unusual spot for such birds. They then found their way to Breydon flats, where they remained for some days. When I saw them (on the 19th) they were restlessly feeding, now "croming" down a drain, and now scrambling up on to the flats and bibbling in amongst the *Zostera*. A Greater Black-backed Gull had joined them, remaining in their company all the afternoon. One bird was fully adult, and had a very fine mop of a crest.

ON THE HYMENOPTEROUS PARASITES OF RHYNCHOTA.

BY CLAUDE MORLEY, F.E.S., F.Z.S.

THE following account of the species of Rhynchota which are destroyed by parasitic Hymenoptera claims to be no more than a basis of future work upon this fascinating subject. In due time I anticipate that the intercourse between these vampires of the air, whose lives depend entirely upon the extermination of other insects, and the remainder of entomological Orders will become of considerable moment to the horticulturist and farmer. That their restrictive influence upon the propagation of injurious insect-pests is far greater than any that can be directly exercised by man must be instantly granted, in so far as the natural is invariably more efficient than the artificial. Were it but possible to rear these most beneficially destructive flies in confinement and distribute them to localities suffering from the undue abundance of, say, the Hop Fly, Rose Aphis, or the various species of Coccids that at times are so fatal to our fruit crops, we should let loose a natural ally the importance of which has never yet been fully appreciated, because so little known. In California, I believe, they are beginning to attempt something of this kind with an ichneumon fly called *Ephialtes carbonarius* in relation to the Codlin Moth, so destructive both there and here to the fruit of apple-trees. Personally, I am persuaded that in Britain the more efficacious ally is *Pristimerus vulnerator*, which I myself have bred in some numbers from stored codlin-infested apples. The first difficulty, however, is in the production under semi-artificial conditions of these extremely shy and retiring flies, which delight in freedom, space, and sunshine. I have bred both sexes from their natural host in some numbers, and attempted to bring about satisfactory nuptiæ, even going the length of introducing a live and apparently tempting young host-larva. All has invariably been in vain. I have upon but two occasions in the

course of ten years' observation seen parasitic Hymenoptera *in cop.*, and in both with no intervention from myself.

In the present paper I have contented myself with indicating, with detail wherever such was obtainable, the species of Hymenoptera preying upon the various sorts of Rhynchota, as recorded by the authors to whom I have had access. Probably there are a great number of other records: I have not seen them. To Prof. B. Oshanin of the St. Petersburg Academy of Sciences, to Robert Newstead, Esq., the learned author of a monograph upon the British Coccidæ, to Ernest A. Elliott, F.Z.S., and other gentlemen I am greatly indebted for valuable information.

Extra-British hosts are denoted by a suffixed asterisk.

HETEROPTERA.

1. PENTATOMIDÆ.

At least four species of the Proctotrypid genus *Telenomus*, Hal., are known to pass the early stages of their existence within the eggs of uninstanced species of this family. These are *T. cultratus*, Mayr (Verh. z.-b. Ges. 1879, p. 699); *T. phalænarum*, Nees (Gaulle, Cat. Hym. France, 1908, 115); and *T. pentatomæ*, Rondani (Bull. Soc. Ent. Ital. 1874, p. 135, et *l. c.* 1877, p. 199).

2. *Tectocoris lineola*, Fabr., var. *banksi*, Don.*

Dodd suggests (Trans. Ent. Soc. 1904, p. 485) that the "brooding" habits of the maternal *Pentatomidæ* serve as a protection against Hymenopterous oviparasites. He says: "I have frequently had ova of Hemiptera produce *ichneumons*."

3. *Eurygaster maura*, Linn.

Telenomus sokolowi, Mayr (described in Horæ Societatis Ent. Rossicæ, xxx. (1897), p. 442; cf. Sokolow, *lib. cit.* p. 444 et Travaux du Bureau d'Entom. Petersburg, 1901, No. 17), at one time caused the almost total extinction of this Hemipteron in the Government of Charkow; the latter had previously become so numerous that the entire crops of wheat and rye were ruined by it, and in some parts the peasants had had to abandon their cultivation. Prof. Oshanin tells me that the allied *Telenomus semistriatus*, Nees, is also parasitic upon the same species' eggs in the Crimea, according to M. Mokrzecti.

4. *Eurygaster integriceps*, Put.*

In like manner the latter species also preys upon the eggs of this Pentatomid, which occasionally causes great damage to wheat in Southern Russia, the Caucasus, and Turkestan; and it is assisted in its beneficial economy by *Telenomus simoni*, Mayr, *T. vassiliewi*, Mayr (Verh. z.-b. Ges. 1903, p. 389; et Vassiliew, Trav. du Bureau d'Entom. iv. (1904), No. 11), and *T. rufiventris*, Mayr (Hor. Soc. Ent. Ross. xxxviii. (1907), p. 158). It was reared from the bug's eggs collected in the district of Rostov, on the Don.

5. PENTATOMA.

A Chalcid, *Eulophus pectinicornis*, Linn., is doubtfully given (Gaulle, Cat. 109) as parasitic upon an undetermined species of this genus, but the association is unlikely. Its eggs are said to be destroyed by *Telenomus alcon*, Walk. (Ent. Mag. 1836, p. 353), since this parasite was bred from them at Paris by the Comte de Castleneuve.

6. *Holcogaster fibulata*, Germ.*

Telenomus truncatus, Nees, preys upon the eggs of this species, according to Gaulle (Cat. 115).

7. *Eurydema oleraceum*, Linn.

The eggs of *Eurydema oleraceum* are said by Rondani (Bull. Soc. Ent. Ital. 1874, p. 135 et 1877, p. 187) to be devoured by the Chalcid, *Misocoris oophagus*, Rond.

8. *Eurydema festivum*, Linn.

Two other species of *Misocoris*, namely, *Pteromalus oomyzus* and *P. ovivorus*, are also described by Rondani (*loc. cit.* 1872, pp. 202-3, et 1877, pp. 186-7) from the eggs of both *Eurydema festivum* and *E. ornatum*.†

† Several species of the Fossorial *Larrinæ* are known to provision their nests with the larvæ of *Pentatomidæ* and other Rhynchota, thus:—*Astata boops* with *Dolycoris baccarum* and *Eurydema oleraceum* — *cf.* Trans. Ent. Soc. 1836, p. 57; *A. costæ* with *Odontoscelis* and *Sciocoris*; *A. minor* and *A. rufipes* with *Shirus dubius*, and the latter also with *Brachypelta aterrima*; *A. stigma* with *Emblethis griseus*; and *A. tricolor* with species of *Aphanus*. *Dinetus pictus* preys in like manner upon larvæ of *Nabis lativentris*; and, doubtfully, *Tachysphex* upon *Pentatoma* (*cf.* Gaulle, Cat. 134). This association cannot, however, be termed parasitism.

These gentle attentions are sometimes reciprocated; for Prof. Poulton found the Reduviid Hemipteron, *Harpactor iracundus*, Scop., to prey upon

9. *Apateticus maculiventris*, Say (= *spinosus*, Dall.).*

Ashmead describes (Bull. U. S. Nat. Mus. 1893, p. 158) *Telenomus podisi* from the eggs of this species in Missouri, and an allied parasite, *Trissolcus podisi*, from Pennsylvania (*loc. cit.* p. 162).

10. *Apateticus modestus*, Dall.*

This species is also said to be attacked by the former of the above Proctotrypids by Dalla Torre (Cat. Hym. v. 519), upon the authority of Riley and Howard.

11. *Thyanta custator*, Fabr.*

A Chalcid, *Eupelmus hirtus* (Proc. Amer. Ent. Soc. 1885, p. xiv), and a Proctotrypid, *Trissolcus thyantæ*, on its eggs (Bull. U. S. Nat. Mus. 1893, p. 163), are described by Ashmead.

12. *Anoplocnemis curvipes*, Fabr.*

In 'The Zoologist,' 1908, p. 193, Mr. H. W. Bell-Marley tells us, in his note on "Rhynchota and their Parasites in South Africa," that he found little Proctotrypid flies (figured, *l. c.*) of the subfamily *Scelioninæ*, which Col. Bingham considered to be undescribed, "resting upon this bug's body in a state of excitement, for they were running up and down the wing-cases and underneath its body." No explanation is given of this association, but Mr. Distant, in a note, refers to Ashmead's statement that all the species of *Scelioninæ* are strictly egg-parasites, though since the individual infested was a male, the cause of their presence is doubly obscure.

13. *Gerris lacustris*, Linn.

De Gaulle tells us (Cat. 110) that the minute Mymarid, *Limnodytes gerriphagus*, Marchal, devours the eggs of this aquatic species.

14. *Psallus variabilis*, Fall.

In my note upon the parasitism of this species (E.M.M. 1904, p. 184), I stated the opinion that the larva taken from its body was that of some Dipteron; subsequently Mr. Saunders wrote that it was a well-known mite, parasitic on Homoptera, one of

the bees, *Halictus scabiosæ*, Rossi, and *H. mucoreus*, Ev., in Majorca and Spain, in July (Trans. Ent. Soc. 1907, p. 404); and on June 5th, 1908, I took *Gerris gibbifera* sucking *Tenthredo balteatus* on my moat at Monk's Soham.

the *Orobittidæ*. This I cannot credit, since it was very certainly apodous; and now I am strongly of the opinion that it belonged to the *Dryinidæ*, since it answered almost *ad amussim* to the description of *Gonatopus pilosus*, Thoms., given by Mik (Wien. Ent. Zeit. 1882, pp. 218-9).

15. *Ranatra linearis*, Linn. 16. *Notonecta glauca*, Linn.

The Mymarid, *Prestwichia aquatica*, Lubbock, devours the eggs of both these aquatic species (*cf.* Trans. Linn. Soc. 1863, p. 140; 'Nature,' 1896; E. M. M. 1898, p. 152; Proc. Ent. Soc. 1899, p. xv.; *l. c.* 1900, p. xii.; Deut. Ent. Zeit. 1908, p. 137). Enoch found, on opening eggs of the latter species, that many imagines—Prof. Heymouss says eleven to sixteen is the usual number, though Enoch once bred thirty-four in a single egg—were in each egg, and these swam about freely upon being liberated; in one he found copulation in progress before emergence (a unique circumstance in parasitic Hymenoptera, and one conducive to inbreeding). Their size is sometimes double that of others, though always equally fully developed.

HOMOPTERA.

17. *Cixius contaminatus*, Germ.

Dryinus formicarius, Latr.—“D’après Capron, cet insecte pourrait bien être parasite de *Cixius contaminatus*, Germ., ayant été capturé à Shiere sur un buisson d’Erable habité par de nombreux individus de cet Homoptère” (Kief. Procto. i. 79).

18. MEMBRACIDÆ.

Ashmead, in his “Classification of the Fossorial, Predaceous, and Parasitic Wasps” (Canad. Ent. 1902, p. 288), says that *Dryininæ* prey upon *Membracides*, though he instances no species. Dale’s *Homopterophagus dorsettensis*, which he thought “must belong to the *Acari*,” and is scheduled as such in the ‘Zoological Record’ for 1879 (*cf.* ‘History of Glanville’s Wootton,’ 304) is most certainly a larva of the same subfamily (*cf.* also Kirkaldy, Entom. 1906, p. 14). Even Buckton (Brit. Cicad. ii. 40) was doubtful whether these sacs were *Proctotrypidæ* or larvæ of *Trombidia*.

19. CERCOPIDÆ.* †

Ashmead, as last referred to, includes this family in his above vague remark.

20. *Penthimia nigra*, Goeze.*

Penthimia atra is said by Lichtenstein ('Naturaliste,' 1880, p. 206) to be parasitised by the Proctotrypid, *Phanurus penthimia*, Licht.

21. ATHYSANUS.

From an undetermined species of this genus, Mik (Wien. Ent. Zeit. 1882, p. 215) bred the Proctotrypid, *Gonatopus pedestris*, Dalm. [Cf. also Perkins, Report of Experiment Station of Hawaiian Sugar Planters' Assoc., Divis. Entom. Bull. i. (1905), which I have not seen.]

22. *Athysanus plebejus*, Fall.

I took a specimen of this species near Ipswich on Sept. 13th, 1904, bearing a larva similar to that found on *Psallus variabilis* (*ante*).

23. *Athysanus obsoletus*, Kbm.

I swept a specimen of this species, bearing a black larva, probably of the same genus as the last-named Proctotrypid, from *Carex paniculata*, at Foxhall, Suffolk, on Aug. 13th, 1904. Mr. Butler tells me he has specimens of this species bearing *Gonatopus* larvæ, and remarks that all the species upon which he has noted such occur almost exclusively in the wettest situations.

† The Fossorial genera *Gorytes*, *Hoplisus*, *Harpactus*, *Alyson*, and *Stizus* are known to provision their nests with *Cicadinæ*, thus:—*G. campestris* and *G. mystaceus* provide the larvæ of *Philænus spumarius* for their own grubs to feast upon; *Hoplisus punctulatus* gathers *Selenocephalus obsoletus*; *H. laticinctus* and *H. sulcifrons* get *Philænus spumarius*, and *H. punctuosus* provisions its nest with various *Tettigometræ*; *Harpactus concinnus*, *H. elegans*, and *H. lævis* with *Selenocephalus obsoletus*; *H. exiguus* with *Acocephalus nervosus*; *H. elegans* also with *Athysanus variegatus*, *Hysteropterum liliimacula*, and a species of *Deltocephalus*; *H. lævis* with *Goniagnathus brevis* and *Athysanus variegatus*; and *H. tumidus* with various *Cicadinæ*. *Alyson ratzeburgi* preys upon *Falcidius apterus*; and *A. fuscatus* upon *Agallia venosa*, *Athysanus sordidus*, *Bythoscopi*, *Grypotes*, &c. *Stizus tridens* attacks *Idiocerus tæniops*, *Thamnotettix martini*, &c.; and *Crabro gonager*, like *Sphecius nigricornis*, also captures "Cicadines" (*cf.* Gaulle, Cat. 133-7, &c.). This association cannot, however, be termed parasitism.

In like manner *Psen (Mimesa) ater* provisions its nest with *Macropsis*

24. *Athysanus sordidus*, Zett.

Mr. E. A. Butler kindly informs me that he possesses specimens of this species containing larvæ of *Gonatopus*.

25. *Athysanus plebeja*, Fall.

His Chalcid, *Eupelmus cicadæ*, is said by Giraud (Ann. Soc. France, 1871, p. 413) to be parasitic within the eggs of *Cicada plebeja*. Cf. also Réamur, Mém. Hist. Nat. Ins. v. 4.

26. *Thamnotettix maritimus*, Perr.*

M. Perris gives an interesting account of the ektoparasitism of the above species upon this Jassid in his "Nouvelles Excursions dans les Grandes Landes" (Ann. Soc. Linn. Lyon, 1857, p. 172).

27. *Thamnotettix quadrinotatus*, Fabr.

Mr. Butler informs me that he possesses this species, parasitized by larvæ of *Gonatopus*.

28. *Deltocephalus assimilis*, Fall. (= *xanthoneurus*, Fieb.).*

A long account is given of the habits of *Gonatopus pilosus*, Thoms., from larva to imago, by J. Mik (Wien. Ent. Zeit. 1882, pp. 215-221); especially interesting is the observation that the hibernated larva strengthened its cocoon immediately before assuming the pupal state in the middle of May, showing a very late active period.

29. *Deltocephalus maculiceps*, Boh.

Specimens of this species in Mr. Butler's collection bear larvæ of *Gonatopus*.

30. *Eupteryx vittata*, Linn.

I swept a specimen of this species from reeds on the bank of the Orwell near Ipswich on Sept. 15th, 1904, which contained a larval parasite, probably Hymenopterous.

31. *Cicadula septemnotata*, Fall. 32. *C. sexnotata*, Fall.

Both these species have been noted by Mr. Butler to bear larvæ of the Proctotrypid genus *Gonatopus*.

lanio, and *Mimesa* (*Psena*) *unicolor* with various "Cicadelles" (Gaulle, Cat. 130); while *M. bicolor* attacks a species of *Tettigonia* (Smith, Cat. Brit. Hym. 184, et Shuck. Trans. Ent. Soc. 1836, p. 57), probably *T. viridis*, Linn.

TYPHLOCYBA.

Riley has observed *Labeo typhlocybæ* (Ashm. Bull. U. S. Nat. Mus. 1893, p. 89) to be parasitic upon an uninstanced species of this genus.

33. *Typhlocyba ulmi*, Linn.

On July 17th, 1904, I took a number of this species on elms on the outskirts of Ipswich, and find the following MS. note in my diary:—In one of these I discovered a white maggot, of certainly the same species as that taken from *Psallus variabilis*, but more fully developed. I sent it to Saunders, who thought it not Coleopterous, and too large for *Elenchus*. I think it Hymenopterous; the oral organs and segmentation are more distinct in this species than in the former.

34. *Typhlocyba douglasi*, Edw. 35. *T. hippocastani*, Edw.

The late Prof. Alfred Giard has given an excellent account of the parasitism of *Aphelopus melaleucus*, Dalm., upon these two species in his "Sur la Castration Parasitaire des *Typhlocyba* par une Larve d'Hyménoptère" (Compt. rend. Acad. Sc. Paris, 1889, p. 708; cf. also 'Insect Life,' 1890, pp. 271–3), in which he clearly shows that the genital organs are rendered abortive by the parasite's presence, in such a way that "wholesale parasitism" results as far as the succeeding generations are concerned.

36. *Typhlocyba rosæ*, Linn.

The above or probably an allied species is also referred to by Giard, "Sur une Galle produite chez le *Typhlocyba rosæ*, par une Larve d'Hyménoptère" (*loc. cit.* pp. 79–82). It is certainly a Proctotrypid of some kind.

37. *Pachypsylla celtidis gemma*, Riley.*†

From a Psyllid bearing this name Howard describes his Chalcid, *Encyrtus pachypsyllæ* (Descr. N. Amer. Chal. 1885, p. 15).

38. *Trioza centranthi*, Vall.*

André has given an account of breeding no fewer than three distinct species of *Chalcididæ* from this Homopteron, which

† Several species of Fossors provision their nests with species of the genus *Psylla*, but this can in no way be termed parasitism. Thus:—*Psenulus pallidipes*, *Passalæcus gracilis*, and *Crabro palmarius* are known to store up *Psylla alni*; and *Psenulus concolor* an undetermined species of the same genus (Gaulle, Cat. 129 et 137).

shows how much there is to learn in this way. These are his *Encyrtus triozae*, *Aphelinus (Agonioneurus) pictus*, which is doubtfully ascribed to Förster, and his *Tetrastichus obscuratus* (Ann. Soc. France, 1878, pp. 83-5; also Bull. Soc. Fr. 1877, p. cxix.).

39. *Trioza magnoliæ*, Ashm.*

A Chalcid, *Encyrtus solus*, is described by Howard from this species (Descr. N. Amer. Chal. 1885, p. 15).

40. *Trioza diospyri*, Ashm.*

In the same work is also described *Encyrtus trioziphagus*, which preys upon the present species in the Colombia District (p. 14).

APHIDIDÆ.

41. SIPHONOPHORA.

Parasites have only twice been bred from unspecified members of this genus. First, Rondani described thence his *Chrysolampus aphidicola* (Ann. Sc. Nat. Bologna, 1848; Bull. Soc. Ent. Ital. 1877, p. 170); and, second, Ashmead brought forward (Canad. Entom. 1888, p. 104) his Tetrastichine Chalcid, *Anozus siphonophoræ*, from Northern America.

42. *Siphonophora rosæ*, Linn.

This abundant species is ubiquitously and directly parasitised by the Braconid, *Aphidius rosæ*, Hal. *Aphidius proteus*, Wesm., is given by Brischke (Schr. Nat. Ges. Danz. 1882, p. 182), *A. (Cælonotus) pictus*, Hal., and *Praon exoletus*, Nees, by Gaulle (Cat. 86), and *Aphidius ervi*, Hal., is said by Marshall to also have been bred from it by Bignell in Devonshire; all these, if correct, are of far less frequent occurrence than the first species, and hyperparasites have been observed, though none of them from this host. A very full and oft-quoted account of the oviposition of *Aphidius rosæ* is given by Haliday (Ent. Mag. 1835, pp. 98-99); he says the female abdomen is telescopic, and the egg deposited on the under side of the puceron, near its tail; the female is able to tell if the host be already parasitised; the larva spins no cocoon, but the imago emerges from the indurated skin of its host. Buckton (Mon. Aph. Brit. i. 110) says both winged and apterous hosts are attacked, adding that the fly poises itself on the back of the Aphid during oviposition (cf. his *Aphidius cancellatus*, l. c. pl. iv., which certainly represents *A. rosæ*, female,

whose habits are referred to at ii. 152). Bignell (Trans. Devon. Assoc. 1901, p. 688) bred *Aphidius rosæ* from this host throughout the summer. The hyperparasitic species are numerous, and the commonest perhaps is *Allotria victrix*, Wesm.,† which was first bred from it by Westwood (Mag. Nat. Hist. vi. p. 491 et Intro. ii. 132); this is probably the *Cynips aphidium* of Geoffroy (ii. 305, referred to by Haliday), and also Guérin's "black *Cynips* with a red head and rufous legs," mentioned by Buckton (Mon. ii. 150); it has further been bred from this host by Bignell in Devon, Brischke in Prussia, and Giraud from the Aphid of *Rosa canina* in France (Ann. Soc. France, 1877 (p. 416)); *Allotria flaviceps*, Kieffer, is doubtless nothing but a new name for it or for some trifling variety. Another common species bred from *Siphonophora rosæ* is *Asaphes vulgaris*, Walk., which was first bred by Haliday and subsequently in some numbers by Ratzeburg (*Chrysolampus æneus*, Ratz. Ichn. d. Forst. ii. 185 et iii. 228); as well as by Brischke (Schr. Nat. Ges. Danz. 1882, p. 182); it is common in England. Buckton figures (ii. pl. lxxxvi. fig. 5, ♀) *Coruna (Pachycrepis) clavata*, Walk., and says that it spins a cocoon of its own‡ between its dead host-Aphid and the leaf, the former being glued to it by its viscous secretions, as had already been pointed out by Haliday; but Marshall (Trans. Ent.

† The Rev. T. A. Marshall (Ent. Ann. 1874, p. 119) says: "The species of *Allotria* are parasitic upon Aphides, in the same manner as the Braconids of the genus *Aphidius*" (*i. e.* not hyperparasitic through the latter). De Gaulle also gives the *Allotriini* as "Parasites de pucerons." But the former later (Bracon d'Europ. i. 44 et ii. 531) recognized them as hyperparasites; and Bignell (Trans. Devon. Assoc. 1901, p. 663) claims to have proved the fact by watching them oviposit in already parasitized Aphids, from which he subsequently bred *Allotria* only. Haliday (Ent. Mag. 1835, p. 99) clearly shows that he considered *Cynips aphidum*, Geoff., to be hyperparasitic, and *Cynips erythrocephala* to be a direct parasite of this species of Aphid; if this be the case, Buckton's assumption (Mon. Aph. ii. 153) that the former is synonymous with *Aphidius varius*, Nees, becomes untenable, and Marshall's synonymy with *A. rosarum*, Nees, equally faulty. Nees saw *Mesolata elongata*, Walk., oviposit in Aphides already containing larvæ of *A. varius*, according to Buckton (*l. c.* ii. 155); but I do not follow him, since no such genus exists in zoological nomenclature. Marshall shows in his table of hosts (Bracon. d'Europ. i. 42) that the *Aphidiinæ* is the only subfamily of the *Braconidæ* parasitic on Hemiptera.

‡ Buckton (Mon. ii. 155) says: "I have bred *Coryna* from the silken tent which it constructs under, and between the legs of, the dried larval

Soc. 1899, p. 15) considers this an error, since the cocoon referred to is almost certainly that of a species of *Praon*, which genus of the *Aphidiinæ* alone evacuate their hosts to pupate. Both Brischke and Reinhardt have bred this species from the same host. At least eight other species of hyperparasitic *Chalcididæ* are recorded:—Rondani describes (Ann. Soc. Nat. Bologna, 1848 et Bull. Soc. Ent. Ital. 1877, p. 194) a species bred by him, under the name *Pteromalus castigator*; and the same author is said by Dalla Torre (Cat. v. 165 et 525), with no reference, to have also raised *Chrysolampus* (*Merismus*) *rufipes*, Walk., and the Proctotrypid, *Ceraphron fuscipes*, Ratz. The former is probably a *lapsus calami* for *Sphegigaster rufipes*, Nees, recorded by Gaulle (Cat. 104), together with *S. aphidiphagus*, Ratz., and, from “*Aphis* sur rosier,” *Tridymus aphidum*, Ratz. Undeterminable species of the genus *Encyrtus* were also bred by Buckton, and, in the United States, Howard (Revis. Aphelinæ of N. Amer. 1895, p. 24) says *Aphelinus mali*, Haldeman, preys upon *A. rosæ*, and *Blastothrix rosæ*, Ashm. (Trans. Amer. Ent. Soc. 1886, p. 130), has been raised from the var. *floridæ* of the same species. Three other Proctotrypids have also been raised from this host, and one of them, *Lygocerus carpenteri*, Curt.—with which Kieffer’s “new” *L. testaceimanus* is doubtless synonymous—in some numbers in Britain by Marshall and Haliday; the others are *Trichosteresis clandestinus*, Nees, and *Megaspilus dux*, Curt. (B. E. fol. 249).

43. *Siphonophora scabiosæ*, Schr.

Dr. Giraud bred (Ann. Soc. Fr. 1877, pp. 427 et 434) *Pachyneuron aphidiphagus*, Ratz., and *Megaspilus aphidum*, MS., from *Aphides* sur *Dipsacus*; and (*l. c.* p. 415) a species of *Aphidius*, which he determines as *Ichneumon dipsaci*, Schr., and was probably the host of the above Chalcids, from a species of “*Aphis* sur *Dipsacus fullonum*.” Buckton gives no *Aphides* as attacking this plant, but I have taken the present species abundantly on

skin” of *Siphonophora rosæ*, though he was doubtful of its hyperparasitism. But he is quite wrong in saying (*l. c.*) that Nees “saw” the certainly synonymous *Chrysolampus suspensus* “emerge from the larva of *Aphis rosarum*.” What Nees says, respecting his *C. suspensus*, is: “Metamorphosis in larva *Aphidii Rosarum*, ex quibus mihi die 2 Julii a. 1813 Sickershusi provenit” (Mon. Ichn. Aff. ii. 127), and (*lib. cit.* i. 19) of his Braconid, *Aphidius rosarum*, “. . . ex *Aphidibus Rosæ* exclusum obtinui.”

stems of *Dipsacus sylvestris*, Huds., at the Havenstreet Woods, in the Isle of Wight.

44. *Siphonophora granaria*, Kirby.

Aphidius avenæ, Hal., destroys this injurious species in great quantities. A stem of barley I noticed in August, 1907, supported no fewer than fourteen females of this Aphid, every one of which produced the above parasite. Curtis says ('Farm Insects,' 291) that he bred it from a large testaceous female Aphid found on an ear of wheat in the middle of July, and that it emerged from near its host's anus. He mentions the habit of the male parasite of hovering over the plants infested with Aphids while the female is laying eggs upon them, which process is accomplished by bending her body under her breast so that, by lengthening her terebra, the spicula is produced under the Aphid, and an egg instantly inserted in its belly near the tail; such of their hosts as are already inoculated are passed over. He refers to Haliday (Ent. Mag. 1835, p. 99), who, however, simply says that he has bred it from Aphids on *Avena sativa*, and observed the proceedings of this species to be precisely similar to those of *Aphidius rosæ*: "the Pucerons pierced by it are found adhering to the grains of oats," &c. Curtis (*l. c.* 292) records *Ephedrus plagiator*, Nees, whose habits were unknown to its author and Haliday, from the same host, and remarks that it oviposits in the back of its host. He also refers to a hyperparasite through this *Ephedrus*, and describes it as *Ceraphron carpenteri*; and Buckton, who was doubtful respecting the determination of his direct parasite with *E. plagiator*—it is said by Marshall (Trans. Ent. Soc. 1899) to be "very different from an *Ephedrus*"—gives (Mon. Aph. i. 118) an interesting account of the oviposition of this hyperparasite, which he synonymises with *Ceraphron clandestinum*, Nees: it extends, he says, over a period of at least ten minutes after the host's skin has already been pierced. A third direct parasite is known to be *Aphidius granarius*, Marsh., who says (Bracon. d'Europ. ii. 579) that Bignell bred eleven specimens of both sexes in the middle of August, 1883, and of June, 1884, from this host on several kinds of *Graminaceæ*. A species of *Entedon* with black feet is also mentioned by Curtis (F. Ins. 294) as a probable parasite of this Aphid, though his *Dacnusa cerealis* (*Blacus ambulans*, Hal.) had

more probably attacked Diptera. In America, *Siphonophora avenæ*, Fabr., is said by Howard (Ins. Life, 1890, p. 247) to be destroyed by his *Pachyneuron micans* and *Encyrtus websteri*; Ashmead has recorded (Bull. U. S. Nat. Mus. 1893, p. 110) *Lygocerus niger*, How., from it; and Dalla Torre gives (Cat. v. 535) *L. triticum*, Taylor, in the same capacity, on the authority of Riley and Howard. *Pachyneuron (Diplolepis) aphidis*, Bouché, given by him "Habitat in Aphidibus graminis" (Naturg. 170), must be noticed here; it was ascribed to *Pteromalus* by Nees, and to its present genus by Reinhardt (Stett. Ent. Zeit. 1859, p. 192).

45. *Siphonophora chelidonii*, Kalt.

Two species of the Aphidiine genus *Praon* are recorded from this Aphid by Marshall; *P. longicornis*, Marsh., is represented by a single male, raised by Bignell in Devon, as the latter tells us, on Aug. 23rd, 1883; and the common and polyphagous *P. volucre*, Hal., whose hyperparasites are *Allotria ullrichi*, Gir., *Isocrates (Asaphes) vulgaris*, Walk., and an ined. or indetermin. species of *Lamprotatus*, Westw.

46. *Siphonophora hieracii*, Kalt.

Our only record of parasites upon this species is doubtful, being based solely upon Curtis's mention (B. E. fol. 283) of *Aphidius picipes*, Nees, bred from the Aphid of "*Hieracium*?"

47. *Siphonophora millefolii*, Fabr.

Bignell alone has brought forward (Trans. Devon. Ass. 1901, p. 689) his breeding of *Aphidius longiceræ*, Marsh., from Aphids upon feverfew. This species often covers that plant in my garden at Monks Soham, and I have never found another upon it.

48. *Siphonophora pisi*, Kalt.

Two, probably three, species of direct parasite prey upon this species. *Aphidius silenes*, Marsh., was bred thence by Bignell, in Devon, on July 6th, 1883, and *A. loniceræ*, Marsh., emerged from the same host upon the same day; Haliday bred his *A. ervi*, which is a very common species, "copiose" from Aphids on *Trifolium*, probably the present species or *Megoura viciæ*, Buck. I have also received the first-named parasite from Mr. W. E. Collinge, who bred six specimens from apterous females of this Aphid at Birmingham in October, 1907.

(To be continued.)

NOTES AND QUERIES.

MAMMALIA.

An Instance of Affection evinced by Ferrets for their Feeder.—Some years ago, when I used to keep Ferrets, I found that they were subject to take distemper from any dogs suffering from that disease, and none attacked by it ever recovered. I had a doe Ferret (very tame and a great pet) which some weeks after having a litter of six young ones was unfortunately attacked by that disease, the infection being communicated by a young retriever that had access to the room in which the Ferrets were kept. The poor animal, after suffering for some days, died, leaving the six little ones to starve; these were very small, only about five inches in length, and so young that their eyes were still unopened. However, not wishing to see the little creatures die of starvation, my sister made a nest for them of some woollen cloth lined with wool, and placed in a box near the kitchen fire, and after a great deal of patient trouble induced them to take a little milk from a teaspoon, though at first it had to be put into their mouths, until they began to drink from the spoon. This mode of feeding was continued for over a week, when I thought of giving them soft meat with the blood in it and chopped up into a pulp, so that they could suck it down. I began with rabbits' livers, taken from fresh-killed rabbits and pulped while warm, so that the blood was well mixed. It was extraordinary to see with what avidity the little blind creatures took to this food along with the milk, and they improved so rapidly on it that I continued it until their eyes were open, and they were able to feed on the usual food of soaked bread and milk. On account of being hand-fed from so young an age they grew up very tame and gentle, and evinced the greatest attachment to my sister; so much so that, when they were nearly full-grown, she used on fine days to take them out for exercise on the lawn, when they would follow her about like a pack of little hounds, and, as the haymaking season was on, she would at times sit on a haycock while the Ferrets were playing about, but they never went any distance away or out of sight. Frequently, to amuse herself and friends by testing the affection of the Ferrets, she used to

run away, as if deserting them, when they would stream after her in full cry, like a pack of little hounds, all emitting the querulous cry of fear at being deserted, while it was amusing to see their delight when she waited for them. They were the most interesting little animals I ever kept, were perfectly clean, and emitted no offensive smell whatever. When they were full-grown I parted with five, keeping only the little doe, which turned out a first-rate working Ferret; but unfortunately, to my great regret, she also, like her dam, died of distemper.—ROBERT WARREN (Moy View, Ballina).

AVES.

Ring-Ouzel at Yarmouth.—On April 25th I received a fine adult male Ring-Ouzel (*Turdus torquatus*), which was killed by striking the telegraph-wires at Cobholm, Yarmouth. Another had met with a similar accident in the same locality in October, 1908. I have reason to believe that this bird meets with its death in the above-named way much more often than the Blackbird, which is its nearest ally.—B. DYE (Great Yarmouth).

Some Bird-Notes from Ballina.—Our spring weather began very cold and wet; there was frost every night from March 1st to the 9th. The coldest night was that of the 6th, when the mercury fell to 27°, the weather keeping very cold and broken; we had frost again on the nights of the 16th and 20th. Rain fell every day from the 17th to the 31st, except on the 20th, 22nd, and 30th, which were dry. April began with three wet days, followed by a dry week, and then fourteen wet days. This cold and wet weather delayed the arrival of many of our spring migrants; yet some appeared in good time. Sandwich Terns were seen near Bartragh the first week in April, though I did not observe any in the estuary until the 12th, when only a pair appeared. On the 14th a pair of Swallows arrived in their old haunts here, and a Chiffchaff was heard in the garden on the 12th. Mr. C. Scroope, near Ballina, heard the latter on the 6th, and Willow-Wrens on the 17th. May began very cold, with two wet days, but subsequently the weather changed, and then up to the 11th we had cold, harsh, drying north and north-east winds which checked the growth of the grass, so that the outlying cattle and sheep experienced hard times. The Corn-Crake and Cuckoo were both late in this locality, not being heard until the 2nd inst., while up to the 20th I did not hear a Willow-Wren, though on the 13th I observed a pair of Whitethroats near Scurmore in some briars on the roadside. On April 25th

Captain Kirkwood saw a White Wagtail on Bartragh, and a few days later a flock of ten birds arrived at their usual haunt—the marshy pasture outside the garden (where, if any are on the island, they are sure to be seen). This little flock remained there for nearly a week, until one day, when the north-east wind moderated, they disappeared, resuming their journey to Iceland. The weather continued so stormy that I was unable to go to Bartragh until the 15th (the only day since the first of the month when the tides suited, and calm enough for my small boat to face the estuary), so I lost my chance of seeing the Wagtails, as they had left before that date. The estuary was very free from birds, and I only observed half a dozen Sandwich Terns, and about as many Little Terns, but I saw a fair number of the Arctic, among which there may have been a few of the Common species, though I was unable to distinguish them. I got near a flock of about fifty Arctic Terns resting on the sands, and was much amused by the antics of the males trying to attract the females. On the Bartragh sands there was a flock of about fifty Dunlins with black breasts.—ROBERT WARREN (Moy View, Ballina).

Notes on the Birds of West Renfrewshire (Caldwell District), 1908.—The chief feature of interest during 1908 was the great scarcity of the Sedge-Warbler. I am quite within the mark in saying that we had not more than one-third of our usual number. On the other hand, there was a marked increase in the number of Redshanks and Lapwings. Golden Plover, Snipe, and Dunlin nested in about the usual numbers. The following are the details:—

There were twenty-one degrees of frost on the night of Jan. 4th.

January 12th. Forty-two "Grey Geese" (species unknown) on Staneley Castle Loch. 21st. I heard the Song-Thrush in fine song as we passed Pollokshaws Station. So far they have not returned to Caldwell. 22nd. About one hundred Fieldfares flying about. The wind was out of the west and piercing cold. 23rd. Six Goosanders on Loch Libo. 24th. The Song-Thrush made its first public appearance for the season, and in fine song. The weather very mild. The six Goosanders still on the loch. 25th. A great fall in the temperature this morning, with several hail-showers. 27th. Five Goosanders on the loch. 28th. About eight inches of snow. 31st. A solitary Pied Wagtail.

February 1st. The snow almost gone. Twenty Redwings feeding in adjacent field. 3rd. Twelve Goosanders on Loch Libo. 9th. Blue Tits and Coal Tits plentiful; heard the welcome song of the Sky-Lark; also the "cooing" of the Ring-Dove. 11th. Four Goos-

anders on the loch. 12th. Three Goosanders to-day. I watched a Kestrel "hovering." 13th. About a score of Pochards on the loch. The woods now ringing with the songs of the Mavis. 14th. Four Goosanders. I heard the spring call-note of the Great Tit. 15th. Four Goosanders. 16th. Eleven Mallards and four Goosanders on the loch. 20th. Three Goosanders. It was very amusing to hear the Chaffinches attempting their full song. There were hundreds of them trying it, but I only once heard the complete song. This was the first morning I heard them. 21st. Six Goosanders on the loch. 22nd. A fearful blizzard to-day; wind, snow, hail, and sleet. 23rd. Storm continued this day. 24th. A beautiful day, with a cold wind blowing. My attention was called to the arrival of the Yellow Bunting by its song. 28th. Four inches of snow. A large flock of Lapwings gathered at Loch Libo this morning, as about the only bare place to be found. None of the birds were singing. 29th. Lapwings scattered about amongst the fields as if they had come to stay. Snow nearly gone.

March 4th. A flock of Herring-Gulls, about one hundred and fifty, resting in a field; nearly two-thirds of these were in immature plumage. The Curlew back in their nesting quarters. 9th. I learned that the Rooks were busy building a week ago. 12th. Four Goosanders; saw a Robin carrying nesting material. 13th. Saw the Redshank. Curlews now very plentiful. About two hundred Herring-Gulls. 15th. A solitary Magpie flew overhead. These beautiful birds are very scarce here. A Coot's nest nearly completed. 16th. This is the last day the Pochards were on Loch Libo. They have been much scarcer all winter than usual. 20th. The Golden Plover has returned. 21st. Twenty Golden Plovers, but only one has as yet the black breast. Meadow-Pipits appeared. 23rd. Six Goosanders and one Little Grebe on the loch. Wagtails (species unknown) kept flying north-west in singles, twos, and threes in a continuous stream. 24th to 28th. Four Goosanders remain all the time on the loch. 30th and 31st. Four Goosanders again on the loch. Wheatear seen on the 31st.

April 1st. About twenty Fieldfares. 5th. A pair of Tufted Duck on the loch. A solitary Goosander lay on the grass with one leg stretched full out, basking in the sun. About two hundred Fieldfares. 7th. Two White Wagtails and the first Bumble-Bee. 9th. Willow-Warbler. 12th. Three Willow-Warblers. 13th. Dipper's nest with five eggs. This is the same nest which contained two separate clutches last year, an experience which was repeated this

year. 21st. Found a Dipper's nest with young ones fully half-grown. 24th. To-day brings records of frost varying from sixteen and twenty-four degrees. This must tell very severely on eggs that are lying about. 25th. Walked to-day from Turnberry to Girvan (Ayrshire) along the shore. Saw a single Great Grey Shrike. 29th. Sandpiper appears. This is the same date as last year. 30th. One Swallow in the morning and nine in the evening. More Sandpipers. Cuckoo heard several times to-day. A friend reports hearing it on the 27th.

May 1st. Swallows now in full numbers. Reed Buntings numerous. A Mallard's nest with ten eggs. 4th. Cuckoo now calling from every quarter. 6th. Water-Rail's nest with six eggs. 7th. Corn-Crake heard. Found a Red Grouse's nest with nine eggs, and one Curlew's nest. 9th. Saw the Wheatear, Yellow and Grey Wag-tails, three nests of the Curlew, and one each of Teal and Red Grouse. 10th. Sedge-Warbler. 11th. Whitethroat. 15th. Whinchat. 18th. Spotted Flycatcher this morning, also nest of the Redshank and Red Grouse. 22nd. Visited the Gullery on the island in Harelaw Dam. Found one or two nests with four eggs each, one of which at least seemed all the product of the one bird (Black-headed Gull). One clutch of three eggs was taken which were not any larger than Tern's eggs. 23rd. Several young Curlews about. 31st. A Robin's nest in a tin can; my tin cans have been a great success with the Robins.

June 24th. Heard the Cuckoo for the last time.

July 6th. Nest of the Tree-Pipit, and young Whitethroats. 13th. Saw a nest of Whinchat. 14th. Two Coots are still sitting on their nests. 25th. Yellow Bunting in song. 27th. The last date on which I heard the Corn-Crake. 31st. Sedge-Warbler in song.

August 2nd. The Corn-Crake reported as being heard to-day. 6th. Six Herons at the loch to-day. 7th. A friend reports a very large flock of Starlings, about five thousand in number, flying from east to west. 8th. Told to-day of a pair of Bullfinches feeding four young. 24th. A large number of House-Martins and Swallows. 30th. Willow-Wren to-day.

September 4th. House-Martins are all gone. 12th. Ice this morning for the first time this autumn. 20. Put up forty-four Common Snipe at Loch Libo. 21st. Heard a Blackbird in fine song. 23rd. Still a few Swallows flying about. 27th. A Willow-Warbler flitting about amongst the raspberry bushes.

October 6th. About twenty Swallows reported flying around to-day. 13th. Pochards returned to the loch, this being their first appearance since the spring. 18th. Visited Loch Libo this morning

and counted ninety-five Snipe, seven Mallards, forty-five Pochards, eleven Wigeon, and three Gadwalls; also flushed a Sparrow-Hawk. 22nd. Fifty-five Pochards and five Tufted Duck on the loch. 24th. Between two and three hundred Ducks on the loch to-day.

November 5th and 6th. Have seen Fieldfares both days. 8th. Severe frost during last night. At Loch Libo found about ninety Snipe, one hundred and twenty Pochards, eleven Tufted Duck, and five Goldeneyes. 9th. Three Goosanders to-day. 15th. Beautiful sunshiny morning after a touch of frost. Fieldfares plentiful, and a few Redwings. At Loch Libo found one hundred and ten Snipe, two hundred and twenty Pochards. There were four Sparrow-Hawks flying about.

December 6th. About two hundred and fifty Fieldfares. At the loch found one hundred and nineteen Snipe, one hundred and twenty Pochards, and a few Tufted Duck. Saw a solitary Kestrel. 23rd. Two Mistle-Thrushes in fine song at 7.50 a.m. From their behaviour I judged they were pairing, an observation afterwards confirmed by some friends. 26th. Mistle-Thrush again in fine song. About eight inches of snow to-day, a fitting close for the year.—T. THORNTON MACKEITH (The Hall, Caldwell, Renfrewshire).

Some Ornithological Notes from North-East Surrey.—The finest bird haunts in this portion of Surrey are undoubtedly the well-known Wimbledon Common and adjoining Richmond Park; in addition, the large reservoirs that lie between Putney and Hammersmith Bridges protect many interesting species of water birds during the winter. I have appended a few notes on some of the birds of the district:—

KESTREL.—This species is fairly common in district, nesting annually in Richmond Park. Watched one hovering over the reservoirs at Putney, Nov. 27th, 1908.

RED-BACKED SHRIKE.—Formerly bred on Wimbledon Common, but is only known there now as an occasional spring visitor; saw a pair for some days during early June, 1908, on Common; was rather disappointed that they did not stay to nest. Nearest regular nesting-place is, I believe, Banstead Downs.

REDWING.—A regular winter visitor with Fieldfares to Wimbledon Common; only occasionally seen in Richmond Park.

WHEATEAR.—Usually only known as a passing migrant in spring. First seen on Wimbledon Common this year, March 31st; they generally disappear by the second week in May. Saw a pair near the Penn Ponds, in Richmond Park, June 16th, 1908, probably a nesting pair. Occasionally seen during April on Barnes Common.

GOLDEN-CRESTED WREN.—A regular winter visitor to all parts of district, including Barnes Common ; only occasionally seen during the nesting period.

GREY WAGTAIL.—A regular winter visitor to the riverside and reservoirs at Putney, usually arriving during the first week in October, departing in March. Only occasionally seen elsewhere in district, as Wimbledon Common, Richmond Park, and meadows near Raynes Park.

TREE-PIBIT.—A fairly common summer visitor to Wimbledon Common and Richmond Park, arriving as a rule about April 12th.

COMMON BUNTING.—I have not observed this species nearer London than Lower Morden and Worcester Park, where it is very common about the fields and hedges.

HAWFINCH.—Occasionally seen on Putney Heath and Wimbledon Common ; I do not know of its having bred recently in district.

CARRION-CROW.—Fairly common in district, especially about the river and reservoirs ; it nests annually in some tall elms at Barn Elms, near Putney.

SWALLOW.—Usually arrives about April 10th, departing during the fourth week in October. On Nov. 26th, 1908, I was surprised at seeing one of these birds flying about the river near the Beverley Creek ; the wind had been blowing from the south-west for some days, so probably this accounted for its very late appearance.

KINGFISHER.—Occasionally seen along the Beverley near Kingston Vale ; also usually seen during the winter on the reservoirs at Putney.

COMMON SANDPIPER.—A regular spring migrant, stopping a week or two at Putney on its journey to northern breeding haunts. I have noted them on the following dates :—May 4th, 1907 ; April 24th, 1908 ; April 26th, 1909 ; also three on May 17th, 1909 ; all at riverside, Putney ; April 13th, 1909, at Penn Ponds.

DUNLIN.—A regular winter visitor to the reservoirs and riverside between Putney and Hammersmith Bridges. Last winter (1908-9) I saw as many as six of these rare visitors ; they usually stay about two months in the vicinity of the reservoir.

COMMON SNIPE.—Uncommon winter visitor ; usually a few to be seen about some swampy grounds by the reservoir.

HERON.—There were quite forty nesting pairs of birds in the heronry in Richmond Park this year. They are regular visitors to the Putney reservoirs in the early morning.

WIGEON.—A common winter visitor to the reservoirs ; as many as two hundred have been seen after severe weather.

TUFTED DUCK.—Usually about twenty of these little diving Ducks may be seen on the reservoirs during the winter.

GREAT CRESTED GREBE.—Resident in the district all the year round, nesting annually on the Penn Ponds, and during the winter they become quite numerous on the Putney reservoirs. Last winter as many as twenty of these handsome birds were congregated on the various reservoirs.

LITTLE GREBE.—Often seen on the Penn Ponds and on the river between Putney and Barnes. Nested successfully in the reservoir grounds in 1908.

COMMON GULL.—This species is becoming a much more numerous winter visitor; during the earlier portion of this year they became quite common on the Thames at Putney, &c. Noted one on the Penn Ponds during November, 1908.

LESSER BLACK-BACKED GULL.—Observed one on the river and reservoirs at Putney, April 24th–27th, 1908, my first record of this species in the district. — WILLIAM A. TODD (62, Festing Road, Putney).

“A List of the Zoological Gardens of the World.”—Referring to the article on this subject by Capt. Stanley S. Flower in ‘The Zoologist’ (*ante*, p. 161), your contributor has omitted to mention the fact that there was a large zoological garden in Hull. This was opened in 1840, and consisted of about seven acres of land. It was situated on Spring Bank, and contained many valuable animals. In its latter days various non-zoological attractions were introduced to secure support, and the garden was abandoned about 1862, the site now being built upon. The fountains, “ruins,” various trees, &c., which existed in the grounds were transferred to the Hull parks. — T. LENNARD (Municipal Museum, Hull).

OBITUARY.

EDWARD HAMILTON AITKEN.

THE death occurred at Mornington Place, Edinburgh, on Sunday, April 25th, of Mr. Edward Hamilton Aitken (“Eha”), a well-known writer on Indian Natural History.

Mr. Aitken was born in 1851 at Satara, where his father, the Rev. James Aitken, was a missionary of the Free Church of Scotland.

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He was educated at Bombay and Poona. Passing the B.A. and M.A. examinations in Bombay University at the head of the list, he won the Homejee Cursetjee prize (poem) in 1880, and was Latin reader in the Deccan College from 1880 to 1886. Mr. Aitken then entered the Customs and Salt Department of the Civil Service, of which he rose to be head. He retired two years ago and settled in Edinburgh. Mr. Aitken wrote, under the *nom de plume* of "Eha," a number of books on Indian life and natural history, notably 'Tribes on my Frontier,' 'Behind the Bungalow,' 'Common Birds of Bombay,' and 'A Naturalist on the Prowl.' He was also the author of 'Five Windows of the Soul.'

Mr. Aitken, who was ill only two months, leaves a widow, two sons, and three daughters.

THE REV. H. MILNES, M.A.

MR. H. MILNES, who was born seventy-seven years ago and died at Cheltenham on March 10th last, was a keen collector of British Mollusca, more especially the Land and Freshwater Shells; he also possessed a small collection of Exotics besides. Before coming to Cheltenham, where he had resided for several years, he was vicar of Winster, in Derbyshire, where he assiduously collected the Mollusca of that county, and as a result published, in 1893, a "List of the Land and Freshwater Shells of Derbyshire" in the 'Journal of Conchology,' to which periodical he was a casual contributor. But, though he published very little, he was a keen observer, of which the voluminous note-books which he continuously compiled constitute sufficient evidence. These, together with his collections, arranged in half a dozen small cabinets, have been presented to the Cheltenham Boys' College. As this institution is considerably overcrowded, and already in possession of a good representative Collection of Shells, and is besides liable to be closed to the public at any time, it is much to be regretted that the deceased did not bequeath the collection to the Town Museum in Clarence Street, which was only opened in the autumn of 1907, and is at present practically starving through want of support in the shape of donations. Mr. Jones, the Curator, informs me that he did approach Mr. Milnes some months before his decease with this object in view, but without success. This, I am given to understand, was chiefly in consequence of the chagrin which he manifested at the conspicuous absence of sympathy displayed towards Conchology, in this osten-

tatious educational centre, by the leisured classes, which was apparently less prominently the case half a century or so ago, especially during the Cuming era, when everybody of consequence considered it the correct thing to be in possession of at least a few examples of ornamental exotic shells. Now this is entirely changed, and the half-pay and retired officers who at the present time constitute a considerable proportion of the principal private residents of Cheltenham do not seem to possess either the means or inclination for pursuits of a purely scientific character. As, however, to my knowledge, there is nobody in connection with the College who is practically interested in Conchology, all the boys being as usual more or less attracted by football and other sports, I should not be surprised if many of the specimens are not in consequence eventually consigned to the dust-bin; while, had the "pearls" been presented to the Town Museum, they would have been available for those who could appreciate them.

The deceased was a member of the Conchological Society of Great Britain and Ireland, as well as formerly of the Malacological Society of London, and served for a time on the Committee of the Conchological Club at Leeds. His entire library of conchological books, pamphlets, and reprints has been purchased by Messrs. Chamberlain & Co., of Gloucester.—W. HARCOURT-BATH.

WILLIAM H. EDWARDS.

THIS well-known American naturalist passed away at his home in Coalburgh, West Virginia, U.S.A., on April 14th, in his eighty-eighth year. He was born in Hunter, Greene County, New York, on March 15th, 1822. Graduating from Williams' College in the Class of 1842, he was admitted to the New York Bar in 1847. The year previous to this he made a voyage up the Amazon River to collect objects of natural history, and published 'A Voyage up the Amazon' (1847). He will, however, be best remembered by his 'Butterflies of North America,' in three volumes, commenced in 1868 and completed in 1897, a standard work of great merit. He was also the author of 'Shaksper, not Skakespeare' (1900).

NOTICES OF NEW BOOKS.

Mendel's Principles of Heredity. By W. BATESON, M.A.,
F.R.S., &c. University Press, Cambridge.

THIS volume describes a great factor in organic evolution. In the pages of 'The Zoologist' (1905, p. 240) a notice appeared of Mr. Punnett's excellent little work on "Mendelism." Prof. Bateson now details the principles on which that philosophical conclusion is based.

The conception of evolution is a very ancient one* ; when we understand its method we shall have discovered the working of the cosmic process. It is not to be enunciated by terms and definitions, nor demonstrated like one of Euclid's problems ; neither is organic evolution the product of one factor, as apparently insisted on by those followers of a dogmatic Darwinism (certainly not that of its great master) who rigidly describe themselves as "selectionists." As Prof. Bateson wisely remarks, to Darwin the knowledge of Mendel's principles would have come "as a delight, that progress, even if in a direction unexpected by himself, had been made with that problem the solubility of which he was the first to make apparent to the world." In fact, the Mendelian factor supplements "Natural Selection" ; even if it qualifies it does not invalidate that great teaching, and both factors together will still be followed by others yet to be, and which subsequently certainly will be discovered. The greatness of a theory is in its promotion of work in other directions, while the process of "Natural Selection" itself will weed out much of the doctrinal commentations and proposed axioms of some neo-Darwinians.

* In the last issue of 'The Hibbert Journal' (vol. vii. p. 533), Ibn Ishak tells us that it is an old truth in Islam. It is taught in the Masnavi of Jalal ud Deen Rumi, who died A.H. 672, and is the belief of all Muslim mystics, and is founded on the teaching of the Kuran.

Prof. Bateson has described a mass of accurate observation and experiment, which fully entitles him to remark that "no one who is acquainted with Mendelian method will doubt that by its use practical breeders of animals and plants may benefit." At the same time this volume very considerably advances our conception of organic evolution, and will well repay the careful study and consideration of all who are interested in that great problem. There is still much to be done by the Mendelian method, the results of which may exceed reasonable expectation, and we gather from the pages of this book that in Cambridge alone there are enthusiastic workers, and of both sexes, who are energetically pursuing the investigation.

A Student's Text-Book of Zoology. By ADAM SEDGWICK, M.A., F.R.S. Vol. iii. Swan Sonnenschein & Co., Ltd.

WE welcome the third volume of this authoritative work on Zoology, which completes the Special Parts, and Prof. Sedgwick tells us that he is now in a position to turn his attention to the General Part. The second volume was noticed in 'The Zoologist' for 1905, so that the work cannot be described as hurried through the press. In this volume the chapters on Tunicata, Enteropneusta, Echinodermata, Onychophora, and Myriapoda are by the author; those on Arthropoda in General and on the Crustacea, and the section on the Xiphosura, are by Mr. Lister; those on the Insects and Arachnida being contributed by Mr. Shipley. That the order of the Phyla is not one universally followed—the Arthropoda being treated last—is discussed in the Preface, and, as Prof. Sedgwick remarks, "all zoological arrangements are compromises, and none of them can be, now or ever, entirely natural."

In his treatment of the Insecta, Mr. Shipley has not followed the sequence of Dr. Sharp in the Cambridge Natural History, of which he is a co-editor, but in this arrangement there is at present, and rightly, no finality. We still have much to learn on this question. At present—at least in this country—the dominant entomological drift is apparently towards speculative questions on the subject of mimicry, the evolutionary study by practical or morphological methods being in some desuetude.

Mr. Shipley's contribution belongs to the older and sounder method, one that will come to its own again, when original guessing will not be considered philosophical speculation. At the same time it is impossible to treat the Insecta in the confines of a section; the class, dealt with fully and universally, would require a series of volumes.

It is a great satisfaction that in this publishing era of "Nature Books" such works as the one under notice should be obtainable for reference by zoologists. It has been well said that every book has many authors, and the authorities mentioned at the foot of each principal section support that suggestion. At the same time the reader will reflect that all would probably not make a precisely identical list; there might be a difference both in inclusion and exclusion.

A Treatise on Zoology. Edited by Sir RAY LANKESTER, K.C.B., M.A., LL.D., &c. Part VII. Appendiculata. Third Fascicle: Crustacea. By W. T. CALMAN, D.Sc. Adam & Charles Black.

THE present volume is devoted to the Crustacea, is written by a specialist thereon, and adequately describes this large and important class of the Arthropoda from the morphological and developmental purview. We trust that Dr. Calman will in another publication as fully describe the Crustacea from the taxonomical, bionomical, and distributional standpoint. Even a new but authoritative volume on the British Crustacea will be appreciated.

To those who accept definitions as helps rather than dogmas, Dr. Calman's caution in this respect will find adherents in specialists on other classes of animal life. He writes of the Crustacea:—"The Class presents so wide a range of structural diversity that it is all but impossible to give, in a few words, a definition which shall apply to all its members." And after detailing his criteria he is compelled to add:—"But while these characters are found in the more primitive members, actual or hypothetical, of all the sub-classes and orders composing the Class, the more modified types furnish exceptions to every statement of the definition." This is the common experience of

those who engage in monographic and faunistic work to any large or comprehensive extent, and constitutes one of the many evolutionary beacons which mark the course of developmental zoology.

Dr. Calman considers that the possession of stridulating organs by many Decapoda "is presumptive evidence that the animals do have some power of hearing"; by some writers this has been doubted, at least so far as regards stridulation in the Arachnida. The problem awaits demonstration, which will probably prove to be of an affirmative nature.

A strong feature in this volume is the historical account of the work achieved and the views held on the different orders by the older naturalists. If it is difficult in these days of extensive publication to keep in touch with contemporary investigation and results, it is also dangerous to ignore the views and conclusions (mistaken as many were) of those who preceded us. Our present structures are built on many old foundations.

EDITORIAL GLEANINGS.

AT a meeting of the Linnean Society of New South Wales, held on October 28th, 1908, a letter from the West Australian Natural History Society at Perth was read, asking the Society's support in approaching the Government, with the object of having Barrow Island, sixty miles off the north-west coast, set apart as a Fauna Reserve. The island, which is remarkable for its Kangaroo (*Macropus isabellinus*), Bandicoot (*Perameles barrowensis*), Rat (*Mus furculinus*), and Wren (*Malurus edouardi*), none of which occur on the mainland, is likely to be leased for sheep-farming, to the detriment of the fauna. The President stated that, with the object of saving time, the Council had responded to the appeal by sending a communication to the Premier strongly supporting the movement. The wise policy of the Crown's retention of islands as sanctuaries for wild life was being amply justified by the experiences of New Zealand and the United States; and the Barrow Island fauna was worth an effort to save. After a copy of the Council's communication had been read, it was unanimously resolved, on the motion of Mr. Kesteven, seconded by Mr. Clunies Ross: "That this meeting heartily endorses the action of the Council, and hopes that the movement will be completely successful."

MR. E. D. HOBEN, editor of the 'Manawatu Daily Times,' Palmerston North, writes:—"I have been especially interested in the Eel discussion (*cf.* 'Zoologist,' *ante* p. 160), and have been corresponding with Mr. R. C. Bruce regarding it. Have any of your readers heard of the curious fact that there are no Eels in the waters on the western side of the dividing range in New South Wales, but plenty in the eastern waters, although the streams, in some cases, start within practically a few yards of each other?" Mr. T. Allan, of Avondale, Auckland Province, states that there are two creeks in his garden. They join and flow into a mud-flat. Large numbers of Eels live in the creeks and also in the bog close by. Along the course of the smaller creek there were some swamps or flats. Mr. Allan attempted to fill these up in order to get the water to run into only one channel. When digging the soil in the swamps he found countless numbers of small Eels which had been living in the place.—('Lyttelton Times' (Christchurch, N.Z.), May 1st, 1909.)

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BONELLI'S WARBLER IN SWITZERLAND.

BY W. WARDE FOWLER, M.A.

THESE notes are put together for the benefit of those who have not yet made the acquaintance of *Phylloscopus Bonellii*, the only one of the four common *Phylloscopi* of Central Europe which has never been observed in this country. It has been long expected; it is a hardy little bird, breeding in the Alps up to some 5000 ft. above sea-level: it has occurred at least twice on Heligoland, and a quarter of a century ago it was thought to be extending its range northwards. Yet, so far as I am aware, no one has ever found it in Great Britain or Ireland.

It was always a favourite of mine in the time long past when I used to be in Switzerland for a few days at least almost every year in June or early July; but since the death of my old guide and naturalist friend Johann Anderegg I had not been there until this June, and the only specimen of *Bonelli* that I have seen in recent years was one which came on board the ill-fated 'Argonaut' as I was crossing in her from Sicily to Greece on April 16th, 1905. This date, by the way, tallies well with what Prof. Fatio writes ('Oiseaux de la Suisse,' i. 458) of its arrival in the alpine region, that it reaches Switzerland in the second half of April or even in May. I have myself met with it on April 28th at Meiringen in a spot which I knew to be a favourite breeding-place, and two days later I found it near Säckinggen on the southern border of the Black Forest. This

year, 1909, being free in June, I felt a great desire to see and hear it again, and in the two of its old haunts which I was able to visit I was not disappointed.

Anyone, in fact, who knows where to look for it and learns to recognize its unobtrusive notes is sure to find it in fair abundance in June. It is in my experience decidedly the commonest Warbler in Switzerland, unless perhaps we except the Garden Warbler; and of the *Phylloscopi* it is quite the most abundant on heights from 1000 to 5000 ft. This year I met with it about a dozen times in a fortnight, while I found the Wood-Wren but twice, the Chiffchaff once, and the Willow-Wren not at all. The last two species are indeed by no means really uncommon, but *Bonelli* and the Wood-Wren, which are closely allied to each other in several ways, and have both the same liking for steep wooded hillsides, are in the mountains the most abundant of the four.

In looking for *Bonelli*, there is no need to stray from roads or paths. It seems to have a particular fancy for low cover by the side of a high road, either immediately above or below it, on some steep bank. This year I noticed that it seemed to be specially fond of hazels; anyhow, I have rarely found it among pines, and I think the reason is that, like the Wood-Wren, it likes to have the assistance of the dead leaves of deciduous trees in concealing its nest under a stone or projecting clod. Its habit, too, is to be continually on the move in low cover or bush, where it finds the insects on which it feeds. One might suppose that southern England would suit it, at least as well as it suits the Wood-Wren, though the latter is more addicted to large woods of oak or beech.

This June I went direct from England to the Hotel Bellevue at Thun, where the large garden is full of birds, some of them so tame that they will hop into your bedroom and demand largess. Above this garden there rises steeply a hill covered with deciduous trees, where, on June 18th, 1891, I was able to introduce this bird to my friend Mr. O. V. Aplin, who, with a stroke of genius, almost instantly discovered its nest, with young. This was one of the only three nests I have seen; it consisted chiefly of roots and dry grass, and was lined with a few hairs. It is one of the points of resemblance between *Bonelli*

and the Wood-Wren that neither of them ever uses feathers for the lining of the nest. I have only once been lucky enough to find the egg, *i. e.* on June 15th, 1889; as a rule, I have been too late in reaching Switzerland. My note records that this was a beautiful one, dull white in ground colour, with rich chocolate-coloured spots, chiefly at the larger end. This agrees fairly well with Prof. Fatio's description of the egg, except that he writes of the spots as being "gris et bruns."

This year, June 8th, I found *Bonelli* again rather higher on the steep hillside above Thun; the old familiar gentle sibilation caught my ear at once in the hazels, and while we waited, the bird, doubtless the male, continued to move about from point to point without once letting you see it. The hen, I imagine, was on the nest, and when this is the case, her consort seems to be constantly on the move, sometimes retiring to a distance for a few minutes, then returning, but never betraying the situation of the nest. All the time the gentle sibilation goes on; sometimes with notes distinctly uttered, almost recalling those of the Lesser Whitethroat (only never so loud), sometimes so hurriedly as to become a kind of subdued hiss. Fatio syllables the sound as "pi-hui-hui-hui," or simply "hui-hui-hui-hui"; but, as a rule, the repetition of the note is more frequent, in my experience, and I should prefer to write at least five or six of these "hui's." They are something like the slower notes at the end of the Wood-Wren's song; and it was interesting to find this latter bird five minutes' walk further on, and so to be able to compare the two utterances. *Bonelli* has not the loud sweet call of the Wood-Wren, but the alarm-notes of the two are much alike (*thûi*, as Fatio renders them), and I found later on this year that, when really alarmed for a nest containing young, *Bonelli* can utter a louder wail which is almost enough to induce even an enthusiast to abandon his search. The nest of the bird I have just been describing escaped me; it probably contained eggs, and when that is the case, the difficulty is great, owing to the hundreds of suitable spots all around you of which one is just as likely as another to be the right one. When the eggs are hatched, the birds are so busy with the work of feeding that they readily betray their secret.

So at least I found a day or two later, June 11th, when we

had moved from Thun to the hotel at the top of the Brünig Pass, rather less than 4000 ft. above the sea. Here, just before it reaches the railway station, the road is skirted for some twenty or thirty yards by a miniature precipice of rock, hewn perpendicularly to make room for it, and about ten feet high, with a steep bank above it covered with hazel bushes. I heard *Bonelli's* sibilation here at once, and sat down on the opposite side of the road to watch. Very soon I found that the nest, in which the birds were feeding young with insects, was in a little hollow exactly at the top of the rock, just where it fitted into the steep grassy bank—a curiously conspicuous place, and one which human beings are constantly passing. But the birds did not seem at all alarmed, and showed themselves to me as I have never known them do before; both together being sometimes at the nest, while I sat watching their proceedings but a few yards away. It was not possible to climb the ten feet of smooth rock, but a day or two later we explored the nest by executing a flank movement. It was composed outside chiefly of moss—of course, with the hole in the side—and deftly hidden under a projecting stone; the young birds were crammed into it, and it was very wet with heavy rain, so we abstained from taking them out to note the nature of the lining, which was no doubt as usual of dry grass and hairs without feathers.

At other spots along the road, such as I have described above, we met with *Bonelli* again, but were unable, in spite of minute search in at least one place, to find another nest; nor did I again have such good opportunity of observing the parent birds. I may say, in conclusion, that the outward appearance of *Bonelli* is slightly different, to my eye at least, from that of the other three *Phylloscopi*; the upper parts are greyer than those of Chiffchaff and Willow-Wren in the breeding season, and the wash of yellow on the under parts is barely visible to the eye, even with the aid of a glass. There is a faint eye-stripe, but you have to look carefully for it. For other details I must refer the reader to the excellent account of Prof. Fatio, quoted above. As with most of these little Warblers, the voice is really the one easily attainable point of identification; and I think that when this has been once heard, it can never, in spite of its unobtrusive gentleness, be mistaken or forgotten.

AMERICAN EGRETS AS VICTIMS TO FASHION.

BY DR. A. MENEGAUX, Assistant, Muséum d'Histoire
Naturelle, Paris.

[Translated by the Author from a communication to 'La Nature,'
March, 1909.]

It is known that in Europe there are two species of a genus of Wading Birds belonging to the Heron group to which the name of Egrets is applied on account of the ornamental plumes arranged in a bunch on their back, namely, the Great White Heron or Large Egret (*Ardea alba*, L.) and the Little Egret (*Garzetta garzetta* [L.]). Their distribution embraces nearly all the Old World, and they are a little larger in size than similar species of America.

The Large American Egret or *Garza blanca* of South America (*Herodias egretta* (Wilson) or *Ardea leuce*, Licht.) greatly resembles her sister of the Old World. Like her, she is of a beautiful white colour, but the ornamental plumes which both sexes possess are longer and have a thicker stem. The bare parts of the tibiæ are always black, like the tarsi and claws. The lores are chrome-yellow, as is the bill, which often in the case of the sitting bird is marked by a continuous black line along the culmen. The "aigrettes," which go beyond the tail, appear in July to mark the breeding plumage, and they fall in October when the young leave their parents. It follows that the winter plumage is the same as that of summer, with the exception that the ornamental plumes are wanting. The young have a white downy plumage, without aigrettes. The male attains to a total length of thirty-eight inches.

The Snowy Heron, Little American Egret or *Chumita* of the indigenous breeds (*Leucophoyx* or *Ardea candidissima*, Gm.), is much smaller in size than the one above referred to, viz. twenty inches. The body is entirely white, but the bill is black, except at the base of the lower mandible. The lores are

yellow and the tibiæ and tarsi black. The ornamental plumes, produced by both sexes, thus form a train on the back, and are of great delicacy. They are arched at the point towards the tip and in front, owing to which they have been termed "crosses" by the trade. On the nape is a crest, a tuft of fine elongated plumes, "non-recurved-like," on the fore neck. These are more developed in the male than in the female. In winter both sexes lose these beautiful feathers. The young bird has an occipital crest before it produces the dorsal feathers of the adult.

These two species of Egrets are found throughout the whole of the temperate and tropical zones of America, from the United States to Chili and Patagonia. They live in colonies consisting of thousands upon thousands of birds, in heronries established in the lagoons which form rivers at the time of periodic rise. These families are particularly numerous in the immense lagoons and marshes formed by the Orinoco and its affluents, which can only be reached by the boats called "pirogues" in the midst of hordes of Caimans, whose length varies from sixteen to twenty-three feet. These waters are also inhabited by numerous ferocious and voracious fishes, the *Pirayes* and the *Caribes*, always on the alert to seize and devour anything that comes in their way. The slightest movement of the water attracts them by the thousand. Woe to the young Egrets and even to the imprudent hunter who comes within the reach of the Caimans.

It is the large Egret which is the first to nest about the beginning of July. The small species does not arrive until the young of the large species have left the nest in October. The nests of both species are made of dry twigs; they are flat, placed three or six feet above the water-level on the mangroves, guava, and other marsh-trees, where the vegetation is very dense. The nest of the large Egret is from eight to ten inches in diameter, and contains two or three blue eggs. The nest of the smaller species is built nearer the water, but it is of the same construction, and has either two or three bluish eggs. These are not hatched until the end of November.

Among these colonies various nests are found belonging to the Roseate Spoonbill (*Ajaja ajaja*, L.), to the Crested Boat-bill (*Cancroma cochlearia*, L.), to the Anhingas (*Plotus anhinga*, L.), to the Red Ibis, and, lastly, to the American Wood Ibis (*Tantalus*

loculator, L.). The last-named build on the tops of masses of foliage, where they break the twigs to form a kind of platform for their nests. All this busy multitude, fully engaged in searching for food and for rearing their young, fill the air with their cries which are as deafening as manifold.

From July to October, during the nesting and rearing season, the male and female possess their ornamental feathers; those of the male of the large species are the longer, and have a thicker stem than those of the female. In the male of the smaller species the tip of the feathers is very strongly curved, whereas in the female it is scarcely arched. In France these feathers are named in the trade "aigrettes" and "crosses," whereas in England they are known as "ospreys." They are made up in small packets of forty sprays, which are called "parures" or "sets"; the small Egret produces forty to fifty sprays, weighing a little more than one gramme. A thousand sprays weigh an ounce (thirty grammes); it takes thirty-three thousand sprays to make a kilo. The "ospreys" of the Asiatic species are heavier, as it only requires eight hundred of them to make the ounce and twenty-seven thousand the kilo. With the large species it is just the opposite. The Egrets of the American variety are heavier; each bird produces from forty-five to sixty, weighing 6.5 to 8 grammes. Two hundred and forty of these go to the ounce and eight thousand to the kilo, whereas in the case of feathers of Asiatic origin three hundred go to the ounce or ten thousand to the kilo.

The wholesale price of these feathers is very variable, even during the course of a year. According to the requirements of fashion it may rise to eighty francs per ounce for "aigrettes" or two thousand seven hundred francs per kilo, and two hundred and fifty francs an ounce for "ospreys" or eight thousand three hundred francs per kilo; but these prices may fall to almost nothing when they are out of fashion.

The chief country producing these feathers is Venezuela, where they are also sent from Colombia and from Brazil. It is stated that the incursions by the natives have already diminished the number of Egrets in these regions; but it is well to guard against any exaggeration, as there is no need to make holocausts of Egrets to obtain their ornamental feathers. In fact, M. Geay,

who lived for many years in Venezuela, in Darien, in French Guiana and in Conteste, ascertained that the breeding plumage of these birds is ephemeral, and that this decoration which appears in July has all fallen off by October. This also takes place with the Chumita, but somewhat later. During the moulting season each year beautiful feathers may be seen scattered about in large numbers on the bushes and under the trees in the neighbourhood of the lagoons and small watercourses where these birds fish daily, and which are frequently situated at a considerable distance from their heronries. The natives gather these feathers (which would otherwise be wasted) up by the pound and sell them, consequently neither of the two species suffer any detriment. When these feathers are picked up in good time they are, says M. Geay, as beautiful as those taken from the killed birds. Under no circumstances are they plucked from the living bird.

M. Geay assures us that the huntsmen always spare the young birds which have no ornamental feathers, and that in a heronry the young orphans are never abandoned, but are fed by the neighbours. These birds in this matter furnish us with a touching example of social solidarity.

To manage such a source of revenue it is evident that the heronries must not be depopulated by the huntsmen. Only we must not admit without convincing proofs that the existence of both species, distributed on so vast a scale, can be jeopardised by hunting excursions conducted during a comparatively short period in such restricted areas as those they affect. The conditions in the Old and New World are very far from being the same, and the protective measures necessary in the Old World may indeed not be indispensable in the New.

The decrease which it is thought has been ascertained is more likely due to a change of domicile of the birds caused by hitherto uninhabited regions having become the home of man. These birds, when leaving places that had become too noisy or dangerous owing to the vicinity of man, would look for some inaccessible spots where their security would appear to be greater. This would therefore be a particular case in a general fact, the withdrawal of the wild species on the advance of man.

The caprice of fashion can hardly be more than a very

secondary cause ; its exigencies are so uncertain in their periodicity and duration, and cause such fluctuations in price, that the plumage of one species is at one time enormously costly, and at another the prices are so low that the search for feathers becomes unremunerative and ceases altogether. It is then that the species finds time to recuperate. This is the case at the present moment in regard to Humming-Birds, at one time in such great demand.

Under these circumstances, it would seem that the Bill, accepted by the English House of Lords and referred back to the House of Commons, the object of which is to restrict decorative birds to those used for purposes of food, and which would prohibit in England the importation and sale of the plumage of all those species that serve for decoration alone, would overstep the purpose in view, and would be seriously detrimental to the trade and to feather-dressers. This is a very complex question, towards the solution of which still further information seems essential.

As to Egrets, the real remedy would probably lie in domestication, by means of which these two species would lose their migratory instinct, just as tame Ducks and Geese have lost it. The difficulties would not be insurmountable, but probably much less than those which the English colonists at the Cape have had to overcome in domesticating the Southern Ostrich. Various attempts have already been made, but they have not been persevered in for a sufficiently long period.

On this subject the Editor reprints a Leaflet issued by "The Royal Society for the Protection of Birds," which bears a different construction :—

Dealers in plumes are circulating statements to the effect that the Egret or "Osprey" plumes are moulted feathers, and that the birds are not killed in order to procure them. In particular a letter is being largely disseminated both in England and Australia, headed "Importation of Plumage Prohibition Bill.—How the Osprey Feathers are Procured." It is in imitation type-writing, signed "Leon Laglaize," and dated "Buenos Ayres, July 29th, 1908," but there is no indication of the persons to whom it is addressed or by whom it is

circulated. This letter professes to give an account of regions in Venezuela and Argentina where, it says, the birds are strictly protected in the nesting-time by "a sort of armed police composed of natives," the impression conveyed being that these vast *llanos*, covered by the flood-waters of the great rivers, resemble English shooting preserves where patrolling keepers warn off the village poacher. It further states that "the natives in charge paddle their canoes, circulating under the trees, and go on picking up the feathers that have fallen into the water during the night"; also that after the breeding season a "valuable amount of feathers" is collected from the abandoned nests: "The feathers have been skilfully rolled in to furnish and soften the interior. These nest-feathers are of the best kind, for they have been pulled off by the bird itself before laying the eggs."

In order to test the amount of truth in this document, and in similar stories, the Royal Society for the Protection of Birds has obtained the facts of the case from H.B.M.'s Ministers in Venezuela and Argentina, and from well-known scientific authorities in other parts of the world where Egrets breed and "Osprey" hunters are at work. The letters are printed in the Society's Leaflet No. 60, "Moulted Plumes." The following extracts contain the pith of the matter:—

Sir Vincent Corbett, H.B.M. Minister at Caracas, writes (Jan. 14th, 1909):—"From the evidence before me I have no manner of doubt that the vast majority of the Egret plumes exported to Europe are obtained by the slaughter of the birds during or about the breeding season, and that no effective regulations exist or indeed, owing to local conditions, can exist for the control of this slaughter, and that the letter of Mr. Leon Laglaize, of July 29th, 1908, gives a *completely erroneous* impression of the conditions under which the industry of collecting the plumes is conducted in Venezuela."

The information enclosed, coming from several correspondents, states:—"In the Tucacas district the coast is one continuous mangrove swamp intersected by creeks. At certain times of the year flocks of Egrets, returning from their feeding-grounds, pass over these swamps in the evening. Shooting parties, armed with all sorts of nondescript firearms, wait for them up the creeks, and when overhead fire a volley right into the middle of the flock. The dead and wounded birds are then collected, the plumes torn out, and the bodies thrown back into the water. The large 'garceros' are those of the Orinoco frequented by the birds during certain months of the year. The owners no doubt do their best to protect the birds, not from any

humane motive but for fear that they should abandon the 'garcero' if disturbed too much; but this is always difficult. It is not like preserving a covert. *Persons who pay for the right of collecting the plumes have no scruples about destroying the birds. Their object is to get as much as they possibly can for their money.* The short or 'crosse' feathers from the Little Egret are *exclusively collected from birds shot for the purpose.* These feathers are so delicate that they are broken and torn in the bushes and thorns before they are moulted, and the dropped feathers are therefore valueless for trade purposes. The difference between feathers collected from birds which have been killed and feathers moulted by the birds is notable and easily recognized. The former, called 'live feathers' out here, are much superior in appearance, they possess greater brilliancy, smoothness, and elasticity; while the latter, called 'dead,' are dull, brittle, and dirty. Statements circulated that the feathers are collected from abandoned nests, and that Indians make their living by picking up moulted feathers, do not appear to be founded on fact. The birds are in full plumage after the month of June, and they begin to moult in October. The nesting and breeding season begins in August, during the height of the wet season, and by November the young birds are fledged. The Little Egret breeds somewhat later than the larger Heron. The season for collecting feathers begins about July and continues to the end of November."

H.B.M. Consul at Rosario, Santa Fé (Argentina), writes (Jan. 16th, 1909):—"Some few years ago, owing to the demand for feathers of the Heron and other birds and the high prices paid, the birds which formerly were very plentiful on the islands bordering all along the River Paraná were *almost exterminated* by the islanders and others, who made a profitable living in hunting them. Although this country has provided laws to prevent shooting out of season, such laws are seldom enforced—in fact, in the inland island districts where the birds exist, or used to, it would be *impossible*, owing to the vast district, *to enforce the laws.* As far as I am aware there are no 'Egret farms' established in the Argentine, and if shooting, as it is, is prohibited in some parts by landowners, it is solely with a view to prevent their herds being injured by inexperienced sportsmen."

Mr. J. Quelch, B.Sc. (Lond.), formerly Curator British Guiana Museum, Adviser to the Government for the granting of Licences to kill Wild Birds, writes (Nov. 29th, 1908):—"During a residence of seventeen years in British Guiana, and with an experience of travel ranging from the Eastern Orinoco to the borders of Surinam, and

inland into Brazil and Venezuela, along the eastern upper waters of the Amazon and the Orinoco, I have *never known nor heard of any such method of collection* as that described by Mr. Laglaize. Until the Government in Demerara put into force the stringent provisions of the Wild Birds Ordinance, a brisk trade was carried on by many people in the export of birds' skins, and largely of Osprey plumes. These feathers were obtained by *killing the Egrets in the breeding season* and cutting off the skin of the back on which the plumes were borne."

Mr. H. E. Dresser, author of 'The Birds of Europe,' writes (Nov. 16th, 1908):—"All I can say is that I do not believe the statements in it. Out of hundreds of Egrets' nests which I have examined I have never found one in which were feathers of the birds themselves amongst the lining, certainly never a single one of the so-called 'Osprey' plumes. I never heard of any trade being done in moulted plumes, and do not believe the tale about the Egret colonies being farmed out for cast plumes."

Mr. Frank M. Chapman, Curator of the American Museum of Natural History at New York, writes (Nov. 30th, 1908):—"So far as my own somewhat extended experience in our Southern States is concerned, I may say without fear of contradiction by those in a position to know that moulted Egret plumes are never gathered for commercial purposes."

Mr. Gilbert T. Pearson, Secretary of the National Association of Audubon Societies, writes (Dec. 1st, 1908):—"In the most populous Egret colonies that I have ever visited, cast-off plume feathers are so scarce that an entire day's search would not reward the hunter with enough to decorate one lady's hat. *The feathers are never used for lining the nest*, as the latter is composed entirely of dead sticks and twigs."

Mr. H. E. Mattingley, in the 'Emu,' the organ of the Australasian Ornithologists' Union, writes:—"The *only method* by which the hunters are able to obtain Egrets' plumes in quantities is to *shoot the birds* on their nests."

ORNITHOLOGICAL NOTES FROM NORTH DEVON.

BY BRUCE F. CUMMINGS.

ON May 1st, while on Braunton Burrows, near the Hospital Ship, I heard a Grasshopper-Warbler (*Locustella naevia*) "reeling" for some minutes, and eventually caught a good view of the bird as it crept to the top of a bush in which it was concealed, and then flew off to another. This Warbler is a rare bird in North Devon, and Messrs. Matthew and D'Urban state, in 'The Birds of Devon,' that they were never able to detect it here. I watched subsequently, but I do not think the bird remained in the district.

A Green Woodpecker (*Gecinus viridis*), found frequenting the sandhills, was shot by Mr. C. Petherick, a mariner, who has "been abroad," and, to his surprise, it was *not* a Parrakeet.

A French Partridge (*Caccabis rufa*) was picked up under the telegraph-wires, near Barnstaple, in March of last year. Our wet climate seems very uncongenial to the bird, and it is rarely reported, at all events in the north of the county.

Three nests of the Buzzard (*Buteo vulgaris*) were said to have been found last spring in the woods around Combe Martin, while in the Lynton district this bird breeds even more freely; but the woodmen appear to have become corrupted beyond all salvation, and I am told that they robbed something like fifteen nests of the Buzzard last year around Lynton alone! I saw one nest at Lynton in the "lap" of an oak with a huge girth, which contained a couple of eggs which subsequently were stolen, much to my regret.

The Watersmeet Valley, Lynton, during the summer, is alive with the song of the Chiffchaff (*Phylloscopus minor*) and the Wood-Warbler (*P. sibilatrix*). I have never seen the latter before in any other part of the county, and it is, most distinctly, a very local bird. In the same valley I saw a pair of Redstarts (*Ruticilla phoenicurus*), which were obviously breeding. The

Redstart is rare in the Barnstaple district, and scarce everywhere in North Devon. They were the only pair of birds which I have found actually resident in North Devon.

While on Exmoor, near Brendon, in June last year I watched a certain bird for some time, and satisfied myself that it was a male Harrier, but I do not know which species. I think it must have been the Hen-Harrier. The female was also present, and the probabilities are that they were resident.

A Short-eared Owl (*Asio accipitrinus*) was flushed on Halsinger Down, Braunton, by members of the Botanical Walk, on July 16th. This is one more instance of this bird being in the Braunton district during the summer (*vide* Zool., January, 1907, p. 23).

During September I noticed a Ring-Ouzel (*Turdus torquatus*) in the Tavy Cleave, near Dridestowe, Dartmoor. On Exmoor, according to my own somewhat limited experience of the district and to the wider experience of others, the Ring-Ouzel has become very much reduced in numbers, and is not so often seen as it used to be.

There was a Purple Sandpiper (*Tringa striata*) on the River Taw in the second week of December, and also several single Grey Plover about, and numbers of Golden Plover. On Jan. 2nd I spent the best part of the afternoon watching two Brent Geese in the water near Crow at the estuary.

A White-tailed Eagle (*Haliaëtus albicilla*) was shot during March by a farmer near West Buckland, who saw it sailing over a field, and thought it was going to attack his lambs. The bird was set up by a Barnstaple birdstuffer, at whose premises I saw it afterwards. The bird was in poor plumage, and the tail was very much abraded, several of the shafts of the tail-feathers being quite bare of barbs. This indicates, perhaps, former captivity, as the state of the tail might well have been caused by being dragged over the bottom of a cage. The colour of the tail was a dirty sandy colour, the weight, in the flesh, ten pounds, wing expanse a little over seven feet. The bill was brownish black, and the cere was not yellow but of a dark brown shade. There were numerous bristles on the skin around the base of the bill. The specimen was that of a young bird. According to Messrs. Matthew and D'Urban, the majority of the

White-tailed Eagles obtained in this county have been immature birds.

I was glad to observe last spring a pair of Redshanks (*Totanus calidris*) on Braunton marshes, which evidently had a nest in the vicinity. I made a repeated search for the nest, and subsequently the gamekeeper, Mr. J. Petherick, stumbled across the young birds in a marsh not far from his house. The young were still unable to fly, and were accompanied by the old birds in great distress. Although the Redshank has often been suspected of breeding in the north of Devon, I am not aware that the suspicion has been hitherto definitely substantiated by fact. The only other record I have seen of its nesting in the county is one made by Mr. E. A. S. Elliott, who found young birds in June, 1894, at Slapton Ley, South Devon. The keeper told me he had never known the birds breed on the Braunton marshes before, nor had he ever seen them there in the breeding season until now, and my own observations agree with this. This year there were two pairs on the marshes in April, but latterly only one pair. This pair I have repeatedly watched, yet have not succeeded, nor has the gamekeeper, in finding either the young or the eggs.

On May 24th last the keeper showed me a nest of the Shoveler (*Spatula clypeata*) situated in a marshy field near the duck-ponds at the Taw estuary. The young birds had hatched out three days before, but the down and feathers, together with the broken egg-shells, were quite sufficient to bear out the statement of the keeper, who saw the female sitting. He is a careful observer of the birds of his district, and thinks a pair have bred on the ponds every spring since 1906, the year I first recorded this species as resident (Zool., January, 1907, p. 22).

NOTES ON THE FISHES OF JAPAN.*—No. IV.†

BY PROFESSOR MCINTOSH, M.D., LL.D., F.R.S., &c.

BELONGING to the group of the Mackerels and Perches is the pelagic *Istiophorus*† *orientalis*, T. & S., a Sail-fish of ten feet in length, and weighing 164 lb., having a huge dorsal fin which stands more than the depth of the body above it, and which may, as Dr. Günther says, be used as a sail before the wind. The dorsum of the fish has a dark green glow with bluish dots, the large dorsal fin being of a similar hue with bluish-black dots. The annual catch of this fish is about 11,823,687 lbs., and it is captured by means of harpoons, and generally consumed fresh. It is excellent food. As a rule it swims in pairs, with the huge fin erect and above water, especially in windy and rough weather, when the fishermen more easily approach it to hurl a harpoon; the line is then paid out until the fish, after furious efforts, exhausts itself. A figure on the same plate with the foregoing represents *Tetrapturus albidus*, Poey, which much resembles the Sword-fishes in habits, and is probably caught and eaten like the foregoing, though no remarks accompany it.

Three members of the Herring Family (*Clupeidæ*) are dealt with in this fascicle, viz. *Clupea pallasi*, C. & V., *Etrumeus micropus*, T. & S., and *Engraulis japonicus*, T. & S. The first, or North Pacific Herring, is perhaps the most important Japanese fish, both as food and as a fertilizer in farming. Like our own Herring, its record shows no diminution, and there are probably greater numbers of this fish in the Pacific—just as there are greater numbers of the Common Herring in the Atlantic—than any other species. Even were it possible to remove every other species of fish and those which prey on them, the supply for

* 'The Economic Fishes of Japan,' by Professors Otaki, Fujita, and Higurashi. No. I. vol. v., four plates. Shokwabo, Tokyo, Japan. 1909.

† Previous communications on this subject will be found in 'The Zoologist,' 1904, p. 247; 1906, p. 143; 1907, p. 450.

‡ *Histiophorus*, Günther.

man would be very considerable. Björnsön's statement that wherever a "school" of Herring touches the coast of Norway there a village springs up would be applied by Starr Jordan, with good reason, to Scotland, Newfoundland, and from Alaska to Japan. The authors of the 'Fishes of Japan' observe that the total catch for 1901 was 7,825,380 lbs., in 1902, 8,979,580 lbs., and in 1903, 9,746,680 lbs. The fishery takes place chiefly in March and April off Hokkaido, when the temperature of the water is 42.80° (6° C.), and frequent visits are made by the "schools" during the year to the shallow water inshore. Its eggs are deposited on the seaweeds and the bottom in masses, as in the British form, and each is said to deposit from 40,000 to 110,000 eggs, a considerably larger number, if correct, than in the case of the British Herring, which has from 20,000 to 47,000. The egg is transparent, 1 mm. in diameter, and with an oil globule. Fishing is by gill-nets and pound-nets, of which a sketch is given. Besides the Herring itself the roe is dried, and forms an important article of diet in Japan.

The Urume-iwashi (*Etrumeus microps*), the second form, is found on the eastern shores of Japan, keeping to the deeper water, and seldom visiting the bays except to spawn. It is caught by gill-nets, seines, and a portable pound-net called "Hachida-ami," which is set horizontally, the fishes being led to it by three boats carrying torches, two extinguishing their lights when they reach the net. The net is then lifted, and when nearly hauled the third boat also puts out its light. No statistics are given of the captures, but they are probably considerably less than is the case of the North Pacific Herring. It is consumed either fresh or dried in the sun.

The Japanese Anchovy, which resembles our own, extends from the south of Hokkaido to Kiushiu. Its egg is also pelagic and ovoid with a reticulated yolk. "Schools" of Anchovies visit the bays from April to June to spawn. They are captured by drag-seine, sweep-nets, and a kind of set-net. Besides being used as an article of food, it is employed as a fertilizer on farms, like the Sprat of the Firth of Forth. The fry are also largely used in the dietary of the Japanese, a sufficient proof of their great abundance, and in a country where such captures have been made for ages.

Two Gadoids, a group so interwoven with the fortunes of the British Fisheries, are alluded to in this fasciculus, *viz.* *Pollachius brandti*, Hilgend, the Madara or Common Codfish of Japan, and *Theragra chalcogramma*, a lean Gadoid. The former is found in latitudes above 40° N. on rough ground, the most important fishery being off the west coast of Hokkaido. It attains a length of 4-7 ft. and a weight of 38 lbs. It is chiefly used in the dried state, and the roes are also salted and dried. It spawns in January and February, and the pelagic eggs are 1.4 mm. in diameter, and are hatched in thirteen days at a temperature of 44.6° F. (7° C.), and therefore in this respect do not differ much from the British Cod. It is captured mainly by gill-nets and trawl-lines somewhat after the fashion of those on our own coast. Statistics are not given up to date, but, in 1901, 6,175,000 lbs. was the total catch. It will be interesting for future naturalists to watch the progress of this fishery in Japan, surrounded as it is by sea like Britain, and with the vast North and South Pacific oceans in continuity. History will probably repeat itself as the fishing industry in Japan extends.

The other Gadoid or Suketo-dara (*Theragra*), the Alaska Pollack, is a deep-water fish somewhat like a Whiting, though the tips of the pelvics are longer and the first anal short. It is a valuable food-fish widely diffused through the North Pacific, attains a length of two feet, and is the cause of important fisheries off the Japanese coasts. In 1895 the total catch was 11,717,690 lbs. It would have been instructive if the authors had added statistics of this and other food-fishes up to date, but perhaps such were not available. The Alaska Pollack spawns in the shallow waters in April, but no mention is made of the eggs, which are probably pelagic. It is captured by similar methods to the former.

The last of the series is the so-called "Dolphin" or Dorado (*Coryphæna hippuris*, L.), a fairly large, swift, predaceous fish well known in all warm seas, but which does not seem to reach so large a size (6 ft.) as in other seas, the Japanese form being 3½ ft. and having a weight of 13-15 lbs., for it is not indicated that capture of the smaller forms is preferred for economic purposes, as in the case of the Tunny. It is esteemed both in the fresh and the salted condition, and is as popular in Western Japan as

the Salmon in the North-east. It spawns in May and June, when it seeks the proximity of a wooded coast, and the young, which differ in their elongated form and in other respects from the adult, are stated to be seven or eight inches long in six months after they are hatched. It would be important, however, to follow their development from the egg. It is captured by hook and line, but also by an ingenious method with a decoy-bush and raft constructed of bamboo. When the fishes congregate under the raft they are caught by hooks baited with Squids. Another method is to encircle by means of two boats the decoy-bush and bamboos by a loop of a seine-net, whilst a third boat by and by enters the circle and drives the Dolphins into the fish-pocket by beating the surface of the water with sticks, and then the circle is closed. The plan of using strong bare hooks beneath the fishes and jerking them out of the water would seem to be adapted for this fish when congregated under the decoy-bush and raft of bamboos.

The Plates in this fascicle are four in number and represent eight species. Their execution would do credit to any country. The artist, K. Ito, is to be congratulated on his work, and similar commendation is merited by the lithographer, E. Koshiba.

TWO UNRECORDED 'CHALLENGER' HYDROIDS FROM
THE BERMUDAS, WITH A NOTE ON THE SYNONYMY
OF *CAMPANULARIA INSIGNIS*.

BY JAMES RITCHIE, M.A., B.Sc., Natural History Department,
The Royal Scottish Museum.

IN the course of an examination—due to the kindness of Mr. R. Kirkpatrick, of the British Museum—of the type specimens of *Campanularia insignis*, Allman, collected by the 'Challenger,' two epizoic Hydroids were observed creeping upon the larger colonies. These must have been overlooked by Allman, for they are not mentioned in his account of the 'Challenger' Hydroid collection; and since they extend the geographical ranges of their species considerably, and are new to the fauna of the Bermudas, it seems worth placing their occurrence on record.

Lafoëa venusta, Allman, 1877.

A very few of the hydrothecæ of this species are scattered over the stems of *C. insignis*, but no gonosome occurred in connection with the specimens examined.

It is a striking fact, to which Dr. Jäderholm* has already drawn attention, that of the recorded occurrences of *L. venusta*, on each occasion the colonies were climbing over the stems and branches of *Obelia* (*Lytoscyphus*) *marginata*, Allman, and of it alone. This is true again of the 'Challenger' specimen, for, as stated below, *C. insignis*, Allman, 1888, is a synonym of *O. marginata*, Allman, 1877.

L. venusta appears to be confined to the tropical and subtropical portions of the western board of the North Atlantic Ocean. It has been recorded from Logger-Head Key, nine fathoms (Allman, 1877); from ten miles north of Zoblos Island (Clarke, 1879); from Anguilla, Antilles, one hundred to one hundred and fifty fathoms (Jäderholm, 1903); and the present

* Jäderholm, E., 'Arkiv för Zool., utg. af Kgl. Svenska Vetenskapsakad.' 1903, Bd. i. p. 274.

occurrence, from off the Bermudas, thirty fathoms, widens the geographical range considerably northwards.

Aglaophenia cylindrata, Versluys, 1899.

There is little to distinguish the trophosome of this species from that of *A. rhynchocarpa*, Allman, and indeed, were it not for the rather marked differences in the corbulæ—that of the former having been described by Jäderholm,* that of the latter by Allman† and Nutting‡—one would be tempted to regard the two designations as synonymous. In the examples growing over *C. insignis*, corbulæ are unfortunately absent, and in identifying them with *A. cylindrata* I have relied upon the different proportions of the hydrotheca, the less marked concavity of the anterior profile, and upon the fact that in every point the 'Challenger' specimens agree with the minute and careful description and figures of Versluys. There is considerable diversity in the shape assumed by the chitinous distal end of the hydrothecal keel.

Dimensions:—Length of colony up to 20 mm. Stem internodes: length, 0·29–0·34 mm.; diameter, 0·15–0·22 mm. Hydrotheca: length, 0·24–0·27 mm.; diameter at mouth, 0·14 mm.; proportion of adnate part of mesial sarcotheca to length of hydrotheca, less than one-third.

The species has hitherto been found only in the Antilles: from Testigos Islands (Versluys), and from Anguilla (Jäderholm). The present record, "off Bermudas, thirty fathoms," is much further north.

These species were climbing on the specimens described by Allman in 1888 as *Campanularia insignis*. Dr. Billard, having examined the type specimens of this species in the British Museum, declares that they do not differ from *C. juncea* (*Lytoscyphus juncea*) of the same author, both of these being synonyms of Esper's species, *Lytoscyphus fruticosus*.§

* Jäderholm, E., 'Arkiv för Zool., utg. af Kgl. Svenska Vetenskapsakad.' 1903, p. 297, pl. xiv. fig. 2.

† Allman, J. G., 1877, 'Mem. Mus. Comp. Zoo. Harvard,' vol. v. No. 2, p. 40, pl. xxiii. fig. 8.

‡ Nutting, C. C., 1900, "American Hydroids. Part I. The Plumularidæ," p. 90 (Spec. Bull. Smithson. Inst. Washington).

§ Billard, A., "Sur les *Haleciidæ*, *Campanulariidæ*, et *Sertulariidæ* du Challenger" (Comptes rendus Acad. Sc. Paris, Dec. 14th, 1908, p. 1).

I am not prepared to admit, however, that *L. insignis* and *L. juncea* are identical, for in the hydrotheca alone characters exist apparently sufficient to distinguish the two forms. Thus, while *L. juncea* has a hydrotheca shaped like the bowl of a clay pipe, with an almost straight abcauline and a strongly humped adcauline profile, *L. insignis* has an almost symmetrical hydrotheca, with both abcauline and adcauline profiles nearly straight. In the former, again, the proximal portion of the hydrotheca narrows suddenly in forming the peduncle; in the latter the transition from hydrotheca to peduncle is very gradual, the hydrotheca tapering gently from rim to base. Again, while in *L. juncea* the rim is bordered by a double line (Pictet),* in those hydrothecæ of *L. insignis* which I have examined only a single line is present, the thickened band of chitin lying exactly along the border of the cup, while in the Ceylon species it lies well within the margin.

Some difference seems to occur in the gonangia also, for while Congdon† figures for *L. insignis* both furrowed and smooth gonothecæ, scarcely any of which exceed the length of the hydrothecæ, Miss Thornely's figures of *L. juncea* show that the gonothecæ are considerably larger than the hydrothecæ, "about one-third as long again."‡ Pictet's figures, on the contrary, make the gonangia of *L. juncea* shorter than the hydrothecæ.

It seems improbable, therefore, that *L. juncea* and *L. insignis* are synonyms, but there can be no doubt that *Campanularia insignis*, Allman, 1888, is identical with *Obelia marginata*, Allman, 1877. The distinctions pointed out by Allman§ are insignificant. Indeed, the inverted cone shape which he attributes to the hydrothecæ of the latter describes exactly those of the former, while the "annular segment between the peduncle of the hydrotheca and its supporting internode"—characteristic of *Campanu-*

* Pictet, C., 1893, "Etude sur les Hydriaires de la Baie d'Amboine" (Rev. Suisse de Zool. T. i. p. 37).

† Congdon, E. D., "The Hydroids of Bermuda" (Proc. American Acad. Arts and Sc. vol. xlii. No. 18, p. 467, figs. 10 and 12).

‡ Thornely, L. R., "On the Hydroida." In Report on the Pearl Oyster Fisheries of the Gulf of Manaar, by Prof. W. A. Herdman, F.R.S., Suppl. Rep. vol. viii. Royal Soc. London, 1904, p. 114, pl. 1, figs. 1, 1A.

§ Allman, J. G., 1888, "Report on the Hydroida" (Scientific Res. 'Challenger,' Zool., vol. xxiii. p. 19).

laria insignis—occurs on only a few hydrothecæ, and even there is abnormal, signifying the occurrence of a truncation of the hydrotheca and subsequent regeneration (*cf.* the same phenomenon as described by me in *Thyroscyphus tridentatus*).* The minute characters of the two “species” are in absolute agreement, and even the fact that the parasitic Hydroid, *Lafoëa venusta*, which hitherto has always been found on *Obelia marginata*, now occurs on *Campanularia insignis*, points to the identity of the two. It is significant also that Jäderholm found on a specimen of *Obelia marginata*, from the Antilles, the epizoites *Lafoëa venusta* and *Aglaophenia cylindrata*, both of which we have now recorded as occurring upon the type specimens of *Campanularia insignis*.

It is clear, therefore, that Allman's name, *Campanularia insignis*, is a synonym, and must fall into disuse. Since the characters of *Obelia marginata* place it in Pictet's genus *Lytoscyphus*, priority decides that *Lytoscyphus marginata* must be regarded (until the evidence of the alleged identity of *L. juncea* and *Campanularia insignis* has become more conclusive) as the name by which the species should be known.

* Ritchie, Jas., 1909, “Supplementary Report on the Hydroids of the Scottish National Antarctic Expedition” (Trans. Roy. Soc. Edinburgh, vol. xlvii. part i. p. 75).

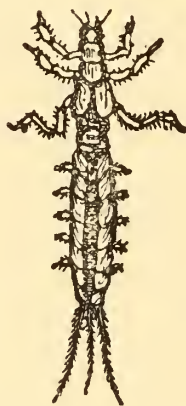
NOTES ON THE COMMON MAYFLY (*Ephemera vulgata*) AND OTHER SPECIES.

BY GORDON DALGLIESH.

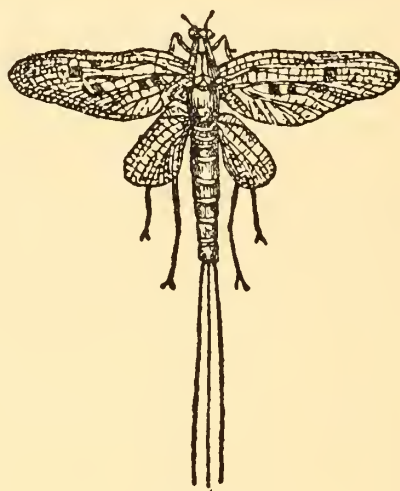
THE name of "Mayfly" is a somewhat paradoxical one, since the perfect insect is found in greater numbers in June than May. Previous to this year (1909), the earliest date I had of its appearance was June 2nd, but this year I noticed it first on May 19th.



Larvule.



Nymph.



Imago.

Ephemera vulgata.

This early "hatch" was in all probability due to the long spell of lovely warm weather. From the 'Fishing Gazette' of May 22nd I quote the following notes:—

"Mayflies on May 15th and 16th on the Colne at West Drayton" (W. H. Bates).

"Mayfly appeared here on the Pinsley on May 15th. I saw to-day (May 16th) a fair basket made [Trout presumably] dap-ping with the Mayfly" (P. Summerville).

"Whilst having lunch in my fishing-hut I noticed several Mayflies rise to the surface of the river [Darent], and they were blown away over the fields by a strong north-west wind" (W. B. Leaf).

The following extracts are taken from my note-book:—

"May 19th.—Common Mayfly up at Sweetwater, Witley,

Surrey, flying in bright sunshine at 3.30 p.m. There was a soft south-west wind blowing, and it was very warm. Only a very small 'hatch,' consisting of males only. A few specimens of *E. danica* were seen at Brook at 6 p.m., these also being males.

"May 19th.—Sweetwater, Witley, Surrey. Evidently a considerable 'hatch' had taken place during the past hours, judging from the shed nymph-pellicles floating on the water, and there were a considerable number of male flies on the wing at 3 p.m. Their flight was only of short duration, and kept up at intervals of from one to two minutes. During their periods of rest they settled on grass some way from the water; wind south-west, as before. When walking their pace is slow, and in their movements reminding one very much of that of the Mole-Cricket. Their front legs are seldom used for progression, but held straight in front in a supplicating manner, like those of a Mantis. Just after alighting the caudal setæ are spread considerably, but closed again directly afterwards.

"May 21st.—Numbers on the wing at 3.30 p.m. Day very hot, and a slight north-east breeze blowing. The flies seen were of both sexes. After pairing, which was of too short duration to allow of any close observations, the female insect flew on to a high branch of a fir-tree, and remained clinging wings downward. The male insect fluttered into the close herbage bordering the pond. From 3.30 p.m. to 5.30 p.m. I was absent from the place, but returned again at 6 p.m., and found swarms of females flying over the water and depositing their eggs. Now perhaps it is right to assume that some hours must elapse before the impregnated eggs are fit to be deposited, as, after pairing, I have never seen the female fly direct to the water, but, as before stated, fly up on to a tree. I had good opportunities for watching the female deposit her eggs, which was effected thus: flying slightly above the water she would dip every now and then as if seeking a suitable place. When this was found she would alight bodily on the water and jerk her abdomen up and down, wings and caudal setæ being widely spread. She then curved the end of her abdomen downwards, and with the three setæ spread out to their fullest extent and just resting on the water the eggs were dropped in a shower, which looked like minute white substances resembling the roe of a fish. The wings at this time were held clear

of the water, as these will not stand immersion, and once they get wet the fly is quite helpless. After the deposition of the eggs life seems to leave the insect, and it remains spread out flat, 'spread-eagle' fashion, in a condition that is technically known to anglers as a 'spent gnat.' I saw numbers of male insects alight for a few seconds on the water, and then fly away. This action on the part of the male gave rise no doubt to the supposition that 'after the eggs are passed into the water they are fertilized by the male,'* for I noticed that the males frequently flew on to the water just after oviposition. The oviduct is on the eighth abdominal segment, and as soon as the eggs are laid two small bladder-like sacs protrude from each side, filled apparently with air, which readily burst when a slight pressure is used.

"May 22nd.—Sweetwater. I arrived at the side of the water at 6 p.m., and found the Mayflies in prodigious swarms, the females predominating, and flying swiftly over the water depositing their eggs. The day had been very warm, and a soft southwest breeze blowing. De Geer says, from his observations, that 'the males greatly exceed the females.'"

As it will be seen by the above notes, according to my own observations, that on the first and second day only males were seen; therefore it is reasonable to assume that the males make their appearance first, and live for a considerably longer period than the females. According to the observations of former years, I note that males always put in an appearance first. The beautiful and wonderful dancing flight performed by the Mayfly is chiefly enacted by the male insect, and generally when the sun is very hot, and again towards the cool of the evening. If, during their flight, the sun is hidden by a passing cloud, they immediately sink to rest on a grass-stem. The female's one and sole duty is, after pairing, to rest awhile and then deposit her eggs; after that she dies. The eggs when first laid are enclosed in a thin transparent covering, which breaks as soon as it touches the water, and the eggs are dispersed and sink at once.

Reference was made in a former paper (Zool. 1908, p. 459) to the long anchoring threads attached to the eggs, and these threads I detected myself under the high power of the microscope. Wishing to get some eggs for microscopic examina-

* Swammerdam, "Ephemeri vita &c."

tion, I took some glass tubes filled with spirit to the water's edge, and caught a female in the act of depositing her eggs, and induced her to lay in the tube. These eggs were examined immediately on my return home, and I then detected the threads referred to. A few days after I examined the eggs again, and the threads had all disappeared, dissolved by the alcohol. The eggs are provided with some sticky property. Some adhered persistently to the side of the glass tube, and it required a good deal of shaking and rinsing with alcohol to release them from their hold and sink in the liquid. The eggs are bean-shaped, and appear when first laid, and under a one-sixth inch objective, of a greenish colour. This colouring matter dissolves after a time in alcohol, and the eggs are then, as they appear when fresh to the naked eye, white.

I have never, so far, been fortunate enough to see the actual emergence of the fly from the nymph. Swammerdamm says:—"When the larvæ have left their burrows they make their way with all speed to the surface, and the transformation is effected with such rapidity that even the most attentive observer can make out little, except that the winged fly suddenly darts out from the midst of the water." The claspers of the male fly are shaped like pincers, and somewhat resemble those of an earwig. In the female they appear, under a powerful lens, like minute hooks.

"Is the Mayfly disappearing?" is a question that has been mooted lately. In the 'Fishing Gazette' for May 22nd is the following:—"There is no doubt that the Mayfly and many other water-flies have become extinct on many rivers; they seem to die out first in the upper parts, and gradually appear only lower and lower down. The clearing away of sedges, shrubs, bushes, and trees from the banks and neighbourhood of the rivers exposes the flies more to the exterminating influence of birds, wind, and weather, as well as by removing the natural shelter necessary for nuptial congress. For this reason I do not believe it is reasonable to expect any transplanting of the fly to be successful unless there is plenty of natural shelter. . . . I think that the plan of attempting to stock by transplanting larvæ offers the best chance of success."

The Surrey Trout Farm at Haslemere make it part of their

business to breed Mayflies for the express purpose of exporting the larvæ to ponds and streams from which the insect is absent. It is stated that eight hundred thousand eggs were obtained from one hundred and twenty females.* For the successful rearing of the larvæ running water is absolutely essential.

Ephemera danica, a slightly smaller species than *E. vulgata*, appears about the same time as the latter, and according to my experience is not a common insect; neither does it occur in anything like the abundance of that insect. The wings are clear without markings, and shine with a beautiful iridescent gleam. The caudal setæ are very long, about twice the length of head and body, and are two in number. The flight of this insect is much swifter than *E. vulgata*, and it never ascends to a very great height. The flight resembles that of a dragonfly (Odonata). They frequent streams, and those with a gravel and sandy bottom. I have frequently taken the male insect a long distance from any water, and both sexes are fond of settling in the middle of a road. The larva is of a dark brown colour, and I have taken them about half an inch in length. They become much paler, almost transparent, before emergence. They have three caudal setæ.

At Frensham Great Pond, in South-west Surrey, on May 22nd, I found that thousands of the small Mayfly mentioned previously ('Zoologist,' 1908, p. 458) had "hatched" out, and left their pseudo-imago skins and nymph-pellicles on posts about twenty yards from the water, and these were also thickly intertwined among the herbage by the roadside in soft white masses, which from a distance resembled the hairy fruit of the willow.

The nymph of this small fly, unlike that of *E. vulgata*, leaves the water and climbs up a reed† to undergo its metamorphosis, and finding their pellicles so far away from the pond was at first astonishing until I realized what had happened, not thinking it possible that the nymph could have crawled all that distance. What had happened no doubt was what was witnessed by Réaumur.

* 'Fishing Gazette,' May 22nd, 1909.

† I found the reeds by the pond-side covered with nymph-pellicles like the cast skin of a dragonfly larva.

He says:—"The cast skin is sometimes carried up into the air, clinging to the tail-filaments, and an *Ephemera* in this state seems twice as long as usual."

The great difficulty in collecting *Ephemeridæ* for purposes of identification is their extreme fragility and the tendency to shrivel up when dry, until all the chief features are destroyed. The specimens I have collected I now keep in spirit in glass tubes. This method of preserving specimens I have found most satisfactory, as the spirit hardens them, and they can afterwards be handled with comparative safety. For their capture I have found a small net made of the finest possible gauze of great service.

NOTES AND QUERIES.

MAMMALIA.

Erythristic Variety of the Field-Vole.—On July 7th I had brought to me a curious variety of the Field-Vole (*Microtus agrestis*) which had been found dead in a clover-field near Shrewsbury. The upper parts were of a pale fawn-colour, the under parts white. The animal was a full-grown male.—H. E. FORREST (Shrewsbury).

AVES.

The Lesser Redpoll (*Linota rufescens*) at Hampstead.—The Lesser Redpoll has again bred here this year. Two or three pairs returned to the Heath by the latter end of May, and on June 9th I found a nest just completed, and which was placed in the top of a furze-bush. Five eggs in all were laid in this nest, and incubation lasted fourteen days; the hen bird commenced to sit when the first egg was laid. I have noticed that this bird, like some others, occasionally swallows the fæces of its young, but whether this practice is only resorted to by birds when they know or suspect themselves to be under observation would be difficult to ascertain. The Lesser Redpoll is a very late breeder here, but the vegetable down which seems so essential for the lining of their nests could not be procured much before the end of May or the beginning of June.—H. MEYRICK (Holly Cottage, The Mount, Hampstead, N.W.).

The Occurrence of the Bean Goose in Cumberland.—In Messrs. Thorpe and Hope's article in 'The Zoologist' (*ante*, p. 187) on the observations made by the Natural History Bureau for the County of Cumberland numerous references are made as to the occurrence of the Bean Goose by Mr. Nichol, for instance: March 19th, flock seen flying; March 12th, some seen; Oct. 5th, a flock of forty seen; Dec. 30th, flock of eighty seen; and also on Dec. 7th, flock of Greylag seen. As the Bean Goose is a comparatively rare species in England and Scotland, and when found usually as a stray bird or birds in a flock of other Grey Geese, and, moreover, it being quite impossible to identify between the four species when on the wing and silent, how, may I ask, did Mr. Nichol know that they were Bean Geese? No mention is made

of the Pink-footed Goose, which is without doubt the most plentiful of the Grey Geese frequenting England and Scotland, at all; and did not the birds he called Bean rather belong to this species? The flock of Greylag seen on Dec. 7th is also open to some doubt owing to the date, but is possible. If Mr. Nichol is a wildfowler he will know that it is impossible, with any degree of certainty, to identify between the four species when in a skein, if silent, and even when in a gaggle only the White-fronted can be identified with any certainty. No mention is made of any being shot or identified in that way, so I conclude, as the letterpress says, that he only identified them as Bean and Greylag at a distance. Of course, the calls of all the Wild Geese, both Grey and Black, differ, but some of them so little that they must have all been heard again and again, and birds shot out of each particular skein or gaggle heard, before the best observer can be certain of them. With all due respect to the gentlemen concerned, I think that Bean should read Pink-foot, especially as many fowlers do not know the Pink-foot under that name, but class both Bean and Pink-foot under the former head, although, of course, quite a distinct species with characteristics quite its own. — H. W. ROBINSON (Lansdowne House, Lancaster).

Nesting of the Wigeon in Cumberland. — On the short note mentioning Messrs. Thorpe and Hope's record of the breeding of the Wigeon in Cumberland on April 30th, 1908, at Bassenthwaite (*ante*, p. 191), may I be allowed to make a few comments, and ask incidentally if the small feathers among the down were identified correctly, and, further, whether or no this is meant to be the first record for that county and place? If the latter is the case, may I quote Mr. W. J. Farrer's note in 'The Field' for Aug. 1st, 1903, as follows:—"In reference to my note on Wigeon nesting in Bassenthwaite, I may state that I have for some years suspected the bird of breeding in the locality, as I have seen three or four pairs all through the spring and summer months. This year [1903] I kept careful watch on one pair from April 20th, when first seen, until May 10th, when I found a female bird sitting on ten eggs. The nest was situated close to the edge of a small rock on the marshes at the head of Bassenthwaite Lake. I am quite sure as to the identity of the birds, and have seen them many times since up to a month ago (July)." I know myself for a fact that the Wigeon does nest at Bassenthwaite, as on July 13th, 1904, I saw a female followed by a brood of young about the same place where Mr. Farrer found his nest the year before. Great care, of course, must always be taken in identifying the eggs of

the Duck, as the following incident will show: In 1901 Mr. Robert Patterson recorded the nesting of the Wigeon near Belfast. The bird was not identified, but eggs and down agreed with those of that bird. This record was accepted everywhere until two years later, when the same gentleman wrote and contradicted the statement, as on further examination of the down the small feathers found therein proved the nest to be that of the Shoveler. It may be of interest to state that a Wigeon nested in the early summer of 1907 on the private lake of a friend of mine in North Lancashire. On the lake, which is natural and of considerable size, he placed a pair of pinioned birds of which the female shook off her pinions almost at once, and disappeared for some weeks to reappear with a brood of young, which she had apparently hatched on a smaller lake in the vicinity. The drake remained on the large lake all the time, being finally shot accidentally at the flight as recently as last November, when he too had apparently just shaken off his pinions, judging from the tremendous height at which he was flying. Incidentally it may be mentioned that these young Wigeon and their mother were as wild as possible, far more so than the foreign birds which arrived in the autumn, and not one of them was shot. Did Messrs. Thorpe and Hope actually see the bird settling on her eggs, or only near the nest? If the latter only, that is no evidence of the nest being her own, just as my evidence of the brood there on July 13th is of little value, as the brood might have been that of a Mallard or some other species following what was undoubtedly a hen Wigeon.—H. W. ROBINSON (Lansdowne House, Lancaster).

Redshank (*Totanus calidris*) carrying Young (?).—Mr. A. H. Patterson, in his Notes on Mud-flat Birds, says (*ante*, p. 211), "Whether it [the Redshank] carries its young as the Woodcock does at times I am not sure, but I strongly suspect it." Facts have come to my knowledge which I think go to prove that this is not the case. Redshanks have of recent years nested close to the town of Stafford, and between the Sewage Farm they frequent and a small muddy pond, close to which there is generally a nest, runs a main road, upon which there is much traffic. A few years ago, and again this year, after the young were hatched, the old birds have been seen in great distress owing to their not being able to get their young ones across this high road, and on *both* occasions the young have been caught by a humane signalman, who occupies a signal-box on the railway close by, and carried to the sewage marsh, apparently to the great satisfaction of the parent birds. Now if the Redshank carried its young I think the

old birds would have done so in the instances I have given. I believe on the first occasion the distress of the old birds lasted several hours before the signalman discovered the cause of their trouble.—JOHN R. B. MASEFIELD (Rosehill, Cheadle, Staffordshire).

MR. PATTERSON, in his interesting article, "Some Mud-flat Bird-Notes" (*ante*, p. 211), referring to the Redshank, says: "Whether it carries its young as the Woodcock does at times I am not sure, but I strongly suspect it." A few years ago a relative of mine, who has all his life lived close to the haunts of this bird, told me that he had seen a Redshank on the wing carrying a young bird between its legs. This he did without any leading up to the subject or reference to this habit in the Woodcock. He evidently considered it a very remarkable thing, and asked me whether I had ever known of a like occurrence.—G. T. ROPE (Blaxhall, Suffolk).

Notes from Wilsden, Yorkshire.—From an ornithological point of view the present breeding season so far has had some quite exceptional features. The Cuckoo up to the end of May was exceedingly scarce; not more than perhaps four Cuckoos had arrived in all Bingley Woods. At or about this date we received large accessions, but, strange to say, I have sought assiduously in all likely places to find a Cuckoo's egg, but have failed up to the present; neither has one been recorded as having been found by anyone else, though during the month of June Cuckoos have been quite abundant, this late arrival in such numbers in June having probably been caused by the presence of myriads of caterpillars, upon which they must have largely fed. A similar movement among Cuckoos occurred here some three or four years ago. The scarcity of their eggs in June can only be explained on the supposition that they laid their eggs previously to their coming here. When at Hastings Museum in May last my son showed me the nest of a Pied Wagtail which had been found near Hastings, and which contained four eggs and one egg of the Cuckoo. Previously to the egg of the Cuckoo having been deposited the nest had contained six eggs, but at the time of the introduction of the egg of the Cuckoo two of them mysteriously disappeared. Whether these were removed by the Cuckoo—and I have little doubt on this point—or through some other agency, it is unquestionably true that nests containing a Cuckoo's egg or eggs have seldom their full complement. Prof. Newton's explanation of this point, in his monumental work, 'Dictionary of Birds,' seems somewhat weak and inadequate to account for the phenomenon in question. My son also showed me the nest

of a Linnet containing two Cuckoo's eggs and one egg of the dupe, while recently, when in Monsaldale, in Derbyshire, a person told me he had found the egg of a Cuckoo in the nest of a Thrush.—E. P. BUTTERFIELD (Wilsden).

PISCES.

A Monster Pike.—On the 16th May last, when Salmon-fishing on Lough Conn, Co. Mayo, Mr. Charles Scroope, of Ballina, captured a monster Pike, weighing thirty-five pounds, on an artificial minnow. Its dimensions were: Length, 47 in.; girth, $24\frac{1}{2}$ in.; length of head, 13 in.; and spread of tail, 11 in. It was in splendid condition, and I never saw a fish of such depth of body. The Pike was taken on the Salmon run in about five feet of water. It was weighed and measured immediately on being brought ashore in the presence of four credible witnesses, so there is no mistake as to its weight or dimensions.—ROBERT WARREN (Moy View, Ballina).

NOTICES OF NEW BOOKS.

The Foundations of the Origin of Species; a Sketch written in 1842 by Charles Darwin. Edited by his son, FRANCIS DARWIN. Cambridge: Printed at the University Press.

THIS Essay has been printed by the Syndics of the Cambridge University Press for presentation to the Delegates of Universities and other learned Societies attending the celebration at Cambridge on June 22nd of the centenary of the birth of Charles Darwin, and of the fiftieth anniversary of the publication of the 'Origin of Species.' We read that the MS. was hidden in a cupboard under the stairs which was not used for papers of any value, and only came to light after the death of Mrs. Darwin in 1896 when the house at Down was vacated. It is a digest of the principles on which seventeen years later the book of the nineteenth century was to be the result. The "foundation," as it has well been called, is a landmark, it indicates the evolution of the 'Origin of Species,' and bears witness to the prolonged patience and concentration of thought and study attending its composition. Is the effect of this epoch-marking publication yet fully estimated? If its mission is considered to begin and end with biology, then its force is still unappreciated, for it has modified and influenced all contemporary thought even in quarters where biology is a stranger. Theology was confronted with the relation of man to other animals, so far at least as his corporeal existence is concerned, and the survival of the fittest became an axiom with the philosophical historian and the practical statesman. We are familiar at all events with the phrase, "The Method of Descartes," but have we sufficiently appraised either the "Method of Darwin" or the subtle way in which his patient construction has become a mental formula, one now alike used by opponents and disciples? Even if imagination may anticipate a time when his conclusions may be

neglected, his "Method" will endure and become hoar with time.

The doctrine of the struggle for existence is unanswerable; it could be interpreted by the "man in the street" as equivalent to the saying that all living creatures, plants as well as animals, have to "fight it out among themselves." The result of that struggle and the lines on which it is fought is the cardinal thesis of Darwinism, and has made that question the dominant one even with biologists who may not be considered as altogether orthodox "selectionists." The 'Origin of Species' is not dependent on its cleverness but on its wisdom; it is not to be patronised as the brilliant theory of a genius, but to be valued as the production of a sage; its greatest danger is from fiery apostles who insist that it is to be accepted as a revelation once given and for all time. If it has largely explained the *how*, it has not, nor could it have been expected to have, demonstrated the *why*.

The Life of a Fossil Hunter. By CHARLES H. STERNBERG. New York: Henry Holt & Co. London: George Bell & Sons.

If any book can convey to the general reader a conception of the zoological past by the palæontological record, this is the one. Much is taught by personal narrative, for such books are much more widely read than purely scientific publications, and the suggestions of the first are more easily appreciated by the ordinary reader than the more scientifically arranged facts of the latter, which by the uninitiated are easily misunderstood. In Darwin's well-known narrative of his voyage in the 'Beagle' how many palæontological and geological conclusions have been widely disseminated and assimilated among readers who may possibly have read none of his other works! As Mr. Sternberg remarks near the end of his book: "The life that now is, how small a fraction of the life that has been! Miles of strata, mountain high, are but the stony sepulchers of the life of the past."

The life of a fossil-hunter is a somewhat new experience. We are familiar with those of animal and plant collectors, but have not before, at least so far as the present writer is aware, realized the adventures, hardships, and methods of one who may be said to have lived among ancient and prehistoric surroundings, and

to have studied and discovered remnants of a vanished zoology. As we peruse these pages we feel, as evolutionists, how dim is the past, how unknown the future; perhaps when we know more of the first we may hazard some guesses as to the second. Mr. Sternberg truly observes that fossil-hunting "is as capable of improvement as any other form of human endeavour." Once "we went over, in a few months, all the chalk in Western Kansas. . . . Now it takes us five years to get over the same ground. Then we dug up the bones with a butcher knife or pick, and packed in flour sacks with dry buffalo grass which we pulled with our fingers. Some strange animals were created by Cope and Marsh in those early days, when they attempted to restore a creature from the few disconnected bones thus carelessly collected. Now we take up great slabs of the chalk, so that we can show the bones *in situ*, that is, in their original matrix, so that they may be the more easily fitted together in their natural relations with each other."

Some interesting reminiscences of the late Prof. E. D. Cope in the field are given by Mr. Sternberg:—"Cope's indefatigability, too, was a constant source of wonder to us. We were in excellent training, after our strenuous outdoor life in the Kansas chalk-beds, while he had just been working fourteen hours a day in his study and the lithographer's shop, completing a large Government monograph, writing his own manuscript and reading his own proofs. When we first met him at Omaha he was so weak that he reeled from side to side as he walked; yet here he climbed the highest cliffs and walked along the most dangerous ledges, working without intermission from daylight until dark." "He used to talk to me by the hour, arranging the living and dead animals of the earth in systematic order."

Sternberg did not only collect for Cope, but subsequently for Zittel, as the contents of the Munich Museum testify. As an ardent palæontological enthusiast he has not made a fortune by his long service, but he has his reward: "I have accomplished the object which I set before myself as a boy, and have done my humble part towards building up the great science of palæontology. I shall perish, but my fossils will last as long as the museums that have secured them."

EDITORIAL GLEANINGS.

'CHRIST'S COLLEGE MAGAZINE' (Cambridge), xxiii. No. 70, is a "Darwin Centenary Number." Mr. T. E. Pickering writes on "Shrewsbury Days"; Mr. A. E. Shipley on "Charles Darwin at the Universities"; the Master of Christ's College contributes a most interesting and original article on "Christ's College in the Years preceding the Entry of Charles Darwin"; "Darwin and the Linnean Society" is from the pen of Dr. B. Daydon Jackson. "Letters from Charles Darwin to Alfred Russel Wallace" (two of which are published for the first time), with Notes by Mr. Francis Darwin; "Present-day Darwinism," by Mr. Leonard Doncaster; and "Darwin's Animals and Plants," by Mr. T. H. A. Marshall, complete another publication to be added to the Darwinian bibliography.

IN his copy of the "Journal of Researches" the Editor some twenty years ago affixed the following cutting, which it may be interesting to reproduce at this time:—

"The Japan Weekly Mail' states that the 'Beagle,' in which Darwin made his memorable voyage, is now (1888) used as a Japanese training-ship. It was then stationed at Yokosuka, a naval station in the Bay of Yedo, not far from Yokohama."

DR. R. L. GARNER has recently contributed to the 'Evening News' (June 15th) an article somewhat sensationally headed "Do Monkeys Speak?" We have frequently alluded to the possibility of man being ultimately enabled to communicate with other animals, but this does not imply a belief in the universality of articulate language, but rather in the majority of cases to what is known as the "gesture language." Dr. Garner states that:—

"For the last twenty years my time has been chiefly devoted to the study of animal speech or methods of inter-communication, and mainly to that of Monkeys. For the last five years I have lived the life of a recluse in the great forest of the Nkami on the south-east side of Lake Fernand Vaz, about two degrees south of the Equator on

the west side of Africa. In this vast forest live countless numbers of Monkeys, representing several different species, many families of Chimpanzees, and some Gorillas, all in a state of primordial nature.

“From some of the literature that finds its way into my jungle retreat one might suppose that any casual visitor to a zoological garden can acquire a sufficient knowledge of the Monkey language in a few hours to enable him to discuss the subject with great familiarity, but I must admit that my progress in learning it has been slow and tedious, and I have found it very difficult to grasp the simian idea so easily.

“I find it very difficult to reduce the vague and often ambiguous meanings of animal speech sounds to any exact formula of human speech, and during the whole twenty years of my studies about ninety words scattered among more than a dozen species embrace the whole vocabulary that I have translated with comparative certainty. During that time I have had access to several hundred specimens, many of them under the most favourable conditions and with all available accessories to aid me, but nine words are the greatest number that I have interpreted in any one language of the Monkey races. On some of those I worked for years, and in the meantime often had to modify my deductions and sometimes entirely abandon them.

“By long experience I find that the best way to learn the language of a species is by rearing a young specimen by hand, and in the process one absorbs, as it were, the meaning of the sounds it gradually develops, for such is their way of acquiring speech. I estimate that during the earlier period of life a Monkey baby develops, relatively, about as much in a day as a human baby does in a month; or, in other words, that one day of a baby Monkey’s life is about such a part of its whole life as one month is of a human baby’s life.”

Dr. Garner gives the following instances of his success:—

	<i>Nictitans.</i>	<i>Ludios.</i>
“‘I want’	quih	ki-uh.
‘Where?’	ou-rh	kri-i.
‘Here’	eu-nh	hu-hu.
A warning	khi-iu	ahr-r.
Imminent danger ...	khi-iu-hou	—
‘Hark’	chu-h	ande.
‘What’	—	ek-e.
‘Mother’	hri	ou-oah.”



WE have received the Report for 1908 of the Zoological Gardens at Giza, near Cairo, by the Director, Capt. Stanley S. Flower. We read that an unusual meteorological event in 1908 was the heavy rain on April 24th; the rain continued nearly all day, and left many of the paths and paddocks covered in standing water. This drenching, combined with the subsequent infiltration of subsoil water from the Nile (the Nile flood having been higher than in the preceding ten years), produced a very damp summer in the Gardens, and had a deleterious effect on some of the desert animals, especially the Addax and Sabre-horned Antelopes. Forty-four accidental deaths occurred, including sixteen mammals, twenty-four birds, three reptiles, and one batrachian. The incidents are thus summarized, and should claim the attention of those who possess collections of living animals:—Two Lemurs killed fighting other Lemurs of the same species; one Sudan Jackal killed fighting other Jackals of the same species; five Egyptian Jackal puppies killed by their parents; one Ratel died from injuries received prior to its arrival in Giza; two newly-born Hedgehogs killed by adult Hedgehogs in the same cage; one Fat-tailed Mouse killed fighting others of the same species; one female Oryx died from injuries received from the horns of a male of the same species; one male Addax died from injuries received from the horns of a female of the same species; one young male Nylgai killed itself in a panic by dashing against the railings of its paddock, frightened from some unknown cause; one female Arui Wild Sheep died from injuries received from the horns of other sheep of the same species; three Indigo Finches killed fighting others of the same species; two Cardinal-birds killed fighting others of the same species; two Yellow Sparrows killed fighting others of the same species; one Parrakeet and one Lark met with fatal accidents; one Flamingo killed by an Adjutant Bird; one Spur-winged Goose killed by a Hippopotamus; four nestling Egrets killed by adult Egrets of the same species; one Ibis and one Spoonbill killed by other birds inhabiting the same aviary; one Partridge killed fighting; one young Partridge found drowned; one Crowned Crane killed by a Senegal Stork; one nestling Purple Coot killed by adults of the same species; one Purple Coot killed by others of the same species; one Purple Coot and one Gull killed by other birds inhabiting the same aviary; two Tortoises found drowned; one Waran Lizard killed by another of the same species; one small Toad swallowed by a larger Toad.

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NOTES ON CORNISH CRUSTACEA.

By JAMES CLARK, M.A., D.Sc., A.R.C.S.

I. BRACHYURA AND MACRURA.

PROBABLY nowhere in Great Britain are conditions so favourable for variety and abundance of Crustacean life as in Cornwall. Its unique geographical position as the most westerly and most southerly county in England, and the consequent genial temperature of its waters; its form as a great wedge projecting out into the Atlantic; its two hundred and fifty miles of much indented and irregular coastline; its variety of littoral and diversity of sea-bottom; its rocky islets and western archipelago; its land-locked caves and tidal estuaries; its large sheets of sheltered sea and long stretches of coastal waters exposed to the full force of Atlantic storms—all these contribute to a variety of environment sufficient to attract every type and section of the marine Crustacea of Western Europe except the exclusively boreal. In addition to these, its currents and prevailing winds and the manifold sources of its surface waters and plankton provide unusual facilities for the advent of waifs and strays, while its varied shipping is occasionally responsible for the introduction of casual wanderers of assisted passage.

The resulting wealth of Crustacean life has naturally attracted a fair amount of attention both from resident and from visiting naturalists. Jonathan Couch, of Polperro, his son Richard

Quiller Couch, of Penzance, W. P. Cocks, of Falmouth, Spence Bate, of Plymouth, G. F. Tregelles, of Penzance, and Rupert Vallentin, of Falmouth and St. Ives, are the most conspicuous among the former; and Victor Carus, Dr. Brady, Dr. Robertson, of Cumbrae, and the Rev. Canon Norman among the latter. Admirable work has also been done by the Marine Biological Association in the waters about Plymouth Sound. In spite, however, of the work of many distinguished carcinologists, the summary of previously published records prepared by the Rev. T. R. R. Stebbing for the 'Victoria History of Cornwall,' and even the recent 'Crustacea of Devon and Cornwall,' by Canon Norman and Dr. Scott, though remarkable as lists of species, indicate in a striking fashion how extremely fragmentary is the available knowledge of local distribution. In Stebbing's compilation many of the species have not been recorded for sixty years or more, and in a number of cases the occurrence of a relatively common species in county waters is indicated only by a quotation from Cocks (1849) or Jonathan Couch (1838). Canon Norman's work contains the results of his own extensive investigations in Cornish and Devonshire waters, and is probably the most complete account of the Crustacea of any district in Great Britain. Even there, however, large stretches of coast-line and sea-bottom on the south are never mentioned; while, except for St. Ives, the Bristol Channel remains practically a *mare incognitum*.

The following notes are based on the results obtained by shore-collecting, dredging, trawling, and the examination of trawl-refuse in 1887-8, during the summer of 1890, and continuously from 1899 to 1908. Shore-collecting has been assiduously practised by the writer and his pupils all round the coast from Portwrinkle to Bude, with the exception of the stretch between Kynance Cove and Loe Pool, and of that between Port Isaac and Millook. The shores of Falmouth Bay from the harbour to the mouth of Helford River have naturally received most attention. Next in order come Gerrans Bay, Millook, Hayle, the unprofitable beaches about Newquay and Perranporth, the happy hunting-ground from Polperro round to Gorran and the sheltered coves from Lamorna to Sennen. The beaches and flats of St. Mary's and Tresco, and the stormy shores and

rock pools of Annet, have also received a fair amount of attention. Falmouth Bay, Gerrans Bay, Mevagissey and St. Austell Bay have been explored by dredge and trawl, and frequent visits paid to most of the trawling grounds in 20 to 45 fathoms along the south coast from the west of Hand Deep to the Wolf, and especially to the south of the Gull Rock, Porthscatho. Whitsand Bay East has been partly explored from Rame Head to the edge of the rocky bottom from which arise the Sherbeterry Rocks and the Knight Errant Patch, and a good deal of difficult but productive work done down to 50 fathoms in the south of the Dodman. The inshore waters to the south of the Manacles have been occasionally visited, and some days have been spent dredging in Mount's Bay and round the coves to the west of Lamorna. On the north coast some work has been done at Zennor, in 20 to 25 fathoms a few miles north of Point Navax, down to about 18 fathoms around Chapel Porth, from shallow water downwards about Padstow and somewhat casually elsewhere. By dredging and by the help of trawlers several channels and various patches of the outside waters at Scilly have been cursorily investigated, with results that greatly exceed expectation. Large quantities of localized trawl-refuse have been received from the western half of the south coast, from Scilly and from the Bristol Channel.

References to the works of Couch, Cocks, Bate, Norman and others are made chiefly in the case of rare species, exceptional occurrences and irregular distribution. Frequent use is made of the 'Journal' of the Marine Biological Association (M.B.A.) for distribution in the Plymouth district and of Vallentin's records for St. Ives.

The writer again takes the opportunity of expressing his great indebtedness to fellow-members on the Fisheries Committee of the county, and especially to Mr. Matthias Dunn and to Mr. E. J. Pezzack, the County Fishery Officer, for assistance of a kind that mature experience alone could give; to Mr. G. F. Tregelles, Barnstaple, to Mr. Rupert Vallentin, St. Ives, and to Dr. E. J. Allen, of the Marine Laboratory, Plymouth, for valuable advice and personal help; to the fishermen in Cornish and Scillonian waters for systematic observations, abundant material and trawling facilities; and to

his biological students at Truro for enthusiastic co-operation in every part of the work.

A. BRACHYURA.

The Gulf-Weed Crab, *Planes minutus* (L.), drifts occasionally into the Cornish seas. In August, 1899, three were captured on a barnacle-covered log at the outer end of the Manacles along with two Stone Bass. Between 1900 and 1908 it was obtained several times both by Vallentin and by the writer on baulks of timber, covered with *Lepas anatifera*, picked up in the offing at Newquay. In April, 1902, a baulk similarly populated drifted ashore on St. Agnes, Scilly. In May, 1908, after very stormy weather, the beach at Perranporth was strewn with shells of *Lepas*, and three examples of this Crab were found and sent in by H. Thomas. It is interesting to note that all previously recorded specimens had been captured on the south coast. The Square or Angle Crab, *Gonoplax rhomboidalis* (L.), here taken as synonymous with *G. angulata*, Pennant, is generally distributed on muddy sand and gravel along the south and at Scilly in 15 to 45 fathoms, but is often scarce and never plentiful. Occasionally it occurs on fine clean sand and, in places, in relatively shallow water. It is moderately common on the Rame-Eddystone Grounds (M.B.A.), has been taken in Whitsand Bay East, and is of frequent occurrence south of Looe, and in 20 fathoms downwards off Polperro. Locally it is fairly common around Mevagissey, in Gerrans Bay, and in Falmouth Bay, and is frequently found in trawl-refuse from the Gull Rock southward in 40 to 45 fathoms. Near the mouth of the Helford River it has been taken several times in 4 to 5 fathoms. It has been found in greatest quantity five miles south-east of Helford in 30 fathoms, and in 20 to 25 fathoms about five miles west of Mullion, though in Mount's Bay generally it appears to be scarce and in many places absent. It has not been observed in trawl-refuse near the Wolf. In Scilly it has been trawled in 35 to 40 fathoms to the east and south-east of St. Mary's, in deep water outside the Bishop, and about fifteen miles W.N.W. of Tresco; and is moderately common about two miles N.N.E. of St. Martin's Daymark. It does not appear to have been recorded in a live state from the north coast of the mainland, though it

has been found in the stomachs of Cod taken off Newquay, and of a Thornback captured at Padstow. Both of the tiny Pea-Crabs, *Pinnotheres veterum*, Bosc., and *P. pisum* (L.) are represented in the county fauna. The former occurs for the most part between the folds of the mantle of *Pinna fragilis*, and has been obtained in about 30 fathoms off Polperro, in 40 to 50 fathoms far south of the Dodman, in 40 to 45 fathoms about eight miles south of the Gull Rock, Portscatho, from Mount's Bay about midway between the Lizard and Lamorna, and occasionally in trawl-refuse at Porthleven and Penzance. It has also been obtained in *Volsella modiolus* from outside Mevagissey Bay, in the same shell from outside Falmouth Bay, and once on the north coast at Padstow among trawl-refuse from the Bristol Channel. Two specimens have been obtained at Scilly to the west of the Bishop in the shell of *Pinna*, and one from forty miles west of the Longships. *P. pisum* is found most frequently in the mantle cavity of the ordinary Mussel, but occurs also in deeper water in *Cardium norvegicum*, *C. fasciatum*, *Glycimeris glycimeris*, and *Volsella modiolus*. It is apparently rare off the eastern half of the county, a single specimen only having been obtained at Portwrinkle, and two at Looe. It is scarce about Polperro and in Mevagissey Bay, but is not uncommon in Gerrans Bay, Falmouth Bay, and the mouth of Helford River. It is occasionally found in *Volsella* among trawl-refuse at Porthleven. In Mount's Bay the distribution is evidently irregular, but specimens have been sent in from Prussia Cove and several times from Newlyn. On the north coast it has occasionally been obtained by Vallentin in *V. modiolus* from "Bay Rough" Rocks, St. Ives, and by the writer in *Glycimeris* from four to nine miles north of Point Navax and off Fistral Bay, Newquay. From Scilly it has not yet been recorded. The Masked Crab, *Corystes cassivelaunus* (Pennant), is pretty generally distributed on fine clean sand from low water down to 45 fathoms, but being a typical sand burrower often eludes observation. After storms dead specimens are occasionally found on beaches in considerable quantity, as at Marazion and Veryan in the autumn of 1900, at St. Agnes, Scilly, in September, 1904, and in Falmouth Bay about the middle of March, 1905. In Whitsand Bay East this Crab is scarce down

to about 8 fathoms, probably because of the exposed and shifting character of the sand, but locally in 12 to 30 fathoms it is fairly numerous. It is seldom found in shallow water at Polperro, but is common on suitable ground at Mevagissey and Gorran Bay. In Gerrans Bay it is unusually plentiful in 8 to 14 fathoms in sandy lanes and patches, and from Falmouth Bay to the Lizard is well represented from low-water mark downwards. It is irregularly distributed but by no means uncommon in Mount's Bay, and has been captured both at Porth Curnow and at Sennen Cove. At St. Ives, Vallentin finds it fairly common in 8 to 10 fathoms, though only taken by trawlers at night. It occurs in 5 to 20 fathoms west of Chapel Porth, is frequently captured at Padstow and brought in by trawlers there. It has also been forwarded from Port Isaac and from Trebarwith. At Scilly it has been captured in St. Mary's Sound, at the Cove, St. Agnes, and in 25 fathoms south of Trinity Rock. Females have been taken in berry during the months of May and June.

The Circular Crab, *Atelecyclus septemdentatus* (Mont.), is evidently a favourite food of Cods and Rays; and it was chiefly in the stomachs of these fishes that the older naturalists like Couch and Cocks obtained their specimens. It is, however, locally common and at times abundant in 15 to about 45 fathoms on muddy gravel and occasionally on sandy gravel all along the south coast from the Mewstone grounds to the Wolf. It occurs in quantity about a mile east of the Eddystone, and also about three miles to the west (M. B. A.), has been dredged in 13 fathoms about two miles south-east of Longstone Rock, Whitsand Bay, is fairly common eight miles south of Polperro, in 15 fathoms off Fowey and about three miles east of Gwineas Rock in Gorran Bay. It is of frequent occurrence outside Falmouth Bay, and there is a thickly populated patch in 30 fathoms about two and a half miles E. $\frac{1}{4}$ N. of Porthallow, and another in about 45 fathoms nine miles east of Coverack. On the north coast it is fairly common in 20 fathoms eight miles north-east of St. Agnes Head, and occurs in trawl-refuse at Padstow. At Scilly it is abundant in 40 fathoms three miles north-east of St. Martin's Daymark. Females in berry are commonest in May.

The tiny Sand Burrower, *Thia polita*, Leach, has probably

been overlooked on account of its small size and habits. It has been taken about a mile south of Long Rock, Mount's Bay, in 6 fathoms in Pentle Bay, Scilly, and by Vallentin in 10 fathoms in St. Ives Bay.

The Nipper Crab, *Polybius henslowii*, Leach, is either migratory or nomadic. Males occur abundantly at times on sheltered stretches of fine sand in shallow water as at Cawsand Bay, Mevagissey, Mount's Bay, St. Ives Bay, and in June, 1906, in Towan Bay, Newquay. It has been several times captured at Looe, and occasionally appears in small numbers at Polperro. In July, 1901, and again in September, 1904, a few were taken in Gerrans Bay. In Falmouth Bay it was found by Cocks only in the stomachs of fishes, and is still one of the rarest of Crabs there, a single specimen taken in June, 1906, being the only record, though in October, 1905, the dredge was suddenly filled with males in 45 fathoms of water about fourteen miles east of Coverack. This Crab is a powerful swimmer, capable of moving with speed and agility, and pursuing Pilchards and Mackerel in and about the fishermen's nets with singular pertinacity. Large shoals are occasionally met with far out at sea. In April, 1901, several hundred were taken in a Mackerel-net twenty-five miles W.S.W. of the Eddystone, and in June of the same year a Pilchard boat reported them in quantity sixty miles south-west of the Dodman. In May, and again in June, 1903, great numbers were captured in Pilchard-nets some distance west of the Bishop Lighthouse at Scilly. In June, 1904, a very large shoal was recorded by a Mackerel boat from seventy miles N.N.W. of St. Ives; while in June, 1907, it was abundant five miles south-east of the Wolf. Though the species is so common around the county, the writer has never seen a female captured in Cornish waters.

Portumnus latipes (Pennant), with body-colour of light purplish yellow, splashed and streaked with pale lilac, is the most beautiful of all the Cornish Crabs, but is unfortunately very scarce. As it burrows about spring-tide low-water mark on sandy beaches, it may of course be generally overlooked. In May, 1902, several dead but perfectly fresh specimens were picked up at Helford; in June, 1905, a dead male was found on the beach opposite Godrevy; and in August, 1907, a living male was

captured at Gyllyngvase. It has been taken in Whitsand Bay East by Norman. *P. biguttatus* (Risso), a Mediterranean species, was obtained by Garstang at low spring-tide burrowing in a patch of coarse shell-sand on the south side of Drake Island.

The Shore Crab, *Carcinus mœnas* (Pennant), is everywhere common between tidemarks and in shallow water all round the coast, and at Scilly. It occurs occasionally in the Carrick Roads, Falmouth Harbour, at a depth of 16 fathoms, and as a casual on outer trawling grounds down to 40 fathoms. It appears to breed all the year round.

Bathynectes longipes (Risso) is a Mediterranean species, first obtained in British waters by Forbes and McAndrew, who dredged it in Falmouth Bay in 1848. It was found several times by Cocks about Falmouth, and once by R. Quiller Couch in Mount's Bay. Some years ago it was taken by Norman at Polperro, and by Garstang in fine sand near the Eddystone (M.B.A.). Recently it has been dredged in Gerrans Bay, and trawled in 45 fathoms seven miles south-east of the Gull Rock, Portscatho, and in 40 fathoms a few miles north of Menavawr, Scilly.

The members of the genus *Portunus* all swim with a see-saw movement of their elbow-bent swimming feet, which has attracted to them the name of "Fiddler Crabs." Because of their fondness for garbage they are frequently spoken of as Cleanser Crabs. The Dwarf Swimming Crab, *Portunus pusillus*, Leach, is occasionally obtained between tidemarks and in shallow water, but is much commoner on clean sand or gravel from 10 down to 45 fathoms. It occurs on the Eddystone Grounds (M. B. A.); in 20 fathoms south of Whitsand Bay East; in shallow water off St. George's Island, Looe; irregularly from low-water to 30 fathoms off Polperro, and is locally plentiful in St. Austell, Mevagissey, and Gerrans Bay from 2 or 3 fathoms downwards. It is patchily abundant about the Falmouth district, both in the harbour and eastward as far as a line running southward from the Gull Rock, Portscatho, to opposite the Lizard. In Mount's Bay its distribution is very irregular, and it appears to be on the whole rather scarce. A single specimen has been obtained at low spring-tide on the beach at Porthcurnow. On the north

coast it has been dredged in 10 to 15 fathoms at Zennor, in St. Ives Bay (Vallentin), and off Chapel Porth, St. Agnes. It is locally common around Padstow, and two have been taken at low spring-tide near Bude. At Scilly it has been obtained in shallow water in Pentle Bay, and dredged in 20 fathoms in Crow Sound and half a mile south of Penninis. Females in berry appear from January to May. The beautiful Velvet Crab, *P. puber* (L.), is, on the whole, common under stones between tidemarks and in shallow water on rocky beaches along the south coast, except at the Dodman, the Lizard, and west of Lamorna. On the north coast it occurs at Zennor, is not very common at St. Ives in 12 fathoms (Vallentin), and has been taken twice at Watergate Bay. At Scilly it is fairly common along the more protected shores. In Gerrans Bay a few have been dredged in 15 fathoms, and in Mount's Bay it has been taken in still deeper water. Females in berry are usually common from March to the beginning of June.

The Marbled Swimming Crab, *P. marmoreus*, Leach, beautifully decorated all over the carapace with a variable but symmetrical mosaic-like design in buff, deep red, and various shades of brown, is, when fresh, one of the most attractive of British Crabs. It is very local on the south coast and at Scilly, occurring for the most part on clean sand and sandy gravel in 25 to 45 fathoms, though occasionally dredged in Carrick Roads and elsewhere in Falmouth Harbour in 10 to 14 fathoms, in Gerrans Bay in 6 to 8 fathoms, and has been twice found alive at spring-tide low-water mark on Pendower beach. It is plentiful on a small patch in 30 fathoms S.S.E. of Polperro, in 45 fathoms due east of Helford River; and occurs sparingly to the west of Boa Rock, Mount's Bay, and to the south of the Wolf. It occurs also in trawl-refuse at Porthleven, at Mevagissey, and at Scilly. The closely allied species *P. holsatus*, Fabr., is more generally distributed on a sandy bottom from low-water down to 14 fathoms, but has never been taken in quantity. It occurs in 5 fathoms on Queens Ground and Cawsand Bay (M. B. A.); in shallow water, Whitsand Bay East; close to St. George's Island, Looe; off Polkerris Harbour, Tywardreath; in Mevagissey Bay, Gerrans Bay, and irregularly but very sparingly in Mount's Bay, and in Nanjizal Bay, Land's End.

In Falmouth Bay it is evidently very rare, only one solitary example having been found at the mouth of the Helford River. On the north coast it has been taken in 10 fathoms at Zennor; from low-water to 14 fathoms in St. Ives Bay (Vallentin); at low spring-tide, Constantine Bay and Tintagel. At Scilly a single specimen has been taken in 3 fathoms in Pentle Bay. Females have been taken in berry in March and in June. The Cleanser Crab, *P. depurator* (L.), is generally distributed, and in places abundant, along the south coast from shallow water down to 40 fathoms. Young specimens are occasionally taken in rock-pools. At Scilly it is plentiful in 40 fathoms south-east of St. Mary's, and is often common in trawl-refuse from outside the Bishop, and from about 45 miles west of the Longships, but is rare in the enclosed waters. On the north coast it is fairly common in 23 fathoms on shell-sand ten miles N.N.W. of Point Navax, and in 16 fathoms north-west of Chapel Porth. It is at times abundant in trawl-refuse at Padstow, and occurs there both within the harbour and outside. Females have been found in berry from February to October, but most commonly in early summer. The Wrinkled Swimming Crab, *P. corrugatus* (Pennant), occurs frequently in the waters of Plymouth Sound, but is apparently scarce all along the south coast and at Scilly. It has been taken at Polperro (Laughlin, *teste* Norman), in Mevagissey Bay, at the mouth of the Helford River, and twice in trawl-refuse at Scilly. It has not been observed on the north coast at all. *P. arcuatus*, Leach, is common locally on sandy bottom in 4 to 10 fathoms, and occasionally in deep water, from Plymouth Sound to Falmouth Bay and harbour. In June, 1902, fifty-two were taken at a single cast of the dredge in 40 fathoms south of the Dodman, and it is occasionally well represented in trawl-refuse at Porthleven and at Mevagissey. About Scilly it is common in the shallow channels and enclosed waters, and has once occurred in trawl-refuse there. On the north coast it has been taken outside Pendeen Lighthouse, at Mawgan Porth, and in trawl-refuse at Padstow. Females in berry occur plentifully on the south coast and at Scilly in April and May.

A tiny Chilean Crab, *Pilumnoides perlatus* (Poeppig), was obtained in quantity by Vallentin on the sides of the guano-barque 'Rushin' from Lobos, off the coast of Patagonia, aban-

doned near the Scillies after a furious gale, and afterwards towed into Falmouth Docks. These Crabs were abundant in the dense coating of green seaweed dotted with clumps of *Lepas*.

Pilumnus hirtellus (L.) is fairly common, and in places plentiful, on stony and rocky beaches along the south coast and at Scilly, from between tidemarks down to 15 fathoms. It occurs under stones, in rock crevices, on the under surface of rock ledges, in Crab- and Lobster-pots, and, when small, in the hollow bulbs of *Laminaria*, and among seaweed generally. Occasional specimens are taken on sand and gravel. On the north coast it is abundant at St. Ives (Vallentin), fairly common near St. Agnes, has been taken in Watergate Bay, is patchily abundant at Padstow, and has been found at Port Isaac, and in *Laminaria* at Cowrie Haven, Poundstock. Females in berry are locally common from March to May. *Xantho incisus*, Leach, is common between tidemarks along the south coast and at Scilly in rock-pools, under stones, and in rock crevices. It has been captured as far west as Porthgwarra. In September, 1907, a single specimen was taken at Pendeen. Females in berry occur in April and May. *X. hydrophilus* (Herbst) is similarly distributed along the south and at Scilly, but on the whole is not so plentiful. On the north coast it has been taken near St. Agnes Beacon and in Fistral Bay. *X. (Xanthodes) Couchii* (Couch) does not seem to have been found again since the type-specimen was forwarded to Bell by R. Quiller Couch in the early fifties.

The dainty little Crab *Pirimela denticulata* (Mont.) is very local in its habitats, but by no means rare. It occurs from low spring-tide down to 15 fathoms, and is occasionally found still deeper. It has been taken round Plymouth (M. B. A.), in shallow water to the west of Donderry, in 10 fathoms in Gorran Bay, and is fairly common in Veryan Bay, and in Gerrans Bay in patches covered with small stones. It has been found several times in trawl-refuse at Porthleven, but not at Mevagissey. In Falmouth Harbour and Bay it is locally not uncommon, but has not been obtained between Helford and the Lizard. In Mount's Bay it has been captured to the west of the Boa and at Poljew Cove, but has not been recorded for the western side at all. It has been taken at low spring-tide at Porthcurnow, and

in shallow water in Nanjizal Bay. At Scilly it occurs on shell-gravel. On the north coast it was found by Vallentin at St. Ives on a little patch of small stones in 12 fathoms, and has been taken at Padstow in shallow water, and in the western extremity of Fistral Bay, Newquay. Females in berry are found along the south coast in March and April, and have been obtained at Padstow in May.

The Great Edible Crab, *Cancer pagurus*, L., is common and in many places abundant round the coast and at Scilly, the smaller ones among stones between tidemarks, the larger ones on rocky and "scuddy" ground from shallow to deep water. Cornish Crabs are not only abundant, but are prized for their quality and renowned for size. In all about three hundred and seventy local boats are engaged in the capture of Crabs, Lobsters, and Crawfish in Cornish waters. Of these about two hundred and fifty are from ports lying on the south coast to the east of the Lizard, the greatest number being from Mevagissey and Gorran. The distribution of the shell-fish fleet is not due to any scarcity of these large crustacea in the south-west or north, but simply to the more sheltered character of the sea to the east of the Lizard and the danger of fishing in an open boat in turbulent water off the exposed headlands round the west and in the Bristol Channel. For some years now a considerable number of French decked boats of twenty to thirty tons and even more, from the neighbourhood of Brest, have been profitably engaged every summer in fishing for Lobster and Crab in deep waters off the Cornish coast, and particularly between Scilly and the Land's End. This Crab breeds all the year round.

The Wart-covered *Eurynome aspera* (Pennant) is widely distributed round the coast and at Scilly on firm sand and gravel from shallow water downwards, but is rarely found between tide-marks. It is generally distributed around Plymouth (M.B.A), and on a suitable bottom in 25 to 40 fathoms off Whitsand Bay East. It is locally common in the waters round Mevagissey, and is occasionally met with in trawl-refuse there. In Gerrans Bay it is very local, but plentiful where it does occur. In Falmouth Bay it is scarce, but after storms is cast up in *Laminaria* stems, and has thrice been brought up in quantity in the trawl in 40 to 45 fathoms some distance outside the Bay. It has

rarely been found in Mount's Bay, though Tregelles mentions that he obtained four there in a cast-up *Laminaria* stem. A single specimen was dredged about midway between Kynance Cove and Mousehole, and it has occurred in trawl-refuse near the Wolf, and from west of the Bishop at Scilly. On the north coast it occurs at Zennor, in 3 to 13 fathoms at St. Ives (Vallentin), and at Padstow. Females in berry are most plentiful from the middle of March to the end of April, and from the end of June to the beginning of August.

The *Maiidæ* and the *Inachidæ*, represented in Cornwall by eleven species, have the singular habit of concealing themselves by attaching living fragments of stationary marine fauna and flora to their shells. These at first are held in place by the numerous tubercles, spines and hairy tracts with which the shell is provided, but soon become permanently attached, and often grow rapidly on this novel but congenial habitat. They are of course cast off with the shell, but are quickly and efficiently replaced. So varied are the Hydroids and Bryozoa in this living disguise that *Mamaia squinado* in particular has always been regarded in Cornwall as a regular purveyor of deep-water forms for the naturalist with limited opportunities of dredging in the open sea. Till the living covering is removed it is often impossible to distinguish closely related species.

Hyas coarctatus, Leach, is locally common from 10 to 45 fathoms on sand and gravel, but over large tracts of apparently suitable sea-bottom is very thinly distributed. It occurs sparingly as a rule in trawl-refuse all round the coast and at Scilly. It is either nomadic or migratory, and in summer is often abundant in 10 to 15 fathoms, as in Gerrans Bay in 1901, 1905 and 1908, and off Helford River in 1901, 1902 and 1906. In 1903, on the other hand, careful dredging over the spots favoured in 1901 resulted in the capture of two examples in Gerrans Bay and not a single specimen at Helford. It is usually common about Gorran, and is often taken in Falmouth Bay and in deepish water outside Mount's Bay. At St. Ives it is abundant in summer in 12 to 14 fathoms (Vallentin), and has been taken in 20 fathoms about eight miles north of Point Navax, in 5 fathoms in Fistral Bay, at Harlyn Bay, and about Padstow. Females occur in berry in April, July and August. *H. araneus* (L.),

though widely spread, is comparatively rare. A single specimen was brought in at Portwrinkle in May, 1902. It has been occasionally obtained near Mevagissey, has been twice dredged in Carrick Roads, Falmouth, and has occurred in trawl-refuse from outside the Bay. In July, 1906, a solitary example was obtained immediately south of the Gear Rock, Mount's Bay, in 5 fathoms. It has not been identified from Scilly or from the north coast. There is apparently no recent record of the occurrence of *Blastus tetraodon* (Pennant) in Cornish waters. Cocks reported it as rare in Carrick Roads and in trawl-refuse. *Pisa biaculeata* (Mont.) is irregularly distributed but nowhere common from shallow water downwards. It is frequently taken in Crab-pots at Polperro, Mevagissey, Gorran and Scilly, and occasionally appears in trawl-refuse outside Falmouth and Mount's Bay. Single specimens have been taken at Porthoustock and at Zennor, and two at Mousehole. The Corwich Crab, *Mamaia* (*Maia*) *squinado* (Herbst), is very common and in places abundant in inshore waters all round the coast from April or May till September, when it gradually diminishes in numbers. In most localities it vanishes into deep water by the end of November. During the summer months it is usually very troublesome among Crab-pots, and often greatly interferes with trawling operations in shallow down to moderately deep waters. In the last week of May, 1907, the trawl brought up a number of very large specimens in 40 fathoms some miles E.S.E. of the Lizard. Occasionally very fine, highly decorated examples are brought in by trawlers from deep water at the mouth of the Bristol Channel, and from about 50 fathoms fifteen miles W.N.W. of Tresco. The largest specimen the writer has handled from Cornish waters was taken in the pot of a French crabber at the Seven Stones. Its carapace measured nine inches in length and just over seven in breadth. In the month of August, 1905, this Crab was singularly abundant at Millook, near Bude. At Scilly it is at times uncomfortably common throughout the summer in moderately deep water. It is found in berry in April, May, June and August. *Inachus dorsettensis* (Pennant) is irregularly distributed, but on the whole common from shallow water down to 45 fathoms on clean sand and gravel bottom and on "scuddy" ground along the south coast, is of frequent occurrence at low water and occasionally

between tidemarks, and ventures for miles up the creeks of the Fal. On the north coast it is evidently scarce, but has been taken in 18 fathoms off Zennor, in 14 fathoms to the west of Chapel Porth, and has been found several times in trawl-refuse at Padstow. At Scilly it occurs in 30 to 35 fathoms on fine sand fully half a mile south of Penninis Head, and has been taken in Porth Cressa Bay and elsewhere. Fine specimens have been picked out of trawl-refuse from some miles north-west of the Bishop. Females in berry are found most plentifully from the beginning of March to the middle of April, and again from the second week in June till the close of July. *I. dorynchus*, Leach, is usually scarce, and nowhere so common as the preceding species is in places, but is widely distributed along the south coast from low water down to about 20 fathoms. It has been taken under stones on the beach at Portwrinkle, Looe, and Talland; is not infrequent in Crab-pots at Polperro, Mevagissey and Gorran, and has twice been taken in Gerrans Bay. In Falmouth Bay it is dredged at long intervals, but has been twice captured in rock-pools at Gyllyngvase, and several times in Carrick Roads. It occasionally appears in trawl-refuse at Mevagissey and at Penzance, and has been reported from Porthgwarra and Sennen Cove. It has been obtained in Crab-pots at Scilly, and on the north coast at Zennor. Females have been found in berry in March and April. *I. leptochirus*, Leach, is evidently scarce and confined to the outer trawling grounds off Falmouth Bay. The type specimen of *Achaeus cranchi*, Leach, was dredged by Cranch off Falmouth in the early years of last century. Cocks, in 1849, records three specimens from *Sertularia pumila* at low spring tide on Gyllyngvase beach. In recent years it has been dredged on Queen's Ground and elsewhere in Plymouth Sound (M. B. A.), in 5 fathoms on fine sand in Mevagissey Bay, and two females in berry were dredged on Aug. 20th, 1908, in a narrow strip of coarse shell gravel and small flat stones in 8 fathoms in Gerrans Bay. *Macropodia rostratus* (L.), Couch's Long-legged Spider Crab, occurs from low-water mark down to 25 fathoms. On beaches and in shallow water it is usually found under seaweed, in rock crevices, and under rock ledges. Deeper down it lives both on gravel and among rocks. It is of frequent occurrence in Cawsand Bay (M. B. A.), has been taken

under *Fucus* at Portwrinkle, and among *Laminaria* at Looe. At Polperro it is locally not uncommon on rocks down to 20 fathoms. It is often found in trawl-refuse at Mevagissey, and is local in Gerrans Bay. It is somewhat casual in its appearance in Falmouth Bay and harbour, but in April, 1907, was abundant in Carrick Roads, and is often present in trawl-refuse from the Bay. A few years ago it was common near St. Michael's Mount among *Laminaria*, but in 1903 it disappeared, and not a specimen has been seen there since. It occurs in Gwavas Lake and at Newlyn, but is not plentiful. It has been dredged in 25 fathoms east of the Runnelstone, and appears in trawl-refuse from the Wolf. Specimens have been brought in at Porthgwarra and at Sennen Cove. It is fairly common at St. Ives, has been obtained in 15 fathoms north-west of Chapel Porth, at the Fistral Beach, Newquay, and at Padstow. Females in berry are generally found in April and May, and again from the middle of July till the beginning of September. Couch's Smaller Spider Crab, *M. longirostris* (Fab.), occurs in varying quantity all round the coast from shallow water down to 45 fathoms, and is specially common in places in fine sand and on "scuddy" gravel. It is locally abundant in nearly all the trawling grounds from the Eddystone to the Wolf. In the Bristol Channel it is not on the whole so plentiful as on the south coast, but is of common occurrence in dredgings and in trawl-refuse, and is frequent in Crab-pots as far east as Widemouth Bay. At Millook, in July and August, 1903, it was a serious pest among Lobster-pots. It is occasionally taken at the Seven Stones, and appears to be widely spread though not abundant between Land's End and Scilly. It is common at Scilly on fine sand with the hydroid *Sertularella gayi* in 40 fathoms to the east of Ganilly, and also north of Menavawr. It is plentiful at the entrance to St. Mary's Channel, and over a large area to the south-east of St. Mary's. Large specimens have occurred in trawl-refuse from forty miles west of the Longships. Females in berry usually appear along the south coast in early spring and from the middle of July till the third week in August. The Mediterranean species, *M. egyptia*, A. Milne-Edw., was recorded as not uncommon on weedy ground near Plymouth by Garstang, who recognized it "by its stripes of reddish brown pigment." Identification, however, by

such a character can scarcely be considered satisfactory. *Ebalia tumefacta* (Mont.) is very local but in places abundant in 25 to 50 fathoms, especially on coarse sandy gravel and on stony sand and gravel. In shallower water and on other types of ground it occurs rather sparingly. It is abundant to the west of the Eddystone (M. B. A.), on coarse gravel about four miles S. S. E. of Portwrinkle in 25 fathoms, far south of the Dodman in about 50 fathoms, in 40 fathoms five or six miles south of the Gull Rock, Portscatho, and in 25 to 30 fathoms in the North Channel, Scilly, about a mile south-west of Mincarlo. It is not uncommon at Polperro (Robinson) and near Gorran, and is occasionally found in trawl-refuse at Mevagissey, Falmouth, and Penzance (Tregelles), and from near the Wolf. Two females were dredged in Gerrans Bay in 1901 and a male in 1906 in about 12 fathoms. A few specimens have been captured in 15 to 20 fathoms south-east of Helford, and in 22 fathoms west of the Boa Rock, Mount's Bay. Vallentin found two females in 14 fathoms at St. Ives, and one was obtained in 15 fathoms north-west of Chapel Forth. *E. tuberosa* (Pennant) is also widely spread, but is nowhere abundant. It is found along with *E. tumefacta* to the west of the Eddystone and to the south of the Dodman, occurs sparingly in Mevagissey and Falmouth Bay, has been found in trawl-refuse from east of the Lizard and at Penzance, and has been sent in from Newlyn. It is very rare at St. Ives in 10 to 12 fathoms and a single specimen has been obtained from trawl-refuse at Padstow. At Scilly it occurs along with *E. tumefacta* on fine sand in 8 fathoms south of Great Ganinnick, in 40 fathoms to the north of Menavawr, and also in trawl-refuse at St. Mary's. *E. cranchii*, Leach, is very scarce. It occurs on sandy gravel on the Eddystone Grounds to the west of Hand Deep (M. B. A.), has been taken near Polkerris in St. Austell Bay, and in trawl-refuse at Falmouth (Cocks). A single example was taken in May, 1902, in 18 fathoms to the south of Gull Rock, Portscatho, and another in June, 1907, in 30 fathoms. Tregelles has taken a number of specimens at different times in Mount's Bay. At Scilly two were taken in July, 1903, in coarse sand half a mile west of Shipman Head.

The essentially southern species, *Dromia vulgaris*, Milne-Edw.,
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is rare. It has been taken near Plymouth (M. B. A.), in a Crab-pot at Portwrinkle in 1904, near Penzance in 1875 (G. B. Sowerby), twice in the west of the county by G. F. Tregelles about 1882, in a Crab-pot near Mousehole in 1900, and at Scilly about 1901, and in trawl-refuse at Mevagissey in 1907. In August, 1906, Vallentin obtained two from Crab-pots within the three-mile limit at St. Ives.

The Shaggy Flat Crab, *Porcellana platycheles* (L.), is common on every stony beach round the coast and in most places abundant from half tide down into shallow water. Over large tracts of littoral both north and south it is to be found under nearly every flat stone, while at Scilly it swarms on almost every stone-covered beach. In stormy weather it usually retreats into deeper water. Females carrying ova are most plentiful from May to June, but are by no means scarce in April and often common in August, while isolated specimens of large size have been taken thrice in February, and casuals of normal size at Scilly in September. The Tiny Porcelain Crab, *P. longicornis* (L.), is more or less abundant on all kinds of bottom from low water and in rock-pools down to 40 fathoms. It is often met with in extraordinary numbers in 10 to 20 fathoms, but on the north coast is generally scarce between tide-marks and in shallow water. It literally swarms at times in thickets of *Laomedia* and *Antennularia*, and Tregelles found forty-four in a cast-up stem of *Laminaria*. Masses of *Serpula* and of weed-covered clinker, too, attract a remarkable population. At Scilly it is plentiful on the sheltered beaches under stones. Females in berry are common from April to August.

B. MACRURA.

The Hermit Crabs of Cornwall are numerous, but present so many variations that their identification presents many difficulties. Professor A. Milne-Edwards, however, discussed for the writer's benefit a large series obtained about Falmouth in 1887-1888, and this annotated material has served as a basis and a standard for the present list. *Eupagurus bernhardus* (L.) is very common all round the coast, and at Scilly on sand, gravel, stones and rock from between tide-marks and in rock-pools downward, but is as a rule most plentiful in 10 to 15 fathoms. The littoral

and shallow water specimens are for the most part immature. It is almost everywhere common in Crab-pots, and very fine specimens are so obtained, chiefly in old shells of *Buccinum undatum*. The shell inhabited by this species in 5 to 30 fathoms usually supplies accommodation for one or more of its singular commensal, the Sea Anemone, *Adamsia polypus*, though the larger shells are occasionally invested with a flourishing colony of the Hydroid, *Hydractinia echinata*. *Buccinum* shells, especially when occupied by this Crab, often give lodgment to the Polychæte worm, *Nereis fucata*, in their apical whorls. Females in berry occur in March and April, and also in July and August, especially in the south-west and north. *Eupagurus cuanensis* (Thompson) is less abundant and much more local than the preceding species, and is very generally associated with the Sponge (*Suberites*). In the English Channel and around Scilly it is most plentiful in 10 to 50 fathoms, but on the north coast is very scarce down to 20 fathoms, below which depth it is fairly common on sand and sandy gravel. It occurs sparingly on the Rame-Eddystone and Eddystone Grounds (M. B. A.), and in increasing numbers from five to twelve miles W.S.W. of Hand Deeps. It is not uncommon locally around Mevagissey, in Veryan and Gerrans Bay, and in Falmouth Bay, where at Gyllyngvase and Maenporth specimens are occasionally taken at low spring tide. It has been found in trawl-refuse from about twelve miles east of Coverack, and commonly in 25 fathoms to the west of Boa Rock. It has also been captured in Mount's Bay in shallow water near St. Michael's Mount, in Gwavas Bay, and immediately south of Gear Rock, and in Crab-pots at Mousehole. It occurs near the Wolf, and apparently in small numbers over the sea-bottom between Land's End and the Isles of Scilly. In the archipelago it is widely spread and locally common down to about 50 fathoms one and a half miles south-west of the Bishop. It has also been obtained in trawl-refuse from about fifteen miles W.N.W. of Tresco. It has been found in berry on the south coast in April and in July. *Eupagurus prideauxi* (Leach) is generally distributed in 10 to 35 fathoms all round the coast and at Scilly, but is not nearly so plentiful as *E. bernhardus*. It is scarce in Whitsand Bay East, but moderately common from Polperro westwards, except on fine sand, and where exposed to the sweep of heavy seas. It is fairly

well represented on the north coast. This Crab is almost always associated with the Sea-Anemone, *Adamsia palliata*, though on rare occasions the shell it inhabits is encrusted with *Hydractinia echinata*. Females are most commonly with ova in June, but have been found in this condition from January to September. Though *Eupagurus sculptimanus* (Lucas) is apparently limited in its distribution to the waters round Cornwall and Devon, it is nevertheless widely spread within that area. It is found on the Rame-Eddystone Grounds (M. B. A.), in 40 fathoms about eight miles W.S.W. of Hand Deeps, and is of frequent but irregular occurrence in 30 to 45 fathoms outside Falmouth Harbour and southward as far as the Lizard. Inshore it is somewhat sparingly found in 3 fathoms downwards from Zoze Head round to Helford, and in Falmouth Harbour. It has been several times identified from Mount's Bay, has been obtained by Vallentin in 14 fathoms about a mile from the Island at St. Ives, and once dredged in 12 fathoms W.N.W. of Chapel Porth. At Scilly it has been captured in 35 fathoms about a mile south of Meledgan, and in 20 fathoms south of Penninis Head. *Diogenes varians*, Costa, a southern species, occurs in Whitsand Bay East (M. B. A.), and in Gerrans Bay, has been taken in fine sand in 8 fathoms to the south of Ganinnick, and in 22 fathoms in St. Mary's Sound, Scilly. *Anapagurus laevis* (Thompson) is most plentiful in 25 to 45 fathoms, and at such depths the shell it inhabits often accommodates on its surface the Anemone, *Epizoanthus incrustatus*. It also occurs sparingly in shallow water, but usually in immature condition and without its commensal. It is common on the Eddystone Grounds (M. B. A.), and locally in 40 to 45 fathoms outside Falmouth Bay, and has been obtained in 8 fathoms in Mevagissey Bay, and in shallow water at Gyllyngvase and at Maenporth. It is of frequent occurrence between Kynance Cove and Mousehole in 25 fathoms, and has been taken near the Runnelstone. At Scilly it has been dredged in 24 fathoms close to Porthellick. Females have been found in berry from May to August. *A. hyndmanni* (Thompson) occurs for the most part in 3 to 10 fathoms, and very frequently in the shell of *Turritella*. It has been taken off Polkerris Harbour, Tywardreath, not infrequently in Gerrans Bay, in Falmouth Bay and at Coverack. It is not uncommon in trawl-refuse at Meva-

gissey and at Penzance, and on muddy sand on the east side of Mount's Bay. At Scilly it has been obtained in berry in Crow Sound in April. Under the name *Pagurus fasciatus*, Bell described a "blue-banded Hermit-Crab" from a coloured drawing made by Cocks of a specimen obtained in trawl-refuse in 1845, but the species has not been found by any subsequent carcinologist. The typical fossorial crustacea, *Axius stirynchus*, Leach, and *Callianassa subterranea* (Mont.) rarely emerge from the sand in which they burrow, so that they are very seldom obtained entire. Fragments, however, especially of the latter, are not infrequently obtained in the stomachs of the Cod, Haddock, in various Gurnards (*Trigla hirundo*, *T. lyra*, *T. cuculus*), occasionally in Rays (*R. clavata*, *R. maculata*), and of *Axius*, rarely in the Painted Ray (*R. microcellata*); and fragments of *Axius* have been identified in trawl-refuse at Mevagissey. Two specimens of *Callianassa* have been taken near the mouth of Helford River by paying out a big length of rope so as to allow the dredge to dig deep. In all probability neither species is scarce, but the subarenaceous mode of life makes the chances of capture very remote. Fragments, subsequently identified as belonging to *Calocaris macandreae*, Bell, were obtained from the stomach of a Sting Ray (*Trygon pastinaca*) of large size, captured in 23 fathoms in Falmouth Bay. *Upogebia stellata* (Mont.), here taken as synonymous with *U. deltaura*, Leach, is also fossorial, but apparently does not burrow so deeply as those discussed above. Occasional examples have been obtained between tide-marks under Mount Edgcumbe, in dredgings on Queen's Ground, and a single specimen five miles W. $\frac{1}{4}$ S. of Rame Head (M. B. A.). It occurs in Gerrans Bay down to 12 fathoms, and occasional specimens have been obtained round Falmouth Bay about low spring tide. At Scilly two have been dredged in fine sand in 40 fathoms east of Great Ganilly. A female in berry was taken near Portscatho on July 23rd, 1908. *Minuda rugosa* (Fabr.) occurs frequently in trawl-refuse from outside Falmouth Bay in 30 to 45 fathoms, from near the Runnelstone, from outside the Wolf, and from 50 fathoms west of the Bishop. Young specimens were taken by Cocks under stones at low spring tide, and it was described by Bate as rare on stony ground in 20 to 30 fathoms off the Dodman. At Padstow it

has twice been identified in trawl-refuse from the Bristol Channel.

In identifying the Squat-Lobsters, *Galathea*, represented in British seas by five species, all of which occur round Cornwall, the writer has employed the key devised by M. Jules Bonnier, and given by Stebbing in his 'History of Crustacea.' *G. nexa*, Embleton, is common in Whitsand Bay East on sand in 8 to 15 fathoms, and has been taken at Polperro. It is of frequent occurrence in 35 to 45 fathoms outside Gerrans and Falmouth Bay, but is obtained very sparingly inshore. It is found in trawl-refuse at Penzance both from within and without the Bay, and from near the Wolf. It has been trawled from the mouth of the Bristol Channel, in 35 fathoms to the south-east of St. Mary's, Scilly, and in 50 fathoms about fifteen miles W.N.W. of Tresco. *G. strigosa* (L.) is nowhere common, but occurs sparingly, and in places frequently, in rock-pools and under stones on sheltered beaches along the south coast from Plymouth to Mousehole. On the north coast it has been obtained at St. Ives (Vallentin), and once at Port Isaac. At Scilly it is taken round St. Helen's Pool, and has been sent in from Old Town Bay. It seems to be a purely littoral species. *G. squamifera*, Leach, is intermittently common, and in places abundant under stones, especially on rocky shores and on stony sand, all along the south coast from between tides down to 15 fathoms. It often invades the Lobster-pots, especially on the north coast, where it rarely ventures into shallow water, and at Scilly, where its usual habitat is from 10 fathoms downwards. Specimens in berry are most plentiful in March and April. *G. intermedia*, Lilljeborg, is widely spread but local from 5 down to 50 fathoms on stony bottom and on coarse muddy gravel. It occurs in many localities round Plymouth, including the Rame-Eddystone Grounds and five miles south-west of Penlee (M. B. A.), and has been dredged about two miles S.S.E. of Portwrinkle on stony mud and gravel in 15 fathoms, and nine miles south of Looe in 32 fathoms. It has been sent in from Mevagissey, recorded from Gorran in berry in February and March, and has been taken in 40 to 50 fathoms S. $\frac{1}{4}$ W. of the Dodman. Occasional specimens have been obtained off Veryan Bay and outside Falmouth Bay, and also close to St. Mawes. There is a favourite haunt on

stony gravel in 20 fathoms almost due south of Prussia Cove in Mount's Bay. A single specimen has been procured on the north coast at Zennor. At Scilly it has been captured to the north of Menavawr in 40 fathoms. *G. dispersa*, Spence Bate, is at least fairly common everywhere from 10 fathoms downwards, while on many trawling grounds it is plentiful, and at times abundant. Females in berry occur in March and from the middle of July till the middle of August.

The Crawfish, *Palinurus vulgaris*, Latr., is taken in large quantity annually all round the coast and at Scilly, and ranks in importance with the Lobster and the Edible Crab. Though often found inshore it is most plentiful, of largest size, and of finest condition in deep waters, where its most congenial haunts are on rocky and on "scuddy" ground, in sandy lanes among rocks, and indeed wherever sand and rock come together. Females in berry are found for the most part in April and May. Though Dr. Borlase referred to a Mount's Bay specimen of the "shrimp," now known as *Arctus ursus*, Dana, as far back as 1758, it is one of the rarest of Cornish Crustacea. One specimen has been obtained five miles south of the Eddystone (M. B. A.), one was taken off Polperro by Laughlin, several have been captured about Penzance at different times by T. Cornish and others, one has been found off Land's End, and one near the mouth of the Bristol Channel (Cornish).

The Lobster, *Astacus gammarus* (L.), the *Homarus vulgaris* of Milne-Edwards and many subsequent writers, is generally distributed and often abundant, from shallow water down to 50 fathoms, for the most part among rocks, but sometimes on sand and gravel. It occurs all round the coast, but reaches its maximum development as regards size and probably also as regards population in the deep waters to the south-west and west, and especially from the Land's End district outwards to some miles west of Scilly. The quantity captured naturally fluctuates from season to season, but on the north coast it is much less abundant now than twenty years ago.

Nephrops norvegicus (L.), the Norwegian Lobster, is frequently brought in by trawlers, especially from forty miles west of the Longships (Norman), and from a few miles W.S.W. of the Bishop. It is occasionally obtained by the French crabbers between

Scilly and Land's End. The southern species, *Nika edulis*, Risso, is rarely found in Plymouth Sound, but is sometimes moderately common in Cawsand Bay, and is occasionally obtained in 20 to 30 fathoms outside (M. B. A.) It has been dredged in from 8 to 15 fathoms in Whitsand Bay East, once obtained in shallow water near Polkerris Harbour, Tywardreath, and twice in berry near Mevagissey in February. It is at times fairly common in fine sand in 30 fathoms about four miles east of Nare Point, and has been occasionally identified in trawl-refuse from the south of Gull Rock, Porthscatho, and once from the Wolf. The type specimen of *Nika couchii*, Bell, was obtained by Couch off the north coast of Cornwall. It has also been captured by Spence Bate in 30 fathoms, but has apparently not been seen by any other naturalist. *Cheraphilus trispinosus* (Hailstone) is plentiful locally on a bottom of fine sand in 3 to 8 fathoms along the south coast to Mount's Bay and at Scilly, except on much exposed parts of the coast. In Cawsand Bay (M. B. A.) and in Whitsand Bay East it is patchily common. At Fowey it is at times plentiful in 4 fathoms. In Mevagissey waters it is of frequent occurrence, and it is sometimes taken in fair quantity with the rake-dredge in Falmouth Bay and in Mount's Bay. On July 8th, 1908, several specimens were captured on the Great Western Beach at Newquay, and on August 11th, 1904, it was abundant in Crow Sound, Scilly, in 3 to 4 fathoms, between Guthers and Innesidgen. Females occur in berry from April to August. *Cheraphilus nanus* (Kröyer) was captured on the surface in Plymouth Sound in February, 1887, and recorded by Cocks from trawl-refuse, and as having been taken by Dr. Vigurs at Bar Point, Falmouth Bay. In July, 1890, an immature specimen was obtained at Zennor, and afterwards identified by Dr. A. Milne-Edwards. *Pontophilus spinosus*, Leach, is of frequent occurrence locally on sand and gravel in deep water along the south, but nowhere common. It is found on the Rame-Eddystone Grounds (M. B. A.) in 25 fathoms south-east of Longstone Rock, Whitsand Bay, in 30 to 35 fathoms south of the Dodman, in trawl-refuse from 40 fathoms 3 to 5 miles south of the Gull Rock, Portscatho, and at a similar depth 15 miles east of the Lizard. At Scilly it has been obtained on sandy gravel about half a mile west of Shipman

Head, and has once been secured in trawl-refuse from the mouth of the Bristol Channel, and once from 40 miles west of the Longships. Specimens in berry have been obtained in February and March.

The Sculptured Shrimp, *Egeon sculptus*, Bell, is occasionally found in 15 to 30 fathoms about Plymouth (M. B. A.), has been dredged in 12 fathoms to the south-east of Portwrinkle, Whitsand Bay, and taken casually in Mevagissey Bay, and in 25 fathoms outside Falmouth Bay. It has been found in trawl-refuse from 40 to 45 fathoms some miles east of Coverack, and also from the Wolf. At Scilly it was fairly common in 30 fathoms about the mouth of Crow Sound in July, 1904, several females being obtained in berry. It is frequently identified in trawl-refuse from the mouth of the Bristol Channel. The tiny Banded Shrimp, *Egeon fasciatus*, Risso, is thinly and irregularly distributed on sand along the south coast about low-water mark down to 5 fathoms, and as a casual in deeper water. It is not uncommon in Cawsand Bay, and occurs in the west entrance to Plymouth Sound (M. B. A.), and in 4 fathoms a little to the east of Longstone Rock. It has been sent in from Looe, Talland, and St. Austell Bay, has twice been captured at Gyllyngvase, and once dredged in 23 fathoms to the south-west of Helford River. It was not uncommon on Marazion Beach at low spring-tide in June, 1904, and has been taken sparingly at Porthcressa and to the south of Guthers Island, Scilly. On the north coast it has not been recorded. Females in berry have been found in the early spring. The Common Shrimp, *Crangon vulgaris* (L.), is very common, and in places abundant on sand and "scuddy" ground, especially when *Zostera* or seaweed is present, from low-water down to 10 fathoms, and occasionally in deeper water, all along the south, except where the coast is much exposed. On the Bristol Channel side its distribution is naturally very irregular. At Scilly it is usually common, but the numbers fluctuate considerably. It appears to breed the whole year round. *Crangon alkmanni*, Kinahan, was common three miles S.S.W. of Rame Head in August, 1898 (M. B. A.), but has not been found further west. Two specimens of the rare *Typton spongicola*, Costa, were obtained by Jonathan Couch from a Sponge, *Halichondria palmata*, hooked up from 30 fathoms, and

were recorded by him as *Alpheus edwardsii*. Several were obtained by Bate in 4 fathoms on stony ground off Plymouth in 1868, and one by Laughlin (*teste* Norman) in the Sponge, *Homæodictyon palmata*, off Polperro. *Athanas nitescens* (Leach) is not uncommon along the south in rock-pools, under stones among corallines and associated with *Fucus*, *Pelvetia* and other seaweeds from between tide-marks into shallow water, and is a frequent casual down to 30 fathoms. It occurs at Mount Edgumbe and Cawsand Bay (M. B. A.), at Donderry, Lantivet, and Mevagissey; is locally common about Gorran, Veryan, and Gerrans Bay, and plentiful at Gyllyngvase, Helford, and near Coverack. In September, 1906, it was abundant near Mousehole, and several specimens were picked up at Lamorna. To the south-east of Portwrinkle it has been dredged in 18 fathoms, and off the Dodman it has occurred in 25 fathoms. At a similar depth it has been taken several times outside Falmouth Bay, and has appeared in trawl-refuse from still deeper water some miles south of the Gull Rock, Portscatho. A single specimen was found under a stone on the beach at Nor-Nor, Scilly, and it has been dredged at the mouth of Crow Sound in 30 fathoms. On the north coast it has not yet been recorded. It has been found in berry in June and July. *Alpheus macrochiles* (Hailstone) was evidently obtained by Bate off the Dodman in 1868, but was recorded by him as *A. edwardsii*. A nearly adult specimen was obtained in trawl-refuse at Porthleven in August, 1890, the identification of which was corroborated by A. Milne-Edwards. *A. ruber*, Milne-Edw., was taken by Bate in 30 fathoms on a stony bottom off the Dodman, and at Polperro by Laughlin (*teste* Norman). Cocks found it frequently in the stomach of the Cod. Two specimens have been dredged in 25 fathoms to the west of the Boa Rock, Mount's Bay. *Spirontocharis cranchii* (Leach) occurs all along the south coast from low-water down to 30 fathoms, in places scarce, in others moderately common. It has been sent in from Sennen Cove, on the north coast has been caught in Crab-pots at Zennor, dredged in 25 fathoms to the north of Point Navax, and in shallow water at Padstow. At Scilly it is scarce in 7 to 8 fathoms in St. Mary's Roads, and has been obtained at Tregear's Porth. This species appears to be at least occasionally nomadic. Females in berry appear in

March and April, and again in July and August. *Spirontocharis pusiola* (Kröyer) as a county species is represented only by two examples taken at Lamorna in September, 1904. *Hippolyte viridis* (Otto) is not uncommon at times in Carrick Roads, is occasionally found in Percuil River, Falmouth Harbour, and has been obtained in trawl-refuse from Helford. On August 11th, 1906, a female carrying ova in an advanced condition was captured in 4 fathoms at Maenporth. Norman records it from Scilly. *H. varians*, Leach, is plentiful, often abundant, in rock-pools, on sand, and especially among weed on the south from between tide-marks into shallow water, and not infrequently fairly common also in deepish water. In the west and along the north coast it is locally as plentiful as in the south, but its distribution is naturally interrupted. At Scilly it is not common, but occurs on Samson Flats, and has been taken by F. Mitchell at Porth Cressa. It appears to breed all the year round. *H. fascigera*, Gosse, is very local, but occurs in Cawsand Bay (M. B. A.), occasionally in shallow water near Portwrinkle, and on sheltered sand on the west side of Mount's Bay. Females in berry have been found in June and July. *Pandalina brevirostris* (Rathke) is common in the Sound and in some of the outer grounds at Plymouth (M. B. A.). It has been obtained by Norman at Polperro, and in July, 1901, was fairly plentiful on clean gravel in deep water south and south-west of the Dodman. It is scarce in about 25 fathoms outside Falmouth Bay, and has been taken in 16 to 25 fathoms off the Runnelstone among *Cellaria fistulosa*. At Scilly it has been dredged in 10 to 12 fathoms in Crow Sound midway between Toll Island and Great Arthur. Females in berry have frequently been taken in March and April, and occasionally in July. *Pandalus montagui*, Leach, is very erratic in its appearance. In June, 1902, it was taken in large numbers at St. Austell Bay; from July to September, 1903, it was remarkably abundant at the mouth of the Helford River, and in November of the same year it appeared in great quantity at St. Agnes Cove, Scilly, and in St. Mary's Sound. In the middle of September, 1906, a number were caught off Newquay, and by the end of the month at Padstow and Port Isaac. In December of that year it invaded Falmouth Harbour in a dense shoal, and was sold by a hawker as "French Prawn."

Outside the occasions mentioned only rare casuals were obtained in these localities. Occasional specimens have also been taken at Portwrinkle, in rock-pools at Polperro and Gorran, in Mount's Bay, and at St. Ives (Vallentin). About the end of May, 1902, a Mackerel-drifter reported an enormous shoal between forty and fifty miles south-west of the Dodman, and brought in a sample for identification. Females have been taken in berry from November to April. *Palæmonetes varians* (Leach), a brackish-water Shrimp, is common about Plymouth (M. B. A.), has been taken at Looe, and in quantity at Par. It is occasionally fairly common about Falmouth, and has been captured several miles up Tresillian Creek. It breeds from April to June.

Leander squilla (L.) is not uncommon between tide-marks in Plymouth Sound (M. B. A.), but elsewhere is scarce and local. It has been taken in rock-pools between Longstone Rock and Dunderry, and Couch records it from Polperro. A few, including two females in berry, were taken near Gorran early in July, 1900, and in May, 1901, females were obtained in similar condition in deepish water to the south of the Dodman. A number of small-sized specimens was dredged in 13 fathoms to the south-east of Longstone Rock in September, 1906. It has been found at Scilly by Norman, and W. Borlase caught two one afternoon in April in a rock-pool on the south side of Annet. The Common Prawn, *L. serratus* (Pennant), is more or less plentiful everywhere on the south and in many places abundant, among weeds, in rock-pools, and among the rocks at low-water. At Scilly it is usually present in great abundance. On the north coast it is often scarce and its distribution is at all times irregular. On the south coast it appears to breed all the year round.

ON THE HYMENOPTEROUS PARASITES OF
RHYNCHOTA.

BY CLAUDE MORLEY, F.E.S., F.Z.S.

(Continued from p. 225.)

49. *Siphonophora pelargonii*, Kalt.

Aphidius rufus, Gour., is recorded from *Siphonophora malvæ* by Gaulle (Cat. 87, though not by Dours); and in all probability the Aphid upon *Pelargonium*, from which Dr. Giraud bred (Ann. Soc. Fr. 1877, p. 416) his *Aphidius pelargonii*, was the same species.

50. *Siphonophora lactucæ*, Kalt.

As direct parasites of this species, Marshall has bred both *Praon abjectum*, Hal., and his own *Aphidius sonchi*; the latter was also raised from it by Bignell in Devon, on June 30th, 1884, together with the hyperparasitic Cynipid, *Allotria minuta*, Htg., and the hyperparasitic Proctotrypid, *Lygocerus glabriculus*, Thoms. (Marsh. B. d'Europ. ii. 534 et 586; et Bignell, Trans. Dev. Ass. 1901, p. 688). Gaulle follows Dalla Torre (Cat. v. 427) in giving *Mymar pulchellus*, Curt., as parasitic upon—(?) the eggs of—this species; the latter ascribes the observation to Rondani, but gives no reference. It is, too, in the last instance, uncertain if the host were *Siphonophora lactucæ*, Kalt., *Rhopalosiphum lactucæ*, Pass., or *Aphis lactucæ*, Fabr. (= *Siphonophora tussilaginis*, Walk.).

51. *Siphonophora rubi*, Kalt.

This species is indicated by Marshall (B. d'Europ. ii. 574-6) as the host of *Aphidius avenæ*, Hal., and of *A. ervi*, Hal. Bignell adds (Trans. Dev. Ass. 1901, p. 688) that he bred *A. rosæ*, Hal., as commonly from this species as from *S. rosæ* throughout the summer in Devonshire.† Gaulle adds (Cat. 112) that "*Myzus* "

† Buckton (Mon. Aph. ii. 157) differs from Marshall in considering that the parasites of *Aphididæ* "do not seem to be confined to preying on single specific forms," though the latter merely circumscribes their range, and, while considering the majority restricted to a single host-species (which

rubi is destroyed by the Proctotrypid, *Trichosteresis clandestinus*, Nees, and (*l. c.* 26) that *Allotria flavicornis*, Htg., preys upon an Aphid on *Sarothamnus*. The present species often migrates to broom towards the end of July.

52. *Siphonophora urticæ*, Kalt.

Aphidius urticæ, Hal., which is at present exclusively British, has been bred from this species by Bignell in Devon on June 7th, 1883, together with three of its hyperparasites:—*Lygocerus carpenteri*, Curt., also bred therefrom by Marshall, *Allotria cursor*, and the beautiful and very rare *Agononeurus basalis*, Westw. One small female of *A. loniceræ*, Marsh., has also been raised from this host, with the abundant *A. ervi*, Hal., its hyperparasite *Isocrates æneus*, Nees, and *Aphidius avenæ*, with its Cynipid hyperparasite, *Allotria cursor*, Htg. I can add *Aphidius scabiosæ*, Marsh., to the known parasites of *S. urticæ*, since I bred a single female thence, in my garden at Monks Soham, Suffolk, in August, 1908.

53. *Siphonophora longipennis*, Buck.

Marshall describes (*Bracon. d'Europ. ii.* 578) his *Aphidius pascuorum* from specimens bred by Bignell in Devon on July 13th, 1883; the latter also raised two species of *Allotria*, *A. erythrocephala*, Htg., and *A. victrix*, Westw., supposed to be hyperparasitic on this *Aphidius*. Bignell says (*Trans. Dev. Ass.* 1901, p. 664) that he bred two examples of the latter hyperparasite from a single already parasitized Aphid, within which he had previously witnessed the female *Allotria* oviposit.†

54. *Siphonophora rosarum*, Walk.

In 1835 Haliday described his *Aphidius eglanteriæ*, “*Prodiit mihi ex Aphidibus Rosæ Eglanteriæ*,” adding that the attacked

opinion this paper will go some distance in refuting), yet allowed that some attacked “several different kinds of Aphis” (*Bracon. d'Europ. ii.* 527; *Trans. Ent. Soc.* 1899, p. 12).

† The means by which a hyperparasite becomes aware that the host is already tenanted by a direct parasite are very little known, but, in the case of Aphides, Walker considers the fact rendered sufficiently obvious by the desiccated appearance and altered colour; and Buckton adds (*Mon. Aph. ii.* 157) that the “form does not apparently alter after the insect has suffered a second attack from a *Ceraphron* or *Asaphes*.”

pucerons become glossy white and fix themselves on the under side of the leaves (Ent. Mag. ii. p. 102). Giraud bred the same direct parasite from "Aphis, sur Bédéguar du Rosier" (Ann. Soc. Fr. 1877, p. 415). Both host and parasite appear exclusively attached to *Rosa rubiginosa*, the sweetbrier. Buckton's record (Mon. Aph. ii. 155) is an error, as noticed under *S. rosæ*, ante.

55. *Siphonophora tanaceti*, Linn.

The only reference to the parasitism of this species is made by Gaulle (Cat. 104), who tells us that the Chalcid, *Spalangia nigra*, Latr., has been bred therefrom.

56. *Siphonophora absinthii*, Linn.

Bignell has been exceptionally fortunate in breeding direct parasites from this species in Devonshire:—*Aphidius absinthii*, Marsh., emerged on September 24th; the rare *Praon flavinode*, Hal., which is supposed to be exclusively British, and the common *P. volucre*, Hal., emerged on June 27th (Trans. Devon. Ass. 1901, p. 688); and he subsequently raised both sexes of his new *P. absinthii* from the same host (E.M.M. 1894, p. 255), and exhibited them at a meeting of the Ent. Soc. (Nov. 7th, 1894).

57. *Siphonophora artemisiæ*, Koch.

Elassus (*Aphidius*) *minutus*, Ratz., with its hyperparasites, *Allotria victrix*, *A. minuta*, and *A. brachyptera*, were "aus Blattläusen auf *Artemisia vulgaris* erzogen" in Prussia by Brischke (Schr. Nat. Ges. Danz. 1882, p. 182). No one else appears to have noticed the species.

58. *Siphonophora sonchi*, Linn.

To such an extent is this abundant species parasitized that Buckton very truly says (Mon. Aph. ii. 157) that their colonies often consist of more dead than living individuals. Haliday bred his *Trioxys centaureæ* "hab. in Aphidibus Centaureæ nigræ minus frequens. . . . I have observed this species attacking the pucerons of the Centaury; its proceedings are similar to those of the true *Aphidii*: it pierces the under side, and by an equally instantaneous touch" (Ent. Mag. 1833, p. 490); and this species is very likely synonymous with Giraud's *Aphidius centaureæ*, which he bred from Aphids on *Centaurea jacea*, representing probably

either the present species or *Siphonophora jaceæ*, Linn. (Ann. Soc. Fr. 1877, p. 415). Haliday also bred his *Aphidius crepidis* from Aphids, probably of this species, on *Crepis virens* (Ent. Mag. 1835, p. 94); and it is possible that *Megaspilus aphidum*, Gir., bred (Ann. Soc. Fr. 1877, p. 434) from "Aphis sur *Crepis*," was hyperparasitic through this species. *Praon volucre*, Hal., has also been bred from it in Devon, by Bignell in the middle of June, with its hyperparasites, *Allotria ullrichi*, *Isocrates vulgaris*, and species of *Lamprotatus*. Giraud's hyperparasite was probably the same species as Kieffer's *Lygocerus bifoveolatus*, and *Allotria flavicornis*, given as preying upon *Aphis sonchi* by Brischke (Schr. Nat. Ges. Danz. 1882, p. 182), synonymous with either *A. (Alloxysta) nigrita*, Thoms., or *A. carpentieri*, Kieff., which have also been raised from this species.

59. *Siphonophora cichorii*, Koch.

There can, I think, be little doubt that the Aphids feeding upon *Cichorium intybus*, from which Haliday (Ent. Mag. 1835, p. 94) bred his *Aphidius crepidis*, were of this species.

60. *Siphonophora olivata*, Buckt.

In Devonshire Bignell has bred *Aphidius cardui*, Marsh., commonly from this species in the middle of August (Marsh. Br. d'Europ. ii. 594), and the exclusively British *Trioxya angelicæ*, Hal., was also raised by him from the same host on July 17th, 1883.

61. *Siphonophora citrifolii*, ? auct.*

Two new Chalcids have been recorded from this injurious species in America by Ashmead: *Encyrtus siphonophoræ* (Trans. Amer. Ent. Soc. 1886, p. 131) and *Entedon aphidiphagus* (*l. c.* 1887, p. 201).

62. *Myzus cerasi*, Fabr.

Ephedrus lacertosus, Hal., was bred from this species in Devonshire by Bignell on June 8th, 1883, and *E. validus*, Hal., on 4th of the following July; but whether it be upon these species or upon *Aphidius cerasi*, Marsh., only one male of which the latter succeeded in raising, that the abundant *Allotria flavicornis*, Htg., preys is not yet clear (*cf.* Marsh. Br. d'Europ. ii. 548 et 608).

63. *Myzus ribis*, Linn.

The only direct parasite known upon this species is *Aphidius ribis*, Hal., which was bred from it by Bignell on June 10th, 1883, though it had long before been noticed by Réaumur (iii. Mem. ix. 286); and it is this species, we must suppose, upon which *Allotriæ* so largely prey, since it is abundant. *Allotria minuta*, Htg., was bred plentifully from it by Bignell (Trans. Dev. Ass. 1901), *A. circumscripta*, Htg., by Kirchner (Cat. 1867, 30), and *A. tscheki* from Aphids on *Ribes rubrum* (Giraud, Verh. z.-b. Ges. x. p. 128). Of *Encyrtus lambinus*, Walker, in describing it (Ent. Mag. 1838, p. 422), says: "May; near London, under a currant-leaf; probably a parasite of *Aphis ribis*."

64. *Drepanosiphum platanoides*, Schr.

Allotria tscheki, Gir., is given by Gaulle (Cat. 27) as preying upon *Aphis platanoides* (cf. Verh. z.-b. Ges. x. p. 128).

65. *Drepanosiphum acerina*, Walk.

Marshall says (Br. d'Europ. ii. 583) that Bignell bred, on July 15th, 1884, two females and one male of his *Aphidius pseudoplatani* from this species, of which two individuals were winged, together with its hyperparasites, *Isocrates vulgaris*, Walk., and *I. æneus*, Nees. Haliday noticed (Ent. Mag. 1835, p. 95) that the pucerons infested with his synonymous *Aphidius constrictus* (nec Nees) became white, and many of them were winged.

66. *Megoura viciæ*, Buckt.

No direct parasites have been noted, and even the secondary ones are all doubtful, since it is from *Aphis viciæ*, Fabr., that they have been ascribed. Thence Kirchner bred (Cat. 30) *Allotria erythrocephala*, Htg., *A. heterocerus*, Htg., and *A. melanogaster*, Htg.; and Gaulle (Cat. 27 et 106) records *A. victrix*, Westw., and the Chalcid, *Aphelinus tibialis*, Nees. Possibly these all appertain to *Siphonophora pisi*, but *M. viciæ* is very common.

67. *Megoura solani*, ? auct.*

As preying upon this American species, Ashmead records (Bull. Ent. U.S. Dept. Agric. 1887, p. 19) his new *Encyrtus megouræ*.†

† I have no idea to what species the "Aphis sur *Lycium*" thrice given by Gaulle (Cat. p. 26) can refer. Buckton gives no species upon any *Solanaceæ*. From it are recorded *Alloxysta filicornis*, Cam., *A. luteicornis*, Kief., and *A. recticornis*, Kief.

68. *Rhopalosiphum ribis*, Linn.

I have not been able to discriminate between the parasites of this species and those of *Myzus ribis*, ante.

69. *Rhopalosiphum nymphaeae*, Linn.

Walker states that *Allotria erythrocephala* saves the white water-lilies from almost entire destruction by this Aphid over large surfaces of the Thames and other ornamental waters. It is, however, a little obscure both if this Cynipid be considered hyperparasitic, like at least the majority of its genus, upon some unknown *Aphidiinae*, and if it be the unrecognisable species described by Jurine (Nouv. Méth. pl. xii. gen. 40), or that of Hartig (Germ. Mag. ii. p. 199), which is synonymised by Cameron with *A. victrix*, Westw. Kieffer has found a very simple expedient by redescribing it as *A. pusilla*, Kief.! The Dacnused, *Gryocampa affinis*, Nees, recorded from this Aphid by Gaulle (Cat. 871), in reality doubtless emerged from some leaf-mining Dipteron.

70. *Rhopalosiphum ligustri*, Kalt.

From *Aphis ligustri* Kirchner bred (Cat. 30) *Allotria erythrocephala*, Htg., and Gaulle mentions the same species (Cat. 27) under the name *A. victrix*, Westw.

71. *Rhopalosiphum berberidis*, Kalt.

From this species Gaulle (Cat. 104) records the Italian Chalcid, *Chrysolampus (Sphegigaster) pedunculiventris*, Spin.

72. *Rhopalosiphum dianthi*, Schr.

Curtis (Farm. Ins. 73) vaguely says that his *Aphidius rapae* (= *A. brassicae*, Marsh.) preys upon the "turnip aphides," of which he describes three species, but all these are synonymised under the present species by Buckton (Mon. Aph. ii. 15). The former remarks that several generations of the parasites are evolved in a single summer, adding that they are so common that he scarcely ever noticed a plant infested with these Aphids where some of their dead and horny shells could not be observed. A Proctotrypid, his *Ceraphron (Lygocerus) carpenteri*, and two Chalcids, *Asaphes vulgaris*, Walk., and *Coruna clavata*, Curt., he describes as parasitic through the *Aphidius*.

(To be continued.)

NOTES AND QUERIES.

AVES.

Where are our Nuthatches?—Referring to Mr. Warde Fowler's query (*ante*, p. 155), it has occurred to me that the Starling may have had something to do with the falling-off in the number of Nuthatches. I simply make the suggestion. In this district an increasing number of old Woodpeckers' holes are used by Starlings in the nesting season, and holes once used by the Nuthatch are now, and have been for several years past, in the possession of the Starling, which is undoubtedly an increasing species here. I cannot confidently say that any noticeable decrease has taken place in the number of Nuthatches in this part of Sussex, but if there is any difference then I think it must be said that there are fewer than there were ten years ago. A pair occupied one of my nesting-boxes last year, but my boxes seldom exceed half a dozen in number.—ROBERT MORRIS (Uckfield, Sussex).

A White Chaffinch.—On several occasions, about the middle of last July, amongst the various kinds of birds partaking of the banquets of bread-crumbs daily provided for them, close to the house, was a white Chaffinch. Being within a few yards of the window from which it was seen it could easily be identified. On mentioning the incident to a neighbour, he informed me that he had seen it, in like manner, near his house.—J. ROSE (10, King's Road, Binstead, Isle of Wight).

[Mr. Dresser, in his 'Man. Pal. Birds,' says of this bird: "Occasional varieties are pale blue, faintly marked with purple, and finely spotted with dark brown."—ED.]

Hoopoe in Northamptonshire.—In the first week in May, 1908, a Hoopoe (*Upupa epops*) was shot in the south-west corner of Northamptonshire by a man who had no idea what it was, and said it was feeding with his fowls!—O. V. APLIN (Bloxham, Oxon).

Cormorant in Warwickshire.—A Cormorant (*Phalacrocorax carbo*), in immature plumage (a bird of the year, I think), was shot on a fish-pond in South Warwickshire, less than a mile from the Oxon boundary, on Sept. 8th, 1908, and sent to me for identification. Its total length

was 32 in., and it only weighed $3\frac{1}{2}$ lb. At this season the Cormorant often wanders inland.—O. V. APLIN (Bloxham, Oxon).

Shoveler breeding in North Devon.—The earliest record of the breeding of this species (*Spatula clypeata*) in North Devon appears to be a note contributed by Mr. John Cummings to 'The Zoologist' for 1905, p. 112, in which he states that a brood were hatched out at Braunton in 1904. This is two years earlier than the date mentioned in Mr. Bruce Cummings's note (*ante*, p. 255).—F. C. R. JOURDAIN (Clifton Vicarage, Ashburne, Derbyshire).

Avocet at Hampstead.—It may be worth recording that on August 10th I saw an Avocet (*Recurvirosta avocetta*) flying over the Heath here. My attention was first called to it by hearing a clear and often repeated note, which sounded to me like "tu-it," emanating from a bird in black and white plumage flying overhead, and I had time, with the aid of my glasses, to make quite sure as to its identity. It was flying rather high up, and in a westerly direction towards Hendon.—H. MEYRICK (Holly Cottage, The Mount, Hampstead).

Notes on Nest-Boxes.—Our nest-boxes, &c., have been occupied during the past season by the Robin (in a kettle), Blackbird, Great Tit, Blue Tit, Coal Tit, Nuthatch, House-Sparrow, Tree-Sparrow, Starling, and Stock-Dove. The Blackbird's nest was in an old hollow log of elm, which has usually been the abode of Starlings. When looking round the boxes early in the year to give them a spring-cleaning I found in one the remains of a cock Blackbird; possibly the unfortunate bird crept in for shelter and could not get out. One of the most interesting nests I have seen was that of a Moorhen, built last year in a thorn-bush overhanging the river, which this season was repaired and used by a Blackbird. The Tawny Owls bred in the church-tower in the same place as last year and the year before; only two eggs were laid, but both were hatched and the young reared. One day I found in the nest about the finest specimen of *Mus flavicollis* I ever saw, but too much mauled to be of any use. I have not seen or heard a Redstart or Wryneck the whole season. Cuckoos have been more numerous than usual; one perched on a croquet-hoop in our garden one day, and a rough sketch made of him has turned out into rather a successful lantern-slide. The only egg I have found this year was taken under rather unusual circumstances. The Pied Wagtails which always nest in our ivy wall did so as usual, and some robber (probably a Rat) destroyed the young when they were about two days old. A day or two later a Cuckoo deposited her egg in the

deserted nest. It is strange that here the Cuckoo never uses the Reed-Warbler's nest. During the last three seasons we have examined upwards of thirty nests of this bird, but not one has been used by the Cuckoo. In one district in Norfolk a friend told me that he used to find on an average one Cuckoo's egg in every three nests of the Reed-Warbler.—JULIAN G. TUCK (Tostock Rectory, Bury St. Edmunds, Suffolk).

Vertebrate Fauna of Cheshire.—I have in preparation, and almost ready for publication, a Vertebrate Fauna of the County of Cheshire and the sea area of Liverpool Bay. I should be greatly obliged if any reader of 'The Zoologist' who has notes on the mammals, birds, reptiles and batrachians, or fishes of this area, which might suitably be incorporated in the work, would communicate with me.—T. A. COWARD (Brentwood, Bowdon, Cheshire).

NOTICES OF NEW BOOKS.

A Guide to the Natural History of the Isle of Wight. Edited by
FRANK MOREY, F.L.S. William Wesley & Son.

THE natural history of the Isle of Wight required description, and this book has gone a long way to supply the want. It is the work of a considerable number of contributors, and, though 'The Zoologist' is outside a notice of the botanical subjects, we will endeavour to deal with the other sections.

The Editor supplies an interesting introduction, and this is followed by "An Outline of the Geology," by G. W. Colenutt. This is fully described, but we wish the Palæontological element had been even more fully discussed, and some reference to the papers on that subject by Hulke would have been more than interesting. Professor John Milne writes on "Earthquakes," and naturally we may rely on this authority telling us all that it is material to know. Then we have a contribution by Mr. Ronald Poulton on "Discoveries of Palæolithic Implements." This prehistoric section will bear amplification. We remember a paper by Mr. A. L. Lewis "On the 'Longstone' and other Prehistoric Remains," and also another by the Messrs. Price on "Excavations of Tumuli on the Brading Downs" of the Island. Even the Palæolithic finds have not yet been exhausted, and we recall an evening at the Anthropological Institute in 1871, when Mr. Hodder Westropp exhibited a worked flint said to have been found many years before on Ashe Down, which antedates the finds recorded in 1886-89 as given by Mr. Poulton for priority.* The Mollusca are fully treated by the Editor, the Arachnida by Mr. F. P. Smith, and the Crustacea and Myriapoda are also from the pen of Mr. Morey. The Insecta has fallen into good hands: Mr. Burr is answerable for the Orthoptera, Mr. Lucas for the Neuroptera (including the Odonata), and Mr. Claude Morley has undertaken the Hymenoptera. The Coleoptera naturally

* Cf. also "On Ventnor Flints," by H. M. Westropp (Journ. Anthropol. Inst. iii. p. 69 (1873)).

occupy a considerable space, and this section has been entrusted to Mr. Newbery, who has, as the Editor remarks, "the distinction of having compiled the most extensive list in the Guide." This is followed by a "Supplementary List," by Mr. Donisthorpe, bringing the enumeration up to date, but even then, in the editorial introduction, we read that two species, both found in 1906, have still to be added—*Lathrobium rufipenne* and *Cis dentatus*. Mr. H. F. Poole enumerates the Lepidoptera, Mr. Morey the Diptera, and Mr. E. A. Butler the Hemiptera.

Mr. Percy Wadham is responsible for the section on "Fishes," a subject that possesses many interesting features. Many species have been recently and still are being introduced, so that considerable disparity may exist in recent enumerations compared with those of an earlier date. Thus Mr. Aflalo, in his 'Sketch of the Natural History (Vertebrates) of the British Islands' (1908), wrote of the Isle of Wight: "The streams hold neither Pike, nor Perch, nor Chub, nor Gudgeon." The first two, however, now appear in Mr. Wadham's list; the Perch introduced in 1907, and the Pike represented by a single specimen out of three imported from the Itchen in 1901, for the purpose of keeping down small Rudd which infest the Isle of Wight Union Pond. "Birds" have been entrusted to Mr. Reginald Fox, and the enumeration is of a greater extent than some would have anticipated. This section contains several plates, that illustrating the White Stork being particularly commendable. The mammals are also treated by Mr. Wadham, but our space is now occupied, and we can write no more. We must, however, give one suggestion and express one regret. The first is that a bibliography of the whole subject would have been welcome, while we deplore the absence of an index. A good map of the island is, however, appended.

A Survey and Record of Woolwich and West Kent. General Editors: C. H. GRINLING, T. A. INGRAM, & B. C. POLKINGHORNE. Woolwich: Labour Representation Printing Company, Ltd.

THE appearance of this volume has from unavoidable circumstances been considerably belated. It was intended to be published in time for the Woolwich Congress (1907) of the South-

Eastern Union of Scientific Societies, and, although the plan of the work as regards some sections has been curtailed, the zoological portion of the work under the editorship of Mr. J. W. Tutt has assumed a very complete form, and, as might be expected, Mr. Tutt has brought the Insecta thoroughly up to date, and insured it possessing an authoritative character. The list of birds has been carefully compiled by Mr. H. J. Turner, but the section "Pisces" is unsatisfactory. It is, however, stated that "the present List is a mere summary of the 'Catalogue of Fishes occurring at Blackheath and its Vicinity,' published by the Greenwich Natural History Club in their "Fauna" (1859). The Ravensbourne since that time is an altogether different stream to what it was then, and when we read of the Chub as not uncommon in the Thames and Ravensbourne, the Bream as found in both waters, and the Pike as common to both, we are somewhat amazed, especially as regards the Woolwich reaches of the Thames. This subject might well be investigated by the members of the West Kent Natural History Society, and the report would form a valuable companion to the 'Report on the Sea Fisheries and Fishing Industries of the Thames Estuary,' by Dr. Murie, published in 1903. The Rudd is localized as "Thames," but is it really found in this part of the river? It is with certainty in some of the private waters, Mr. Joseph F. Green having recorded a fine specimen of 4 lb. 4 oz., taken by himself in the "Cedars" pond at his residence in Lee.* The botanical subject is beyond the purview of 'The Zoologist,' but the section Geology is not only well and fully written by Messrs. Whitaker, Chandler, Dibley, Leach, and Salter, but what is equally valuable and welcome is a "Chronological List of Works on the Geology of the District," compiled by Messrs. Whitaker and Chandler.

The Prehistoric Period of Woolwich and West Kent has been contributed by the late B. C. Polkinghorne, and the antiquarian will find a full guide to the "Churches, &c., 1000-1900 A.D."

This book must be specially marked as containing three good indices—Botanical, Zoological, and General—which enhances the value of a distinct addition to our volumes on local natural history in its widest sense.

* 'Zoologist,' 1905, pp. 256 and 270.

THE ZOOLOGIST

No. 819.—September, 1909.

NOTES ON THE ORNITHOLOGY OF OXFORDSHIRE, 1908.

BY O. V. APLIN, F.L.S.

January 1st. — Weather severe. Large flocks of Wood-Pigeons.

3rd.—Bullfinch feeding on berries of privet.

6th.—Sudden change to mild weather.

8th.—Great Tit with spring note.

9th.—Big floods.

10th.—Weather severe again. Good many Bramblings under beech avenue, but not many adult males.

12th.—Down to 13°.

13th.—14°. Hedge-Sparrow singing.

15th.—Mild and very damp.

17th.—*Galanthus elwesii*, *Cyclamen coum*, and *Chimonanthes* in flower.

18th.—Green Woodpecker's laugh now very full and ringing, a leisurely "hark, hark, hark, hark" (or "yark"). In summer, just after the breeding season, and late summer, its notes are shorter "hik, hik, hik," more rapidly uttered, or sometimes a short "hick-el"; hence its local name.

24th.—Thick and persistent fog the last three days. It prevails over a great part of Europe.

27th.—Song-Thrush singing, but not many birds here.

About an inch and a half of rain this month.

February 8th. — No Fieldfares and Redwings to be seen. Some Bramblings. Thrush song very fine now.

14th.—Chaffinch, Yellow Bunting, and many Larks singing. Saw one Fieldfare.

20th.—Thousands of Wood-Pigeons reported feeding on seed-grass and clover-fields about South Newington hills. Saw a Siskin in cypress in Banbury, where several have been seen for some days.

21st.—Blackbird singing. Great increase of Chaffinches in the last week.

28th.—Snowstorm and frost.

29th.—Sharp frost. A great many Bullfinches in the garden, six in one plum-tree. Some Bramblings in the garden; frequent stackyards this weather.

A very dry month.

March 1st.—Heavy snowstorm.

5th.—Notwithstanding wintry weather the Rooks have a lot of nests built.

6th.—Violent storm and deluge of rain.

7th.—A Thrush's nest in garden finished externally.

8th.—Mistle-Thrush sings finely now in the daytime, but I do not notice it in the evening, when the Song-Thrush is at its best.

13th.— Song-Thrush laid one egg. Found in yew-hedge Blackbird's nest with four eggs partly incubated. Some Fieldfares about again.

15th.—Some snow. Apricot blossom.

23rd.—The first spring-like day. Peewits in the ploughings.

26th.—Big floods.

31st.—Although I went over a great deal of ploughed land about Wroxton when out with the Basset hounds, I could see no Wheatears.

A rough, cold month, with much high wind and over $3\frac{1}{2}$ in. of rain or snow.

April 3rd.—Chiffchaff in song.

4th.—Young Robins hatched.

17th.—Swallow. Male Lesser Redpoll about some alders above Upper Grove Mill. A late spring.

19th.—Some snow.

20th.—Heavy snow showers.

22nd.—Mistle-Thrush's nest with four hard-sat eggs in a laburnum-tree in the garden; the bird sits very hard, but her tail extending over the edge of the nest and the light-coloured outer tail-feathers make her conspicuous.

23rd.—Snow fell all day (up to noon mixed with rain), but fortunately wasted to some extent; temp. 37° at noon. At 5.30 p.m. every twig loaded with snow and shrubs weighed down. A Thrush sitting high on big young in a bay-tree sat bravely through it, though the weighing outwards of the branches has quite exposed her; wind N.N.E. By 7 p.m. it was freezing, and the wind having risen the conditions approached those of a blizzard for a time, but the wind sank to calm again. A Black-bird sang in evening.

24th.—At 4.30 a.m., with everything deep in snow and the temperature having been down to 26° in the night, Blackbirds sang well. Bright sun thawing snow in forenoon, but the air was cold, and icicles from one to two feet long formed on the eaves, &c. Most of the snow wasted during the day, but some remaining on the roofs, hills, and the church-spire (a sure sign) looked ominous, and the air soon cooled again, until by 6.30 p.m. it was freezing; then snow began to fall at night, the wind having backed from N.N.W. to S.W. The Mistle-Thrush and the Song-Thrush in the bay-tree sat out the storm so far.

25th.—Snowed all last night, but the snow had wasted to same extent as it fell, so that it was not very deep this morning; still falling. But about 11 a.m. the wind went into the east and then north, the temperature dropped, and the snow accumulated. Snow fell all day, and by evening everything was buried. At 11 p.m. snow was still falling. Heard Fieldfares flying over in the day. Blackbirds sang at intervals in the morning, but not in the afternoon, and Thrushes not at all. The Cuckoo was reported as seen and heard at Stanton Harcourt!

26th.—A wonderful scene this morning in the sun. Snow a foot deep on the level—*e.g.* my lawn—and several feet deep in the drifts. It was nearly a foot deep on the roofs and heaped up on shrubs (which were in many cases bowed to the ground), and trees to the same extent. Great destruction among shrubs and trees, which were broken or fallen in all directions. The

sun was strong, and the temperature rose to 50° , so the snow melted fast during the day; much, however, still remained. The Cuckoo was heard at Watlington and at Tadmarton this morning, and a male Blackcap appeared in the garden in the afternoon. Every nest that I knew of in the garden was deserted, and the young, if hatched, perished, and numbers of Rooks seem to have lost their broods. But, strange to say, a Pheasant, which had a nest under some thorns lying against a mangold-bury in one of our fields, sat right through the double storm covered up with snow except for a small blow-hole, and finally hatched off and brought up her brood. The storm was one of the heaviest we have had since 1881, and possibly had not a great deal of the snow melted as it fell it would have been the deepest fall of modern years; it certainly was the deepest spring fall ever known. Some remote villages were isolated on the 25th, and the snow was seventeen or eighteen inches deep on the level in some parts of Oxfordshire.

27th.—A steady thaw, and a great deal of rain at night.

28th.—Still some heaps of snow remaining; a great rain and the lower part of the village heavily flooded. The Thames Valley flooded. A Swan's nest on island near Caversham Bridge carried away.

29th.—The warmest day this year— 56° in shade. Cuckoo noisy; a pair of Swallows here, singing; Willow-Wren in song; but it is probable that a great many migrants have perished.

30th.—A lot more rain last night and until noon to-day. Great floods in the valleys, and upland fields with standing pools of water. Lots of Swallows about the village.

Rain (and snow) on about eighteen days this month amounted to nearly four inches. Wind chiefly in the north-west.

May 1st.—An extraordinary change to a summer day; 70° in the shade. Whitethroats, Ray's Wagtail, and Tree-Pipit had arrived, and Swallows and Cuckoos are numerous.

2nd.—Up to 72° , and blossom coming out rapidly in the hot air, and everything seems in a hurry to make up lost time; a Thrush had a nest externally finished in the forenoon of the 29th. Two Garden Warblers here to-day. Kestrel had four eggs.

3rd.—Lots of House-Martins. A clutch of Carrion-Crow's

eggs brought in to-day consisted of two very hard-sat and one addled egg. Six Magpie's eggs were fresh.

7th.—Several Swifts. Two Nightingales reported from Bloxham Grove. A clutch of Crow's eggs consisted of three very hard-sat and two addled ones.

9th.—Spotted Flycatcher. Some of the summer migrants I have missed seeing altogether this season. Jackdaw's clutch was two half-incubated and one addled eggs. These addled eggs are due to the snow, I suppose.

10th.—Turtle-Dove.

12th.—Shot some young Rooks; some few could fly. This is the average day for shooting them, so it is evident that plenty of young Rooks survived the snowstorms, although it is difficult to understand how the old ones got any food. As usual at this rookery, some of the young birds showed more or less white about their beaks and claws. Redstart (scarce this year) and Lesser Whitethroat first noticed, although a nest of the latter had three eggs the next day.

15th.—Away from home until June 4th. A male Nightjar was sent to me from Banbury on May 25th.

June 4th.—Mistle-Thrush singing.

9th.—A Turtle-Dove's nest in a hedge had a distinct lining, worked so that it held together, of thick herbaceous plant-stems. There is a great variety in these nests. In the longest evenings, when they are bright, Song-Thrushes stop singing in this garden at 9.10 p.m. Blackbirds stop a good deal earlier. In the hilly grass-fields at the back of the garden, which catch the light longer, the Thrushes sing a little later.

19th.—A pair of Shrikes at the old place near the railway station.

23rd.—Report that there were three Crested Grebes and a nest with one egg on the water at Eynsham Hall on April 24th.

30th.—Examined a clutch of eight Sparrow-Hawk's eggs taken at Chadlington on May 5th. Saw a Hobby on the wing near Churchill.

June a cold, rather dry month, with much N.E. wind. A little over two inches of rain fell on seven days, over an inch of which fell in one day.

July 1st.—A curiously light night, with a glow in the north; not dark all night.

5th.—Great Tit with fledged young in one of my boxes. Does this bird rear two broods?

19th.—Blackbird singing.

26th.—Thrush singing early.

About $2\frac{1}{4}$ in. of rain on ten days this month. The 30th was the hottest day so far, and only 75° .

August 4th.—Starlings (with Blackbirds), having swept the garden of bush-fruit, do not visit the garden much now. They ate all the black currants this year for the first time. Blackbirds are now eating plums on the wall-trees.

11th.—Country very dry now.

14th.—Gulls passing over at night. Two were seen over this garden yesterday evening, and a flock of Wild Geese were reported flying over the village a few days ago.

15th.—Martins have gathered on the house-roof for nearly a week in increased numbers daily.

16th.—Plenty of Swifts, although they are not very numerous this year.

17th.—About half a dozen seen.

18th.—None.

20th.—Five weeks since the last useful rain.

September 5th.—Goldfinch singing. A diminution in numbers of Swallows and Martins.

11th.—Began shooting; harvest late.

12th.—Great congregation of Martins on roof lately and till to-day, but none noticed next day.

14th.—Flock of two hundred or three hundred Peewits on ploughing at Barford. No migratory Pipits yet. A good season for Hares.

15th.—A Blackbird sang a little. We have seen no Land-Rails this season, but shooting began late.

22nd.—News of Quail shot at Signet Hill on 17th.

23rd.—Some Pipits in roots for first time, scattered about everywhere, but nowhere in any numbers.

24th.—A few Martins on roof.

25th.—The greater part of the Martins and of Swallows have gone. Blackbirds have nearly all left the garden now, the fruit

(except apples) being gathered. Thrushes always leave earlier, and do little damage.

27th.—A Blackbird sang a little.

29th.—Lark singing.

30th.—No Swallows or Martins to be seen. Fine hot weather.

Less than an inch of rain this month, though it fell on nearly half the days of the month.

October 7th.—A pair of Martins. Bullfinches have been scarce this summer; none bred here this year.

12th.—Very fine warm season. Some Pipits in roots; seem to be on the move. Great many Song-Thrushes in roots and hedges, where they feed on elder-berries. I was standing at the end of a spinney (chiefly larch) on South Newington Hill, which the beaters were bringing along, when a Long-eared Owl flew out low down, with its beautiful long wings held straight out almost like a Shearwater's. Seeing me close by, it wheeled round and settled in a partly bare elder-bush. As it flew past me its "ears" were hardly noticeable, but directly it alighted it put them up. When staying at Rainworth with Mr. Whitaker early in the month I learned the hoot of this bird. It is a single cry; a rather long-drawn melancholy "who." They probably breed in the spinneys about South Newington Hill and Great Tew, but we have none about Bloxham.

13th.—Wren sang. Few migratory Pipits this year.

17th.—Blackbird sang a few notes. Fair lot of Pipits. The flocks of Mistle-Thrushes have gone. A friend of mine saw a Magpie carry a stick across a field and go to a nest in a tree at Milcomb. Very fine warm season. The song of the Wren is quite a feature of this autumn.

18th.—A great many Song-Thrushes and Blackbirds now about the hedges.

22nd.—A Woodcock at the gamedealer's.

29th.—A Brimstone Butterfly.

30th.—Song-Thrush singing, a poor song.

31st.—Small party of Redwings. Greenfinches now feed on cotoneaster-berries; eight in a bush by the dining-room window at one time.

A fine warm month; rain only amounted to about .90 in.; but very heavy mists and dews.

November 2nd.—Corn-Bunting singing. Very warm.

3rd.—One Fieldfare. Bramblings heard. Hedges blind and trees hardly changed at all yet.

5th.—Flock of about one hundred Fieldfares, and others about. The notes of the Brambling to be heard all round.

6th.—In an osier-bed at South Newington we got a Jack-Snipe, while a wasp's nest was in full blast in the hedge-bank. A curious mixture of seasons. In the high thorn-hedge four Moorhens were perching quite twelve feet up. There were no haws for them to be feeding on.

8th.—First white frost; weather summer-like up to now.

10th.—Severe white frost; down to 17°.

11th.—Mild again.

16th.—Song-Thrush singing.

17th.—Lots of buttercups flowering in grass-fields.

18th.—A Grey Wagtail on my lawn; a most unusual visitor to a walled-in garden, though often seen in the village brook not far away. I saw it frequently afterwards down to the 26th feeding about on the lawn and borders; a delightful visitor, but not welcomed by one of the garden Robins, which attacked it once. Wren sings well this month.

26th.—Pied Wagtail singing.

27th.—A few Redwings about, but no Fieldfares.

28th.—Corn-Bunting singing. Lots of daisies in flower.

29th.—Song-Thrushes are now in full voice, and sing well most of the day, but chiefly in morning. Little song until after the middle of the month.

A fine, warm, but damp month. Rain on more than half the days, but only a little over an inch altogether. Wind south-west.

December 2nd.—A few Fieldfares about again, single birds.

12th.—Nuthatch at Wroxton. One here this autumn.

14th.—Hedge-Sparrow sings now.

18th.—Mistle-Thrush singing. Fairly mild weather so far, but morning frosts.

21st.—Winter aconite blooming. *Climonantes* next day.

26th.—Colder weather. Big flocks of packed Larks. Many Bramblings among the mixed flocks of Finches, and a flock of about one hundred by themselves, chiefly, if not all, old males.

27th.—Snowed all day, and froze at night. Thrushes are silent, but Hedge-Sparrow still sings.

28th.—Hard frost until end of year, when thaw set in.

29th.—Snowed all day.

30th.—Maximum temp. 14°. Fieldfares flying over.

Mr. Fowler reported in the summer that a pair of Little Owls were established at Kingham, but this little bird, which is spreading all over the country, and is now common in Northamptonshire, has not yet reached this neighbourhood. I knew it and its curious notes well at one time.

Rain or snow fell on more than half the days of the month, but amounted to less than two inches. A remarkably damp, mild autumn.

THE GEOGRAPHICAL DISTRIBUTION OF THE LAND-
BIRDS OF THE BANDA ISLANDS.

BY J. R. McClymont.

(Continued from vol. xi. p. 351.)

SYLPHITRERON WALLACEI, G. R. Gray (Wallace's Pileated
Fruit Pigeon).

Ptilonopus wallacii, G. R. Gray, P. Z. S., 1858, pp. 185, 195,
pl. cxxxvi.

Sylphitreron wallacei, Sharpe, 'Hand-List, Genera and Species
of Birds,' vol. i. p. 59 (1899).

Aru Islands, Ké Islands, Timor Laut, Babar, Great Banda.

This Fruit Pigeon was first obtained in the Aru Islands in
1857 by Dr. Wallace, and was recorded as inhabiting Babar by
Dr. A. B. Meyer in 1884.* A male was obtained on Great Banda
by the late Mr. H. Kühn on Oct. 17th, 1898. "Iris red orange,
feet crimson-lake, bill sulphurous."

EURYSTOMUS AUSTRALIS, Swains. (Australian Roller).

Eurystomus orientalis, Vig. & Horsf., Trans. Linn. Soc. xv.
p. 202 (1826).

E. australis, Swains., An. in Menag. p. 326 (1827).

Celebes, Sula Islands, Buru, Amboyna, Great Banda, Ceram,
Matabello Islands, Lombok, Lesser Sunda Islands, Timor, Flores,
Aru Islands, Timor Laut, Ternate, Gilolo, New Guinea, North-
east, East, and South-east Australia, Lord Howe Island, New
Zealand.

One specimen (the sex of which is not stated) was obtained
by Mr. Kühn on Great Banda in September, 1898. The egg is
white and glossy, and average specimens measure from 1.31 in.
to 1.38 in. in length, and from 1.05 in. to 1.13 in. in breadth.

Food.—Insects.

* 'Ueber neue und ungenügend bekannte Vögel, Nester und Eier aus
dem ostindischen Archipel,' p. 50.

For the knowledge that this species or subspecies, and also all the species and subspecies which follow it, are Bandanese, I am indebted to a paper entitled "The Birds of the Banda Islands," by Dr. Hartert, published in 'Novitates Zoologicae,' vol. vii. pp. 551-554. Where permissible I have, in accordance with the usual practice in 'The Zoologist,' preferred binomial to trinomial nomenclature.

CUCULUS INTERMEDIUS, Vahl. (Oriental Cuckoo).

Cuculus intermedius, Vahl., Skriv. af Natur, Selsk. iv. p. 58 (1797).

Eastern Siberia, Japan, China, Formosa, India, Assam, Pegu, Andaman Islands, Nicobar Islands, Burma, Sumatra, Java, Celebes, Great Banda, Batchian, Morty, Flores, Timor, Dama* (Banda Islands), New Guinea, North and North-east Australia, New Britain, Pelew Islands, Luzon, Mindanao, Palawan.

Food.—Insects and fruit. The egg is known and has been described.†

EUDYNAMIS CYANOCEPHALA subsp. EVERETTI, Hart.

Eudynamis cyanocephala everetti, Hart., Nov. Zool. vii. p. 231.

Buru, Great Banda, Ké Islands, Timor, Alor, Sumba, ? New Guinea.

A small form of *E. cyanocephala* (the Koel), the food of which consists of insects and fruit.

ASTUR POLIONOTUS, Salvad. (Hoary-backed Goshawk).

Astur polionotus, Salvadori, Mem. Accad. Torino, xl. p. 19 (1889).

Timor Laut, Dama (Banda Sea), Great Banda.

MEGAPODIUS DUPERREYI, Less. & Garn. (Scrub Fowl).

Megapodius duperreyi, Less. & Garn., Bull. Sci. Nat. viii. p. 113 (1826).

Kangeang Archipelago, Lombok, Flores, Sumba, Romah, Wetter, Dama, Toukang, Besi Islands, Great Banda, Ké Islands, Aru Islands, Salawatti, New Guinea, North, North-east, and North-west Australia, Prince of Wales Island, Booby Islands, Cairncross Island, Scawfell Island (Great Barrier Reef).

* I follow Herr Riedel's mode of writing this name.

† Campbell, 'Nests and Eggs of Australian Birds,' p. 563.

This Megapode has been already recorded from the Banda Islands.* In Australia its food consists of insects, fruit, &c. (*Broadbent*); in the stomach of an example from Dobbo were fruits only (*C. Ribbe*). The egg varies in colour from reddish brown to pale buff or dull cream colour, and the long diameter of eggs of average size is 3·2 in. to 4·0 in., and the short diameter 2·05 in. to 2·2 in.†

OCHTHODROMUS GEOFFROYI, Wagl. (Greater Sand-Plover).

Charadrius geoffroyi, Wagler, Syst. Av. Charadrius, p. 61, No. 19 (1827).

South-eastern Europe, Africa to southern extremity, Madagascar, Rodriguez, Palestine, Syria, Arabia, Central Asia, India, Ceylon, Tenasserim, Cochin China, China, Japan, Formosa, Hainan, Andaman Islands, Nicobar Islands, Malay Peninsula, Sumatra, Java, Borneo, Flores, Solor, Babar Letti, Moloe, Buru, Amboyna, Banda Islands, Ceram, Batchian, Gilolo, Mysol, New Guinea, Negros, Panay, Leyte, Bohol, Palawan, Pelew Islands, Ualan, North-west, North, and North-east Australia.

The food of the Greater Sand-Plover consists of spawn, small insects, &c. (*Dresser*).

OCHTHODROMUS MONGOLUS, Pall. (Lesser Sand-Plover).

Charadrius mongolus, Pall., Reis. Russ. Reichs, iii. App. p. 700 (1776).

Eastern Asia (Kamchatka, Dauria, Mongolia, Corea, Japan, China, Hainan), Kurile Islands, Philippine Islands (Bohol), Celebes, Banda Islands, Gilolo, Morty, Aru Islands, Ruk, Admiralty Islands, Duke of York Island, Troughton Island, North and North-east Australia. Accidental on Choris Peninsula, Alaska.

Troughton Island is off the north-west coast of Australia. The Lesser Sand-Plover breeds in Eastern Siberia and on the Commander Islands, and in Ladakh. Ridgway describes the eggs as "pale dull olive, varying to buffy olive, rather sparsely and irregularly speckled with dark brown and black."‡ They measure about 1·43 in. by 1·05 in.

* 'Schlegel, Mus. Pays-Bas,' viii. p. 57 (1880).

† 'B. M. Cat. Birds' Eggs,' i. p. 17.

‡ Ridgway, 'Manual N. A. Birds,' p. 179 (1887).

NUMENIUS VARIEGATUS, Salvad. (Eastern Whimbrel).

Tantalus variegatus, Scopoli, Del. Flor. et Faun. Insubr. ii. p. 92 (1786).

Numenius variegatus, Salvadori, Orn. Pap. iii. 332 (1882).

Eastern Siberia, Burma, Tenasserim, Selangore, Singapore, Japan, Corea, South China, Formosa, Negros, Cebu, Luzon, Sula Islands, Borneo, Celebes, Sangir, Sido, Tukang-Besi Islands, Buru, Great Banda, Ceram, Tenimber Islands, Flores, Babar, Dama, Aru Islands, Ké Doulan, Gilolo, New Guinea, Mysol, Morty, Jobi, Admiralty Islands, Duke of York Island, New Britain, Pelew Islands, Matalotas Island, Uap, Lukunor, Ruk, Ponapé, Ualan, New Caledonia, Vanua, Levu, Australia, Lord Howe Island, Tasmania, New Zealand.

TOTANUS STAGNATILIS, Bechst. (Marsh Greenshank).

Totanus stagnatilis, Bechstein, Orn. Taschenb. ii. p. 292 (1803).

Northern, Central, and Southern Europe (accidental in Heligoland), Africa (south to Orange River), Asia Minor, Arabia, South Persia, North-west, North-east, and South India, Ceylon, Burma, Pegu, Tenasserim, Turkestan, Siberia, Dauria, Manchuria, Japan, China, Formosa, Malay Archipelago (Java, Great Banda), East and South-east Australia.

The egg has been described in several ornithological works.*

HETERACTITIS BREVIPES, Vieill. (Grey-rumped Sandpiper).

Totanus brevipes, Vieillot, Nouv. Dict. d'Hist. Nat. vi. p. 410 (1816).

Heteractitis brevipes, Stejn., Orn. Expl. Kamt. 137 (1885).

Eastern Siberia, Japan, China, Formosa, Liu-Kiu Islands, Cebu, Negros, Leyte, Bohol, Mindanao, Ladrone Islands (*G. R. Gray*), Borneo, Celebes, Tukang-Besi Islands, Banda Islands, Dama, Moloe, Batchian, New Guinea, Admiralty Islands, Duke of York Island, West Island (Torres Straits), Wednesday Island, North-east Australia.

TRINGOIDES HYPOLEUCUS, L. (Common Sandpiper).

Tringa hypoleucus, Linn., Syst. Nat. i. p. 250 (1766).

Europe (occurs in Corsica), Africa to southern extremity,

* Dresser, 'Manual of Palearctic Birds,' p. 788.

Madagascar, Mauritius, Socotra, Arabia, Palestine, Persia, Beloochistan, India, Ceylon, Kamchatka, Commander Islands, Mongolia, Manchuria, Corea, Japan, Tsushima, China, Formosa, Hainan, Luzon, Camiguin, Negros, Cebu, Bohol, Pelew Islands, Ladrone Islands, Lukunor, Assam, Andaman Islands, Nicobar Islands, Burma, Pegu, Siam, Malay Peninsula, Singapore, Sumatra, Java, Great Cocos Island, Celebes, Siao, Sangir, Tukang-Besi Islands, Buru, Amboyna, Banda Islands, Floris, Timor, Babar, Luang, Letti, Kisser, Aru Islands, Ké Doulan, Batchian, Morty, Mysol, Waigiou, New Guinea, Admiralty Islands, New Ireland, Duke of York Island, Australia, Tasmania.

The food of the Common Sandpiper consists of insects, Crustacea, &c. (*Gilbert*). A bird from Dobbo had small crabs in the stomach (*C. Ribbe*).* There is a description of its egg in Dresser's 'Manual of Palæarctic Birds,' p. 792. It nests in Northern and Central Europe and in Northern Asia.

TEREKIA CINEREA, Güld. (Terek Sandpiper).

Scolopax cinerea, Güldenst., Nov. Comm. Petrop. xix. p. 473, tab. 19 (1774).

Russia (accidental in Finland), Germany, Italy, Africa, Mauritius, India, Ceylon, Andaman Islands, Selangore, China, Siberia, Japan, Palawan, Negros, Bohol, Sumatra, Java, Celebes, Ceram, Great Banda, New Guinea, Australia.

The name of this bird is derived from the Terek, near the mouth of which, on the western shore of the Caspian Sea, it nests. It also nests in the valleys of the Volga and Ural, and north of the Dvina. The egg is described in Dresser's 'Manual of Palæarctic Birds,' p. 795. The food consists of worms, insects, &c. (*Dresser*).

GLOTTIS NEBULARIUS, Gunner. (Greenshank).

Scolopax nebularius, Gunner. Leem. Lapp. Beschr. p. 251 (1767).

Europe, Africa to southern extremity, Socotra, Arabia, India, Laccadive Islands, Ceylon, Cochin China, Siberia, Manchuria,

* A. B. Meyer in 'Zeitschrift für die gesammte Ornithologie,' 1884, p. 295.

Corea, Japan, China, Luzon, Burma, Pegu, Assam, Tenasserim, Malacca, Sumatra, Java, Borneo, Celebes, Great Banda, Goram, Babar, Dama, Aru Islands, Ké Islands, Ternate, Gilolo, Australia, Tasmania, New Zealand (*Buller*), accidental in eastern North America (Florida), ? (*Ridgway*).

The Greenshank feeds on mollusca, crustacea, &c. It nests in Northern Europe and Siberia; a description of the egg is in Dresser's 'Manual of Palæarctic Birds,' p. 786.

LIMONITES RUFICOLLIS, Pall. (Eastern Little Stint).

Trynnga ruficollis, Pall. Reis. Russ. Reichs, iii. p. 700 (1776).

North-eastern Siberia, Dauria, Bering Island, Commander Islands, Kurile Islands, Mongolia, Japan, Corea, China, Palawan, Negros, Bohol, Pelew Islands, Burma, Pegu, Tenasserim, Andaman Islands, Nicobar Islands, Selangore, Malacca, Singapore, Java, Borneo, Celebes, Sangir, Amboyna, Great Banda, Ceram, Gilolo, Morty, New Guinea, Aru Islands, Salawatti, Australia (occurs on Troughton Island and Rottnest Island), Tasmania, New Zealand (*Buller*).

The food of the Eastern Little Stint consists of marine insects and small mollusca.

ANCYLOCHILUS SUBARQUATUS, Güld. (Curlew-Sandpiper).

Scolopax subarquata, Gldenst., Nov. Comm. Petrop. xix. p. 471, tab. xviii. (1774).

Europe (occurs in Corsica), Greenland, occasional in eastern North America and in Alaska (*Ridgway*), Africa, Teneriffe, Madagascar, Rodriguez, Cyprus, Arabia, India, Ceylon, Diego Garcia, Siberia, China, Hainan, Burma, Andaman Islands, Pegu, Tenasserim, Selangore, Malacca, Singapore, Java, Great Banda, New Guinea, Australia (occurs on Houtman's Abrolhos and Rottnest Island), Tasmania, New Zealand (*Buller*).

The Curlew-Sandpiper nests in Northern Siberia and within the Arctic Circle in Greenland. The egg is described as pale greyish or greenish buffy spotted with deep brown, and with purplish-grey markings. The length is from 1.47 in. to 1.40 in., and the breadth from 1.02 in. to 1.0 in.

MOTACILLA MELANOPE, Pall. (Grey Wagtail).

Motacilla boarula, Linn., Mant. p. 527 (1771).

M. melanope, Pall., Reis. Russ. Reichs, iii. App. p. 696 (1776).

Europe (occurs in the Azores), Madeira, Egypt, Asia Minor, Arabia, Palestine, Persia, India, Ceylon, Assam, Tenasserim, Pegu, Siam, Penang, Malacca, Java, Borneo, Tukang-Besi Islands, Buru, Amboyna, Great Banda, Moa, Dama, Morty, China, Japan, Cebu.

The food of the Grey Wagtail consists chiefly of aquatic insects and larvæ. The egg is described in Dresser's 'Manual of Palæartic Birds,' p. 203.

[*Pitta vigorsi* has been obtained on Dammer or Dama in the Banda Sea (Nov. Zool. vii. p. 18). That it has occurred on Dammer or Dama is doubtful. *Edoliosoma dispar* and *Chalco-phaps chrysochlora* were obtained by M. Kühn at the Banda Islands (Nov. Zool. vii. pp. 552, 553).]

DESCRIPTION OF *FILARIA MAVIS*, N. SP., FROM
THE THRUSH.

BY ROBERT T. LEIPER, M.B., F.Z.S.,
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THE blood of birds, both in this country and in the Tropics, often swarms with minute larval nematodes. The parental forms that give rise to these young are seldom obtained without a very detailed examination of all the tissues of the host. Thus it happens that while the characters of the embryo are frequently quite well known, those of the adults escape investigation.

Several observers have reported a high percentage of Black-birds and Thrushes in Great Britain to be heavily infected with microfilaria, but none describe systematically the mature worms.

A short time ago I examined a couple of Thrushes in Inverness-shire; both showed numerous sheathless microfilariae in the blood. The adults were discovered, in a bursa in close association with the ankle-joint, when the skin of the leg was reflected over the metatarsus. The only other round worm found in these birds was a solitary *Spiroptera turdi* in the walls of the stomach. There were several filaria in each bursa. They had the appearance of short lengths of softened catgut, and were of two sizes, the males being only half as long as the female worms.

DESCRIPTION OF THE MALE WORM.

Total length 6 mm., greatest diameter 0·2 mm. This thickness is maintained uniformly over the middle 2 mm. of the body; from that region the worm tapers anteriorly to 0·16 mm. at the commencement of the chyle intestine, and abruptly to 0·05 mm. at the level of the nerve-ring within 0·1 mm. of the anterior end of the body. Posteriorly also the worm tapers gradually to 0·16 mm. at 1 mm. from the tip of the tail, which is bluntly pointed, the last 1 mm. being coiled to resemble a "note of interrogation." The skin is smooth and without spines in any region. The mouth is simple, there is no oral

vestibule, and if there be any circumoral papillæ they are too minute to observe. The œsophagus is a delicate tube of uniform thickness $\cdot 01$ mm., measuring $0\cdot 65$ mm. in length. Its wall shows faint transverse striæ due to muscular fibres. At $0\cdot 1$ mm. from the mouth the œsophagus is crossed by the nerve-ring. The chyle intestine, with a thickness almost double that of the œsophagus, passes along the remaining length of the body to open at the anus $0\cdot 05$ mm. from the tip of the tail.

The testicular tube shows many changes in diameter in its long wavy course from anal aperture to its free blind end at $0\cdot 45$ mm. from the anterior extremity of the body. Passing forwards from the cloaca it gradually dilates to attain a width of $0\cdot 1$ mm. at $0\cdot 85$ mm. therefrom. Suddenly constricting to $0\cdot 03$ mm., it proceeds forwards as a narrow tube for $0\cdot 4$ mm. A sharp kink occurs, and the tube soon widens to $0\cdot 05$ mm. This diameter is maintained for 3 mm. along a slightly tortuous course. The tube now almost imperceptibly narrows to $0\cdot 02$ mm., and remains of this thickness until within $0\cdot 45$ mm. of the mouth, where the testis then curves upon itself to end in a small round knob.

The spicules are two in number, and of almost equal size and shape. They are short and thick, with bent tips, and measure $0\cdot 09$ mm. The genital papillæ were represented by small cuticular knobs not at all easy to determine. One pair of such papillæ immediately in front of the anus and a second pair almost at the tip of the tail were seen. Immediately behind the anus there were indications of a third pair, but their existence is doubtful.

DESCRIPTION OF THE FEMALE WORM.

Total length about 12 mm., greatest breadth $0\cdot 3$ mm., both ends are bluntly pointed, the anterior tapering more gradually than the posterior. The truncate anterior extremity measures $0\cdot 05$ mm. in diameter; this increases at the nerve-ring to $0\cdot 1$ mm., and at the vaginal opening, $0\cdot 4$ mm. from the mouth, to $0\cdot 15$ mm. At $0\cdot 9$ mm. the body has a breadth of $0\cdot 2$ mm., and then slowly increases until the middle of the body, where the maximum diameter of $0\cdot 3$ mm. is attained. For 3 mm.—*i. e.* to the level of the junction of uterus with ovary—this thickness remains unchanged, but thereafter it decreases; at 1 mm. from the tail it

is 0.26 mm., at 0.5 mm. 0.22 mm., rapidly dwindling to 0.06 mm. at the anus.

The vulva opens at 0.4 mm. from the mouth. The vagina is exceedingly short, only 0.05 mm., and divides almost at once into two uteri that pass backwards for about 0.5 mm. Each tube then twists upon itself and proceeds with increasing diameter to attain a thickness of 0.1 mm. at about 2 mm. behind the mouth. The two uteri pass backwards side by side and in close contact for a distance of 4 mm. Thereafter they diverge slightly, the chyle intestine occupying the intervening space, but continue their course to within 3.5 mm. of the posterior end of the body, when they abruptly terminate, within half a millimetre of each other, in fine ovarian tubules that occupy the succeeding millimetre with their numerous coils. The remaining two and a half millimetres of the body is traversed by the chyle intestine alone.

The alimentary canal closely resembles that of the male, the oesophagus is crossed by the nerve-ring at 0.13 mm., and terminates in the chyle intestine at 0.75 mm. from the mouth. The anus opens at 0.1 mm. from the posterior extremity.

NOMENCLATURE.

The adult filaria that have been found hitherto in members of the genus *Turdus* and in allied forms have been provisionally identified as *Filaria abbreviata*, Rud., apparently without investigation of their minute structure.

The specimens described in this paper cannot belong to this species, for there are characteristically present in *Filaria abbreviata* deciduous spines on the cuticle, an infundibuliform pharynx armed with teeth, and the spicules are dissimilar both in size and design.

Filaria turdi, v. Linstow, is apparently the same, or a closely allied species of *Spiroptera* as occurred beneath the mucosa of the stomach in one of our birds. *Filaria turdi olivascentis*, Molin, and *Filaria turdi atrogularis*, v. Linstow, are unacceptable names according to modern rules of nomenclature, although the latter species appears from its too brief description to approach somewhat closely to the parasite now described. Under these circumstances it is obvious that our *Filaria* of *Turdus musicus* must be recorded as a nomenclaturally new species, *Filaria mavis*, mihi.

ON THE HYMENOPTEROUS PARASITES OF
RHYNCHOTA.

BY CLAUDE MORLEY, F.E.S., F.Z.S.

(Continued from p. 314.)

73. *Melanoxanthus salicis*, Linn.

McLachlan found this species to be annually abundantly attacked by *Aphidius gregarius*, Marsh.; he says, "I saw a mass of many thousands, each of which I believe to have been stung," on a willow-twig, at Kentish Town, in September (quoted by Buckton, ii. 23); Marshall raised the same species from this host in Devonshire, where also its hyperparasite, *Lygocerus carpenteri*, has been bred. On the Continent its place appears to be taken by *Aphidius proteus*, Wesm., and *A. obsoletus*, Wesm., both of which Brischke bred in Prussia (Schr. Nat. Ges. Danz. 1882, p. 182). Haliday says of his exclusively British *Trioxys letifer*, "Prodiit mihi ex Aphidibus Salicis ulmi-foliae, Junio mense," and Gaulle (Cat. 87) records *T. heraclei*, Hal., from *Aphis salicis*. *Praon abjectum*, Hal., is said by Giraud (Ann. Soc. Fr. 1877, p. 415) to have been bred from an aphid on *Salix*, and from others similarly designated Gaulle (Cat. 27) mentions *Allotria victrix*, Westw., and *A. tricolor*, Kief., which may be nothing but Cameron's *Phæoglyphis salicis*, raised by the latter from black Aphids concealed in galls of the Nematid, *Cryptocampus medularius*, Htg. (= *Euura pentandræ*, Thoms. et Cam.) on *Salix pentandræ* in Clydesdale. Perhaps *Lygocerus castaneus*, Kief., is hyperparasitic on this Aphid (cf. Gaulle, Cat. 113).

74. *Siphocoryne pastinacæ*, Linn.

Curtis says (Farm. Ins. 74) that the Cabbage Aphid is preyed upon by "the *Trionyx rapæ* and *Cynips fulviceps*, and the same or a closely allied species infests the carrot aphides at an earlier period." Possibly Kieffer's new *Allotria brevicornis*, said to have

been bred from an Aphid on *Bupleurum* (the present species occurs on the allied *Apium graveolens*), is synonymous with the latter, as may also be said of *A. mullensis*, Cam., bred from Aphids on *B. falcatum* (Gaulle, Cat. 26). *Aphidius dauci*, Marsh., has been bred from the present species by Bignell and Marshall in Devonshire on Sept. 30th, 1886, and July 10th, 1888 (Marsh. Br. d'Europ. ii. 602), and it is perhaps the larva of this direct parasite, which Buckton figures (Mon. Aph. ii. pl. xliii.), lying subcutaneously in a curved position within the abdomen of an apterous female of *S. pastinacæ*. *Aphidius exiguus*, Hal., *Allotria minuta*, Htg., *A. pusillima*, Gir., *Encyrtus atheas*, Walk., and *Agonioneurus daucicola*, Först. (? MS.), were raised by Giraud (Ann. Soc. Fr. 1877, pp. 415-6) from Aphids, most probably of this species, on *Eryngium campestre* and *Conium maculatum*. *Allotria perpusilla*, Kief., is recorded from an Aphid on *Conium*.

75. *Siphocoryne xylostei*, Schr.

Aphidius avenæ, Hal., and *A. loniceræ*, Marsh., were both bred from this too common species in Devon by Bignell, who also raised the former's hyperparasite, *Allotria cursor*; but *A. loniceræ* would appear to be rare, since but eight females and two males were obtained on July 16th, 1884. Bignell also there raised *Praon longicorne*, Marsh. (Trans. Devon. Ass. 1901, p. 688). *Lygocerus carpenteri*, Curt., is also somewhat vaguely given as attacking this species by Gaulle and Dalla Torre.

76. *Siphocoryne fœniculi*, Pass.

In Devonshire, Marshall bred six specimens of his *Aphidius brassicæ*, comprising both sexes, and Bignell a single male on July 2nd, 1884, from this species; and Cameron (Phyt. Hym. iii. 233) records *Allotria circumscripta* from Aphids on fennel.

77. *Siphocoryne caprææ*, Fabr.

The only direct record we have from this species is that of Bignell (Trans. Devon. Ass. 1901, p. 688 et Br. d'Europ. ii. 594), who bred *Aphidius cardui*, Marsh., very commonly in Devonshire. Possibly some of the species under *Melanoxanthus* (*supra*) and the genus *Aphis* (*infra*) belong here; but none are sufficiently explicit.

78. APHIS.†

A good many parasites have at various times been bred from members of this genus—sometimes, doubtless, *sensu lato*—which have not been recognized, and often with no record even of their food-plant. From an *Aphis* on *Lapsana communis*, upon which at least five Aphids are known to live, Marshall bred “a fine set” of *Aphidius crepidis*, Hal. (Br. d’Europ. ii. 582). From an *Aphis* on *Galium verum* Bignell bred two *A. cirsi*, Hal.; from an *Aphis* on a foreign shrub he also bred nine male and female *Aphidius hortensis*, Marsh.; and from an *Aphis* feeding on several species of willow he bred, in July and August, *Aphidius salicis*, Hal., of which the latter tells us (Ent. Mag. 1835, p. 102) the majority are destroyed by the hyperparasitic *Allotria fulviceps*

† Many Fossores are known to provision their nests with *Aphididæ*:—*Pseculus pallidipes* preys upon species of both *Aphis*, as mentioned by Curtis, who saw the former storing them in straws of thatch, and nymphs of *Psylla*, as given by Giraud (Ann. Soc. Fr. 1877, p. 470); *Pemphredon unicolor*, as indicated by Curtis, Shuckard (Trans. Ent. Soc. 1836, p. 57), and Giraud (Verh. z.-b. Ges. 1863), and *P. lugubris*, as noted by Latreille, Kennedy (Philosoph. Mag. 1838, p. 17), and Shuckard (Foss. Hym. 197), prey upon *Hyalopterus pruni* and various species of the genus *Aphis*; the last also stores up *Melanoxanthus salicis*; *Stigmus pendulus* preys upon *Myzus cerasi*, another unspecified species of *Aphis*, and I have seen it in Ipswich carrying off *Aphis hieracii* from the stems of *Heracleum sphondylium* on July 28th and 29th, 1901. Gaulle says the species of *Diodontus* are “parasites de Pucerons,” and Curtis found them storing living Aphids in their nests in straws of thatch. *Passalæcus gracilis* and *P. corniger* gather species of *Aphis*, and the latter was captured among them on currant-bushes in Battersea Fields by Shuckard (Foss. Hym. 192). *Nitela spinolæ* attacks *Aphis picridis* and another species of the same genus, and *Crabro aphidum* and *C. panzeri* allied species. Buckton considers it probable that Fossors paralyse their Aphid prey by stinging them before carrying them off, but this is not the case, since I have seen *Diodontus tristis* seize and fly off with *Siphonophora millefolii* without bringing its sting near it (*cf.* Entom. 1908, p. 210). Suspended animation may, however, be produced by stinging after reaching the nest. Each kind of Fossor is thought by Buckton to store a single species of Aphid. Giraud (Ann. Soc. Fr. 1866, pp. 443-500) states that the genus *Celia* appears to confine the food of its progeny to Coccids, while *Pemphredon*, *Cemonus*, *Diodontus*, *Passalæcus*, and *Stigmus* prey upon Aphids.

The intercourse of Ants with Aphids is, I believe invariably, of a friendly nature, and in no way enters the subject of this paper; the latest note on the subject (Ent. Rec. 1908, p. 281) is very typical.

and another species of the same genus. From Aphides on *Pyrethrum parthenium*, *Engelmannia pinnatifida*, and *Echinops bannaticus*, Giraud bred *Aphidius exiguus*, Hal. (Ann. Soc. Fr. 1877, p. 415), and adds (*l. c.* 419, 421) that the Chalcids, *Agonioneurus flavicrus*, Gir., and *Encyrtus atheas*, Walk., also emerged from the Aphids on the last-named plant. *Misaphidus* (= ? *Praon*) *crudelis*, Rondani, has been bred by him from *Aphis* sp. in Italy. Buckton gives no Aphids at all as feeding on any *Plantagineæ*, but Kirchner says (Cat. 31) of *Allotria heterocerus*, Htg., "Später aus *Aphis plantaginis*." From "*Aphis* on *Chrysanthemum*, *Populus*, and *Salix*" has been bred *Allotria pusilla*, Kief.; from "*Aphis* on *Ægopodium*, *Alisma*, and *Platanus*" has been bred *Allotria relicticornis*, Kief., according to Gaulle (Cat.); and from *Aphis* on *Carthamus tinctorius*, Giraud records (Ann. Soc. Fr. 1877, pp. 415, 421) *Allotria flavicornis* Htg., and *Encyrtus atheas*, Walk. This last Chalcid is also given by Giraud as preying upon an *Aphis* on *Scorzonera*, and, together with another, *Agonioneurus daucicola*, Först. (? MS.), upon an *Aphis* on *Silva aurifolius* (*l. c.* 419-421). *Chrysolampus æneicornis* and *Tridynus rosulorum* are recorded from *Aphis* spp. by Ratzeburg, and his *Lygocerus antennalis*, *L. aphidivorus*, *L. campestris*, and *L. Giraudi* by Kieffer. Giraud bred *Isocrates vulgaris*, Walk. (Ann. Soc. Fr. 1877, p. 427) from *Aphis* on *Gypsophilus* and *Pinus*, and *Cerocephala cornigera*, Westw. (*l. c.* 422) from "Aphides diverses."

79. *Aphis brassicæ*, Linn.

Curtis tells us (Farm. Ins. 74) that during the end of July and beginning of August, 1848, scarcely a female of this species out of the swarms under his cabbage-leaves escaped the attacks of his *Trionyx* (*Aphidius*) *rapæ* and his *Cynips fulviceps*; he adds that Jurine figures another species, *C. erythrocephalus*, with the same habits. Buckton (Mon. Aph. ii. 35) says that often nine-tenths of a colony of this aphid is destroyed by *Trionyx rapæ*—which he bred from it and professes to sketch (*l. c.* ii. pl. xlvi. fig. 7)—and that others are attacked by species of *Ceraphron* and *Coruna*. *T. rapæ*, which is referred to the genus *Aphidius* by Curtis (MacIntosh's 'Book of the Garden,' ii. 194), is synonymised by Marshall with his own *Aphidius brassicæ*, several of which were bred by Bignell in Devon from this host on Aug. 4th, 1885; and

by Marshall from probably the same Aphid on *Raphanus maritimus* (Br. d'Europ. ii. 598), from which also he raised a single female of his *Aphidius matricariæ* (l. c. 592). Gaulle adds that *A. medicaginis*, Marsh., has been bred from an *Aphis* on *Raphanus*, and Giraud (Ann. Soc. Fr. 1877, pp. 415 et 434) bred *Megaspilus aphidum*, Gir., and *Allotria circumscripta*, Htg., from Aphids on the same genus of plants. *Allotriæ* are not very satisfactorily bred from this species, which we must suppose to have been that on *Sinapis*, from which Kieffer records *A. victrix*, Westw., and his own new *A. curvata* and *foveigera*, as well as that upon *Barbarea*, from which he records *A. pusilla*, Kief.; *Aphis chenopodii*, Schr., from which Kirchner (Cat. 31) says he raised *Allotria testacea*, Htg., is probably synonymous. From America we only have the new descriptions of *Encyrtus aphidiphagus* and *Pachyneuron aphidivora*, Ash. (Bull. Ent. U. S. Dept. Agric. 1887, p. 14); and the record of *Aphelinus mali*, Hald. (Howard, Revis. Aphel. N. Amer. 24), as bred from the Cabbage Aphis.†

80. *Aphis cratægaria*, Walk.

From this species in South Devon, Bignell has bred the very common direct parasite, *Aphidius avenæ*, Hal., together with its hyperparasite, *Allotria cursor* (Marsh. Br. d'Europ. ii. 574).

81. *Aphis mali*, Fabr.

The only mention of this species I find is in Gaulle's Catalogue, where it is said (p. 86) that *Ephedrus plagiator*, Nees (= *parvicornis*, Nees) preys upon it.

† I believe no *Ichneumonidæ* to be truly parasitic upon Rhynchota. The only records of which I am aware are in the case of (1) *Aphis brassicæ*, from which Cresson says (Trans. Amer. Ent. Soc. 1872, p. 173) that Webster bred the former's Ophionid *Limnerium rivalis*, as well as (Proc. Ent. Soc. Philad. 1864, p. 259) his *L. (Mesoleptus) tibiator*, which preys, according to Riley, upon Lepidoptera; and (2) *Tolype vellida*, from which Dalla Torre (Cat. iii. 563) erroneously says Wesmael bred the still ambiguous *Ichneumon bellus*, Grav. (cf. Morl. Ichn. Brit. ii. 4). Members of the Tryphonid genus *Bassus* are frequently seen among Aphids, but they are certainly invariably in search of aphidiphagous Syrphid larvæ, upon which they oviposit (cf. Westw. Introd. ii. 140, fig. 1 et Entom. 1908, p. 234). Many *Ichneumonidæ* are, however, attracted by the honeydew exuded by Aphids (cf. Morl. Ichn. Brit. ii. 344 et iii. 321).

82. *Aphis urticaria*, Kalt

A new species of *Allotria*, *A. urticarum*, is described by Kieffer (André, Spp. Hym. Eur.) from this *Aphis*.

83. *Aphis pyraria*, Pass.

Bignell tells us (Trans. Devon. Ass. 1901, p. 689) that he has bred *Monoctonus caricis*, Hal., from this species in South Devonshire, on June 10th, 1884.

84. *Aphis scabiosæ*, Kalt.

All that is known of the parasites of this species is contained in the second volume of Marshall's Bracon. d'Europe. He describes (p. 597) a new species, *Aphidius scabiosæ*, twenty-nine individuals of which were bred by Bignell in Devon from this host in the middle of June, 1884. *Aphidius avenæ* (p. 574) and *A. ervi*, with the latter's hyperparasite, *Isocrates æneus*, Nees (p. 576), were also bred by Bignell in Devon commonly. Rondani is said (p. 615) to have bred in Italy his *Misaphidus* (= ? *Praon*) *aphidiperdus* from *Aphis chloris*, Koch, probably synonymous with the present species, on *Hypericum perforatum*.

85. *Aphis tanacetina*, Walk.

Three individuals of *Aphidius cirsii*, Hal., were bred in July, and three females of *A. chrisanthemi*, Marsh., were bred on the remarkably early date of Jan. 9th, 1884, in Devonshire by Bignell (Trans. Devon. Ass. 1901, p. 690).

86. *Aphis pruni*, De G.

Praon volucre, Hal., with its hyperparasites, *Allotria ullrichi*, Gir., and *Isocrates vulgaris*, Walk., have been bred hence by Bignell in Devon, and Gaulle (Cat. 87) mentions *Aphidius rosæ*, Hal., from it. *Aphidius proteus*, Wesm., with *Allotria victrix*, Westw., are brought forward by Brischke (Schr. Nat. Ges. Danz. 1882, pp. 124 et 182), "aus der Schlehenblattlaus erzogen"; and Buckton says (Mon. Aph. ii. 150 et errata) that Guérin's "black *Cynips* with a red head and rufous legs," probably *Allotria victrix*, . . . "is parasitic on one of the plum *Aphides*." From an "*Aphis* on *Prunus*," Giraud (Ann. Soc. Fr. 1877, p. 415), gives *Alloxysta erythrothorax*, Htg., and Kirchner (Cat. 31) says of the same parasite, "Aus der Schwarzen Pflaumenblattlaus."

87. *Aphis hieracii*, Kalt.

In Devonshire, Bignell has bred *Praon abjectum*, Hal., but Haliday himself (Ent. Mag. 1833, p. 491) says of his *Trioxys heraclei*, which alone he bred from the Aphids of *Heracleum sphondylium*, "Habitat in Aphidibus Heraclei Sphondylii florentis Julio mense vulgatissimus, posthâc vix obvius." It is surprising more parasites have not been bred from so ubiquitous a host.

88. *Aphis epilobii*, Kat.

Praon abjectum, Hal., has also been bred in Devon by Bignell from this species on Sept. 24th, 1883 (Trans. Devon. Ass. 1901, p. 688), and Gaulle (Cat. 26) tells us that *Allotria brevitarsis*, Thoms., also preys on an *Aphis* sur *Epilobium*.

89. *Aphis euonymi*, Fabr.

I have been unable to clear up the mystery attaching to Dalla Torre's record of *Miscogaster nitidus*, Walk., from "Britannia" only, and yet bred by Rondani from this host; it is certainly not mentioned thence by Walker (Ent. Mag. 1833, p. 459 et Mon. Chal. 280).

90. *Aphis lychnidis*, Linn.

Bignell bred *Aphidius lychnidis*, Marsh., from this species on April 29th, 1883, in Devonshire (Marsh. Bracon. d'Europ. ii. 607).

91. *Aphis ilicis*, Kalt.

Probably this was the "*Aphis* on holly" from which Bignell (Trans. Devon. Ass. 1901, p. 690) raised *Aphidius matricariæ*, Marsh., on June 19th, in Devonshire; it is not recorded as British, though thought by Buckton and Walker to be probably synonymous with our abundant *Aphis hederæ*, from which no parasites are recorded.

92. *Aphis jacobæ*, Schr.

Marshall tells us (Bracon. d'Europ. ii. 594) that *Aphidius cardui* has been commonly bred from *Aphis jacobæ* in England.

93. *Aphis rumicis*, Linn.

This polyphagous Homopteron has been noticed to be somewhat extensively preyed upon by Hymenoptera, and it would be of great economic importance if some permanent natural enemy could be established. So far from that, we at present have but

four direct parasites, two of which must be considered doubtfully ascribed to this host, and two secondary (and consequently injurious) parasites. Marshall bred both sexes of his *Aphidius fabarum* from it in England (Bracon. d'Europ. ii. 600); Gaulle (Cat. 87) gives *Trioxys heraclei*, Hal., as preying upon it. It can hardly be considered proved that Haliday's *T. angelicæ* destroys it, since he says simply, "Hab. inter Aphidis Angelicæ sylvestris autumnoparum frequens" (Ent. Mag. 1833, p. 490); and his *Praon abjectum* is no more reliable with "Hab. inter Aphides Angelicæ sylvestris autumnopassim" (l. c. 485). I simply place these here because the common *Aphis* of *Angelica*—a plant not mentioned by Buckton—seems to me hardly distinct from *A. rumicis*. However that may be, I consider it comparatively certain that some species of *Praon* attacks *A. rumicis*, since Buckton states (Mon. Aph. ii. 155) that he has bred *Coryna clavata* from "its silken tent" beneath the dried larval skin of this species; it is extremely improbable that this Chalcid constructs a cocoon of its own, and *Praon* is the only genus of direct parasites known to do so outside the host's body. Buckton further gives a capital account (l. c. 85, pl. lxiv.) of his Chalcid, *Pachycrepis (Coryna) dubia*, which he (probably erroneously) considered a direct parasite, and he states that it is sometimes destroyed by a much smaller parasite—(?) of the third degree—several of which find sustenance in the former's body and pupate within the external cocoon, which is said (l. c. 156) to resemble a tilting casque, beneath the body of the either winged or apterous aphid.

94. *Aphis atriplicis*, Linn.

I have found this species abundantly upon *Aster tripolium* in the salt-marshes at Southwold, in Suffolk. Haliday records his still exclusively British *Aphidius asteris* (Ent. Mag. 1835, p. 101), "Habitat in Aphidibus Asteris Tripolii copiose." Gaulle says (Cat. 106) that the Chalcid, *Aphelinus tibialis*, Nees, has been bred from the probably synonymous *Aphis chenopodii*.

(To be continued.)

NOTES AND QUERIES.

MAMMALIA.

Mammals of the Isle of Wight: a Correction.—In Mr. Morey's 'Guide to the Natural History of the Isle of Wight,' recently reviewed in 'The Zoologist,' I am responsible for the mammals, &c., in the list. Since the book was published Mr. R. Lydekker has written to me to say that he made a mistake in identifying a cetacean as the White-sided Dolphin (p. 539), which he now finds is a Porpoise.—PERCY WADHAM (Newport, Isle of Wight).

AVES.

The Unfortunate Swifts.—In a previous short note (*ante*, p. 196), I called attention to the early appearance of those summer-loving birds in this part of Hampshire, but I fear the cold of June and July was very adverse to their well-being and general increase. Only once—about the beginning of June—did I hear their excited screams, or see their sweeping flight near the eaves of the old thatched cottages where they usually nest, or hear their peculiar evening song as they joyously gambol high in air, as if bidding the sun a last good-night. On the contrary, more than one evening they were observed hanging in clusters from several buildings, as is sometimes their wont, in cold weather, and I do not recollect any previous occasion when I have seen or heard of so many Swifts being found dead, and most, if not all, in a starved condition; one morning a friend of mine picked up fourteen birds beneath the church-tower. By the end of July all seem to have disappeared, except a few stragglers from more northern localities on their way south. Was a similar mortality observed in other localities, as the distribution of heat and cold seems to have been very uncertain even within the compass of our own comparatively small island?—G. B. CORBIN (Ringwood, Hants).

The Common Buzzard in East Sussex.—A Common Buzzard (*Buteo vulgaris*) was shot in the Battle neighbourhood, in Sussex, on June 8th; the bird was not, however, recovered till the 26th, when it was in too bad a condition for the purpose of preservation. The wing however, was sent to me for identification. I cannot help feeling

sorry that it has met with an untimely end, as the deep woods at Ashburnham and around Battle seem as if they might be a resting place for this now fast-vanishing species.—THOMAS PARKIN.

Note on an Eagle in North Wales.—On July 2nd I had the unusual pleasure of seeing an Eagle on the hills near Harlech, North Wales. As it came sailing along a ridge some three-quarters of a mile off, I at first took it for a Buzzard (not an uncommon bird thereabouts); while watching it, however, one of the latter species appeared following, and made a stoop at it. The Buzzard then came on quite near me, and soared to an immense height, finally disappearing, while the Eagle kept along the ridge, and was still too far off to be identified for certain. Soon after I heard a tremendous croaking, and saw a pair of Ravens attacking it; I then observed it was about twice the size (across wings) of its assailants, and its wing-flap and note were quite unlike a Buzzard's. (I regret I could get no idea as to which species it was, unless the note, sounded like "kyu," very shrill and sharply uttered, can identify it. I did not notice any white about it, but the bird was too far off to be sure of this.) The Ravens never ceased stooping at it, even when settled, until they had driven it off some half-mile along the ridge, when they returned with redoubled croaks to the spot where I suppose they had carrion, for the Eagle at once turned and followed them back. They drove it off in this way no fewer than six times, and its immediately following them back seemed most remarkable; it never retaliated, only once or twice turning up on one side in the air as if in defence. Sometimes when it settled only one Raven stayed on guard, as it were, but as soon as it rose again both went for it. All three birds kept up an incessant noise. I was watching them more than half an hour, when, on trying to get nearer, the Ravens disappeared; the Eagle settled near by, but on my moving again it also made off.--H. G. ATLEE (Wimbledon).

Early Appearances of Sea-Birds in and round London.—On July 31st I saw a Cormorant fly over the road between Hampton and Sunbury; it passed over at no great height (probably from the reservoirs). A few minutes after it again appeared, and flew round for some minutes, finally going off to the northward. On Aug. 1st a Black-headed Gull paid a short visit to Penn Ponds, Richmond Park, and on the 6th I saw four at Kew. On the 10th there was a party of at least twenty Blackheads on the river between Vauxhall and Lambeth Bridges, and on the 10th I saw at the same spot a Lesser Black-backed and a Herring-Gull flying up the river together (the former

seems rare in London in mature plumage; at least I never could see one during all the hard weather last winter).—H. G. ATLEE (Wimbledon).

Cormorant in Warwickshire.—I wonder if it is possible for Mr. O. V. Aplin to re-examine the Cormorant sent to him for identification, and which was killed on Sept. 8th, 1908.* From the length (32 in.) and weight ($3\frac{1}{2}$ lb.), I am somewhat certain the bird was not a Common Cormorant (*P. carbo*), but a Green Cormorant (*P. graculus*). My reasons for this conclusion are that the average weight of adult Green Cormorants varies between 3 lb. 8 oz. and 5 lb. 2 oz., the weights of immature Green Cormorants from 3 lb. 3 oz. to 4 lb. 10 oz. The average length of both adults and immatures seems to be from 28 in. to 30 in. In the Common Cormorant the weights run from 8 lb. to 9 lb., and average length from 38 in. to 40 in. The above weights and measurements are taken from a series of both species in my collection, all of which were weighed and measured by me. The wing-measurement in the example under notice would go far towards a satisfactory identification.—F. SMALLEY.

The Bean Goose on the Solway. — We are sorry we were not able to reply earlier to Mr. H. W. Robinson's remarks (*ante*, p. 270) on the records of Bean Geese and the note mentioning the nesting of Wigeon at Bassenthwaite in April, 1908, as recorded in the Natural History Bureau of the Carlisle Museum, for we were from home during the intervening time. When we state in these records that a species has been seen we are quite sure that the person making the record is perfectly competent to identify the species, and that there is no doubt as to the correct identification. Our opening note in the records for 1908 points out that we do not accept such notes unless we know that the person sending them is competent to identify the species recorded. Mr. Nichol is not only a wildfowler of thirty years' experience, but is a keen and observant ornithologist whose knowledge of the birds of the Solway is unequalled by anyone in the district, and whose word was never questioned by such an eminent ornithologist as the late H. A. Macpherson. We quite agree that it is difficult for an inexperienced person to distinguish between the calls of the various kinds of Geese, but Mr. Nichol's life-long and daily intercourse with the wild life of the Solway enables him to identify immediately any of the birds which ordinarily visit the firth, and even our own more limited experience would not allow us to confound the call of the Grey Lag with that of either the Bean or Pink-foot. Of course we are

* *Cf. ante*, p. 315.

speaking of birds at a reasonable distance; Geese flying in "skein" or "gaggle" at a distance of half a mile or upwards could scarcely be determined, and would not be noted unless the occurrence was exceptional. The Pink-foot, Bean, and Grey Lag Geese are all common in season on the Solway marshes, and although the Pink-foot is undoubtedly the commonest of the three, it does not appear to frequent the lower marshes as much as the Bean, and on the upper marshes the combined numbers of Bean and Grey Lag run it pretty close. During the last two winters the game and poultry shops of Carlisle contained quite as many of the two latter species as of *brachyrhynchus*, a good criterion of the comparative rarity or otherwise of wildfowl. Perhaps we on the Solway have better opportunities of observing the various species of Geese than is afforded to Mr. Robinson, and it may surprise him to hear that at times the Wild Geese on one particular marsh can only be estimated in thousands, and it is possible frequently to hear the calls of the three species mentioned at one time, and with the aid of a glass to distinctly make out the different species. There is never the least difficulty with the Grey Lag in flock, as the blue shoulder of the adult is most conspicuous, and the longer beak and generally darker coloration of the Bean is almost quite as unmistakable to the experienced observer; moreover, it is probably as easy for Mr. Nichol to identify these species at a distance of from two to four hundred yards as it is for some people to do in the hand, even if they know certain characteristics. We are quite sure that when Mr. Nichol says Bean Geese, he has been able to distinctly identify them as "Bean" and not "Pink-foot," and Mr. Robinson may be assured that they were that species. We need not reply to the query as to correct identification of Grey Lag on Dec. 7th: the date is not exceptional.

With regard to Mr. Robinson's further letter respecting the breeding of Wigeon at Bassenthwaite in April, 1908, we hardly see the point of his criticism. Has it escaped him that this is another note by Mr. W. J. Farrer, and is neither the first or second record to this Bureau of such occurrence, but simply a record of the fact that a Wigeon was nesting there at that time? Mr. Farrer clearly established his identification as correct in the first instance in 1903, as Mr. Robinson's quotation shows: "I found the female bird sitting on ten eggs"; his later records therefore cannot be doubted. The particulars of a pinioned Wigeon breeding in North Lancashire may be interesting, but has no bearing upon the Bassenthwaite case. Several pairs of Wigeon breed on an estate in North Cumberland, but they

were introduced, though now in a feral state. Neither is there any parallel between the Bassenthwaite case and the case of mistaken identification of Shoveler's eggs at Belfast. It may in some instances be difficult to distinguish between the eggs of various ducks; there is of course more or less variation in the eggs of all birds, but it is again largely a matter of experience, and Shoveler's eggs are usually distinct from those of Wigeon, without the evidence of down or feathers. The Shoveler breeds regularly in the Solway district.—LINNÆUS E. HOPE & D. LOSH THORPE, The Museum, Carlisle.

Birdsnesting in August.—It is three years ago since I sent my last notes under this heading to 'The Zoologist.' This year I was again in the same village in Cambridgeshire for the August Bank Holiday. On Saturday, July 31st, I walked from the station to the village through a narrow belt of trees alongside the road. Here I found a nest of Spotted Flycatcher with half-fledged young on a dead fir-bough close up to the trunk. A little further on was a nest of Song-Thrush in the hedgerow with nearly fledged young. Next I came across a Wren's nest about four feet from the ground in a bush beside a pine tree, and, feeling something soft moving inside, I opened up the hole, and found it to contain a litter of young Shrews, apparently the common species (*Sorex vulgaris*). There were four or five of them, more than half-grown. I believe the Shrews generally build on or under the ground—at all events, this is the first family I have ever found in a bird's nest. Then a Wood-Pigeon went from its nest in a beech tree, and a few yards further on I found a Turtle-Dove sitting on two eggs. Alongside the road I found a Linnet with three fresh eggs in a hawthorn bush. On Aug. 1st I followed a dyke or drain for about a mile and a half through the cornfields. Put a Common Bunting (*E. miliaria*) from its nest of four nearly fresh eggs amongst the long grass on the edge of the dyke. In the hawthorn bushes along its course put a Wood-Pigeon off a newly-made empty nest, and found another sitting on two eggs. Both these nests were very substantial structures, fully six inches in depth, and looking more like Crows' than Pigeons' nests. Saw a party of young Hedge-Sparrows and another of young Whitethroats fluttering amongst the thick herbage, having evidently only just left their nests. Found a Linnet with two fresh eggs, a Turtle-Dove with two deserted eggs, each having a hole pecked in it, and another nest of the same species with two fresh eggs. The heavy rain at midday put a stop to any further search that day. On Aug. 2nd I examined some pollard-willows, and found three nests of Tree-Sparrow, each with five eggs,

one set fresh another partly incubated, and the third with the young hatching. Several nests of House-Sparrow in a stall alongside contained fresh eggs and young birds respectively, and in the hedgerow adjoining was a Song-Thrush with young. On a straw-stack in an adjacent field, I was told, a French Partridge had nested, but its nest had been disturbed a fortnight previously when some of the straw had been taken away for thatching the hayricks. I counted sixteen eggs scattered about under the stack in a half-rotten condition in various stages of incubation. Along the roadside I found the Linnet's nest which had three eggs on Saturday now contained five, and found two more nests with five eggs and one egg respectively, all fresh; also a Yellowhammer with two and another with four eggs. By the side of a ditch I found a Common Whitethroat with three eggs apparently hard-sat, and not many yards away was a young Cuckoo almost fully fledged in the nest of a Hedge-Sparrow. This is the latest date at which I have ever found a young Cuckoo in the nest, although I have found a new-laid egg of the Cuckoo in a Whitethroat's nest in the first week in July. On the morning of Aug. 3rd I found two nests of Turtle-Dove with one and two fresh eggs respectively, a nest of Hedge-Sparrow with four eggs all sucked, whilst a few yards further on was another new nest with one fresh egg, two nests of Linnet with four and two eggs respectively, and four nests of Yellowhammer with one, four, two, and three eggs respectively. In the afternoon I returned to town.—ROBERT H. READ (Bedford Park, W.).

A Correction.—In the note appended to the record of the White Chaffinch (*ante*, p. 315) the word "eggs" was unfortunately omitted. It should read: "Mr. Dresser, in his 'Man. Pal. Birds,' says of the *eggs* of this bird, 'occasional varieties,' &c."—ED.

REPTILIA.

The Smooth Snake (*Coluber lævis*).—It is interesting to know that this somewhat local reptile is still found in the Forest, and upon the heath-lands on the opposite side of the Avon, where it was first established as a British species. The localities where I formerly found it are being gradually built over, but during the summer a gentleman, wishing to secure one of the snakes for a friend, asked me if I could tell him where to find it. Having searched near its old haunts he succeeded in capturing three specimens, one a very fine female measuring fully twenty-five inches in length, and of a very dark colour, but having the characteristic dark "crown" and black

line running from the gape. Contrary to its general habit, this specimen appeared to be very lethargic, but undoubtedly it was near changing its skin, as the "scales" had already grown over its eyes—(one person who saw it suggested blindness)—but when placed in a box with the other two it fought and bit furiously at the smaller one, which was, I suppose, of the same sex. These two, sixteen and eighteen inches in length respectively, were very prettily marked, and appeared iridescent, especially about the head, when the sun shone upon them. After retaining them two or three days the person for whom they were secured declined to have them, because of the difficulty of keeping and providing food, so they were taken back to their native heath and there liberated. My limited experience points to the fact that the species in question prefers dry and sunny situations, and is seldom found in damp places such as the common *natrix* delights to inhabit; this latter I have often seen in the water, but *lævis* never, and I think it is often supposed to be an Adder, and is killed in consequence.—G. B. CORBIN (Ringwood, Hants).

AMPHIBIA.

Palmated Newt (*Molge palmata*) in Hertfordshire.—On June 27th I took several examples of this Newt from a pond in Ashridge Park. The species does not seem to have been recorded hitherto for Hertfordshire.—CHARLES OLDHAM (Watford).

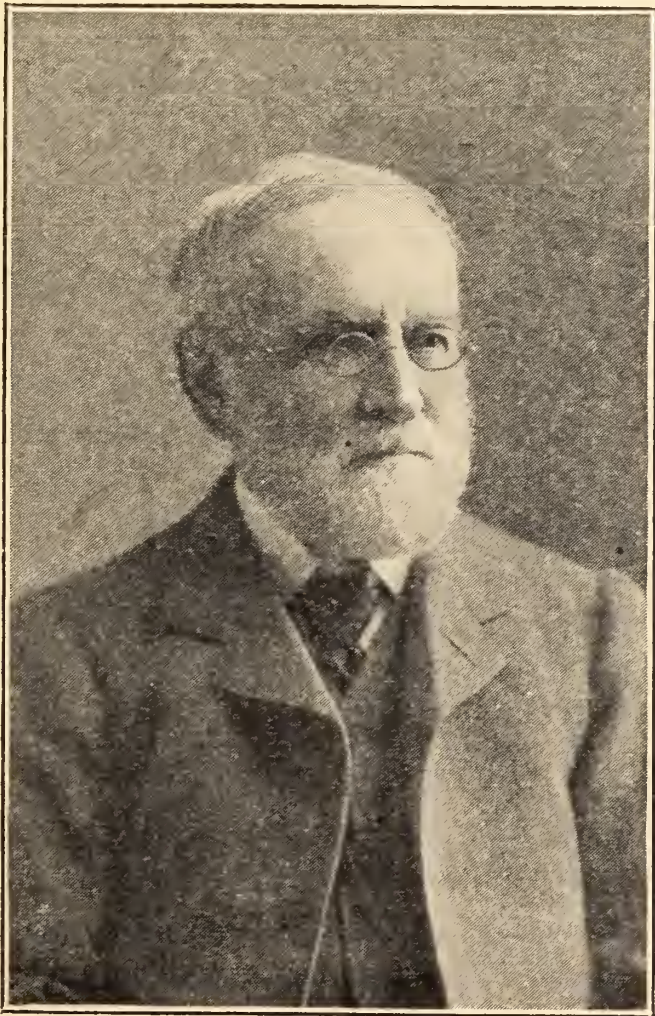
OBITUARY.

THOMAS SOUTHWELL.

By the death of Mr. Southwell 'The Zoologist' has lost one of its oldest contributors and Norfolk one of its best naturalists. He passed away on Sunday, Sept. 5th, at his residence, 10, The Crescent, Norwich, in his seventy-ninth year, having rallied from an alarming breakdown in January of last year, about which time he wrote to us saying his work was done, a statement we rightly refused to accept, and he subsequently acquired a considerable amount of bodily and mental vigour.

According to the 'Eastern Daily Press,' in a notice evidently written by a competent authority, "Mr. Southwell was a native of King's Lynn, and the greater part of his days he had spent as a

member of the clerical staff of Gurney's Bank, afterwards Barclays', which he had served at Lynn, Fakenham, and, chiefly, at Norwich. A voracious reader and a born naturalist, he used his leisure hours to such good effect that by the time he had reached middle life his reputation as an ornithologist was already considerable. He edited the third volume of Stevenson's 'Birds of Norfolk,' compiling it from matter which Stevenson had himself left, and adding to it copious notes. He brought out also a new edition of Lubbock's 'Fauna of



Norfolk,' to which he made various additions. His work on 'Seals and Whales of the British Seas' is everywhere recognized as an able and authoritative treatment of a somewhat neglected subject. It would be too long a task to follow Mr. Southwell in all his literary enterprises. Suffice it to say that he wrote with skill and freedom, and touched a great variety of natural history subjects. Perhaps the best of his more fragmentary work was done in connection with the Norfolk and Norwich Naturalists' Society, whose secretary he was for several years, and whose president he was in 1894. The work by

which he is most popularly known is perhaps his 'Guide to the Castle Museum' (Jarrolds). He was a member of the Zoological Society and the British Ornithologists' Union. He served on the Castle Museum Committee and the Norfolk and Norwich Library Committee. He actively interested himself in the formation of the new Museum Association at Norwich, and he was one of the leading spirits of the Science Gossip Club. Mr. Southwell leaves two daughters. His wife predeceased him about five years ago."

Mr. Southwell appears to have first contributed to the pages of 'The Zoologist' in 1869, when he described a nesting of the Little Grebe, and since that time very few volumes indeed of our Journal have appeared without some interesting and valuable communication from his pen, and also for a very considerable number of years his annual reports on the northern "Seal and Whale Fishery" which possess an importance in zoological literature which subsequently will reach a fuller estimation. He was a naturalist of the old school, now, alas! represented by sadly diminished numbers, and was an extremely cautious and accurate recorder; his writings exhibit an absence of controversy, though in his private correspondence he was a very candid critic. We will conclude with a cutting from an appreciation written by our contributor Mr. A. H. Patterson:—"Mr. Southwell will not be remembered so much as an original observer and litterateur as a careful and painstaking compiler, and by the excellent work he has accomplished in simplifying and completing the work begun by others. Of his one published book, 'The Seals and Whales of the British Seas,' he was not at all proud, and, indeed, has expressed his dissatisfaction with it to me in strong terms. Yet his researches among the Fennipedia and Cetacea of our islands have been of great service in reducing from a chaotic state the nomenclature and classification to a well-arranged system, and his editing of Arctic whaling records and logs is appreciated all through the world of science. He was foremost to give credit where credit was due, and deeply resented literary and scientific cribbage."

NOTICES OF NEW BOOKS.

The Making of Species. By DOUGLAS DEWAR, B.A., &c., and FRANK FINN, B.A., &c. John Lane.

THIS book appears to have been written with two intentions: one to criticize much evolutionary theory, the other to give a popular abstract of many of those theories which to-day, more or less, occupy the biological outposts. The authors are dissatisfied with much of the dogma that has been built upon these theories, and in this protest, for the work is highly polemical, many naturalists will probably not be too greatly shocked; at the same time the pages would not have suffered in argument had they been written in a more subdued style.

As regards Darwinism the authors clearly point out that the dogma of the all-sufficiency of natural selection is not to be ascribed to Darwin, who "at no time believed that natural selection explained everything," and they further remark that it is Wallace who claims the all-sufficiency of natural selection, in which he is followed by Weismann and Poulton, and they "dub the school" which "holds this article of belief . . . the Wallaceian school." In connection with this subject, however, one statement is cryptic. We are told that the Darwinian theory "has the defect of the period in which it was enunciated. The eighteenth century was the age of cocksureness, the age in which all phenomena were thought to be capable of simple explanation." Is not this antedating the theory by a century? and is the mental affliction to which our authors refer quite a thing of the past?

The section devoted to mimicry is a piece of careful and judicious criticism, and one that will well repay the perusal of the extreme advocates of that theory. Instances of false mimicry where the mimicking species inhabit widely separated continents are not infrequent, and Messrs. Dewar and Finn give examples in both mammals and birds, to which many other instances could be added. They pertinently observe:—"We

may perhaps call the cases which the theory of mimicry is unable to account for 'false mimicry,' but in so doing we must bear in mind the possibility that some at any rate of the examples of so-called mimicry may, on further investigation, prove to be nothing of the kind."

We cannot follow the discussion of most of the cognate theories on the subject, but readers will find the abstracts of many of them given in an easily understandable manner. But we are still only on the fringe of a demonstration; "at present our knowledge of the causes of variation and mutation is practically *nil*." In reading books and papers on what may be called external or superficial evolution it is a marked feature that the genus *Homo* seems to be let severely alone; but why? The different colorations of mankind and the distinct racial cranial developments ought to be included in the postulate of "the all-sufficiency of natural selection," as well as the peculiarities of insects, as a rule, and of other animals less frequently. We neither venture to affirm nor deny the possibility of this demonstration, but it is necessary to advance the theories of mimicry and protective resemblance into anthropological studies before we have exhausted the argument or absolutely proved the thesis.

The Wild Beasts of the World. By FRANK FINN, B.A.,
F.Z.S., &c. T. C. & E. C. Black.

With part 17, recently published, this serial work is completed, and forms two handsome volumes. The publishers claim that it is "a very beautiful book to look at, a fascinating book to read, and a valuable book to possess." As a richly illustrated work, with Mr. Finn's carefully compiled text, these claims may be admitted, and as a popular introduction to a knowledge of "the larger and nobler types" of terrestrial mammals it is in advance of similar publications. The coloured illustrations may perhaps as a whole be described as too brilliant in hue, but the drawings on which they are founded are by Louis Sargent, C. E. Swan, and Winifred Austen. If it can scarcely be described as a treatise on zoology, it is certainly one of the best "nature books" that we have seen; while the text will bear comparison with that of our standard popular "Natural Histories."

EDITORIAL GLEANINGS.

SOUTH AFRICA is advancing outside the dreams of millionaires. In the 'Transvaal Weekly Illustrated,' just to hand, we have a report of Prof. Thomson's lecture on "What we Owe to Darwin," before a congested and crowded audience at Johannesburg, in the Assembly Hall of the Transvaal University College, and with the *Anglican Bishop of Pretoria as Chairman*. The following extracts are typical of the Address:—

"The evolution idea was known to Greek philosophers; it came from Aristotle to Hume and Kant; it linked Lucretius to Goethe. It was made more actual by pioneers of modern biology such as Buffon, Lamarek, Erasmus Darwin, and others, and became current intellectual coin when Charles Darwin, Alfred Russell Wallace, Herbert Spencer, Huxley, and Haeckel won the conviction of most thoughtful men. It showed how each stage of life was linked to the one before, back and back, until all was lost in the thick mists of life's beginnings. In dealing with the evidence he claimed that all facts known were evidences of evolution, and that just as the Whale had rows of teeth that never came through and beneath feet of blubber concealed a hind-leg, so man was a perfect collection of relics, like the buttons and tabs on his garments, which had long ceased to have any functional use, but had a highly interesting history. An instance of this survival was the word Leopard, the 'o' in which was no longer sounded, but which served to remind us that the ancients believed that animal to be a cross between the 'Leo' and the 'Pard.'

"Darwin was the liberator of human intelligence. The 'Origin of Species' had been called the Magna Charta of intellect. It freed the intellect from the tyranny of dogma, attacking realms hitherto considered inaccessible to science. It threw light, in a hopeful way, upon man's nature, it gave new light to literature, even to theology; and it could lead us in the future to an almost undreamt-of control of life. The evolution idea was now part of the intellectual inheritance of every man. It had given the world a new outlook. Older than

Aristotle, from being an *a priori* anticipation, it became a detailed interpretation, of which Darwin was chief interpreter. From a model interpretation—an explanation of the mode by which things came—it became a causal theory, the most convincing part of which would always be called Darwinism. We had to take into consideration, besides the personality of Darwin, the work of other pioneers, the development of thought, social changes, the ripening of public opinion. But granted that the man and the moment came together, we had still to remember that Darwin succeeded where others had failed, had put forward a more plausible theory of the process than others had been able to do; and that of his condescension he wrote so that all men could understand.”

IN the ‘Avicultural Magazine,’ published this month, Dr. A. G. Butler contributes an interesting article on “Morality in Birds.” He thus concludes:—“Touching the question of *meum* and *tuum*, we all know that birds have no conscience; they rob one another whenever the chance offers, and believe to the full in the doctrine of the survival of the fittest. They do, however, sometimes seem to be compassionate towards young birds left orphans, for I have known a Robin to help to rear young Thrushes when a cat had killed her own young and one of the parent Thrushes had been shot; yet it is probable that this was only a way in which the arrested feeding-fever was working itself out, and no more creditable than is the love of female children for dolls. If, therefore, there is any moral sense in birds, it would seem to be limited to the female sex, and as a guard against pairing between parent and child. . . . In the case of fanciers’ birds—Canaries, poultry, Pigeons, and even Barbary Doves—I have little doubt that all moral sense is lacking, owing to man’s constant supervision, high feeding, and other things which encourage an unnatural condition; all experiments, therefore, should be conducted with birds which retain their wild character and have not been long under man’s care.”



BRILL (*Rhombus laevis*), VARIETY.

THE ZOOLOGIST

No. 820.—October, 1909.

ROUGH NOTES ON THE FISH AND FISHERIES OF EAST SUFFOLK.

BY ARTHUR H. PATTERSON.

(PLATE IV.)

FOR the following rough and random notes on the Fish and Fisheries of the North-eastern part of the County of Suffolk I offer no apology: their compilation has been to me an interesting task, gathered as were many of the facts on some very pleasant odd-day outings during my summer holidays of 1909. Some of these excursions will be noticed in the context. I have to thank several gentlemen for valuable help rendered me in piecing together the list of species, the first of its kind, I believe, for East Suffolk, and their names will be a sufficient guarantee for accuracy and veracity. Many of the rarer records have been gleaned from the pages of that excellent journal, the Norfolk and Norwich Naturalists' 'Transactions.' I frankly admit the crudeness of these "notes," but I hope they will form a nucleus for more elaborate and exhaustive work.

As the premier fishing-port of Suffolk, I take my bearings from Lowestoft, which, to quote from a Suffolk directory, "ranks next to Yarmouth among the most important fishing stations on the Eastern Coast, and is a handsome and rapidly improving market-town, bathing-place, and sea-port. It is pleasantly situated on the most easterly point of England, upon an

eminence, rising from the German Ocean, 11 miles E. by N. of Beccles, 7 miles S. of Yarmouth, 25 miles E.S.E. of Norwich, . . . and 114 miles N.E. of London."

Having said this for Lowestoft, I may make reference to the quiet, sleepy little town of Southwold, situated a few miles to the south of Lowestoft, itself a fishing centre, referred to in White's directory as "a creek under the port of Lowestoft," which at the present moment has shaken itself into sufficient wakefulness as to make promise of some development in its Herring-fishing ambitions. Southwold's long-delayed chances of improvement seem to have been taken advantage of in 1907, when the overcrowding of Yarmouth and Lowestoft harbours by fishing-boats from Scotland, and from other English ports, made a demand for further accommodation. Several of the boats ran into Southwold and landed their catches. In this incident certain energetic townfolk saw their opportunity, and at once made effort to provide better harbour room, not without much pessimistic prophesying, tinged with fearfulness, on the part of the fishing interest at the premier Herring port.

In the course of 1908 quite a little muster of Herring-boats fished out of Southwold, which made the following number of landings, *viz.*: Scotch, 119; English, 177. From Mr. H. J. Sayers, a fish-merchant of Southwold, I learn that 1097 trunks of trawl-fish were landed there for the twelve months ending December, as well as 4452 crans of Herrings, and 122,250 hundreds of Mackerel, the bulk of these fishes arriving between September and December. He stated to me (July, 1909) that the harbour was being dredged to a depth of fifteen feet at low water, and that great preparations were then on the way to provide pickling-plots and gutting-sheds, while a considerable fleet of boats was expected in for the autumn fishing of 1909.

In August, 1906, the harbour was in a chaotic state, the piers worm-eaten and weather-worn, with notices here and there warning the stroller not to venture thereon; the bar at the river entrance was visible at low water. On Aug. 4th of the present year [1909], in company with Mr. Percival Westell, I revisited Southwold, and found its harbour and approaches undergoing quite a phenomenal metamorphosis; the ancient breakwaters had disappeared, and were replaced by modern structures; a

concrete quay-heading made, with piling extensions extending along the north side as far as Walberswick. New gutting-sheds had been built, and large areas of the original marsh and sand-dune levelled, raised, and in places concreted, in preparation for the Herring harvest. A Herring-mart, surrounded by some seventeen merchants' offices, stores, sheds—even a restaurant and a Scotch Girls' Rest—had cropped up; and there is a promise of great things in store for the resuscitated port. Nearly four hundred Scotch lasses are expected this coming season, with a corresponding number of male labourers and participators in the fishing. Mr. H. J. Sayers, who kindly piloted us round, speaks most optimistically of the future of the port. Yarmouth, Ramsgate, and Lowestoft boats have used the harbour with encouraging results.

That Yarmouth should see, in the development of Southwold, a menace to her prosperity as a Herring port is absurd; Yarmouth can still retain the lion's share, and if the local authority [without hindrance from the Commissioners, with the jealousy of Norwich behind them], instead of haggling and wasting money over law proceedings, would spend it for increased accommodation, a fishing of yet huger dimensions would ensue. There are plenty of Herring shoals off Southwold, in the latter part of the fishing especially. I have seen a "punt" bring in a fine autumnal catch of Herrings of a quality unsurpassed.

The old-worldness of Southwold, and its beach, notwithstanding the assumption of modernity in the matter of catering for visitors, is still an observable and interesting feature. The fishermen's storage huts remain on the south foreshore, with many quaint hints for the artist, and some eighty small fishing-boats, called "punts," fish from the beach, being hauled up into a north and a south contingent when operations are over in the bay, known as Sole Bay—a suggestive title. They are marked L.T. (port of Lowestoft), the dues being under that port's authority. Southwold has ambitions for a separate authority. These sturdy little "punters," of some twenty feet in length, are built much on the lines of a "gig"; they are fitted with a lug-foresail (without a boom) and a small mizen; the mizen-mast starts straight up from the stern-post. They sail well, but the foresail flaps ungracefully when luffing up into the wind. The

men in turn fish for Sprats with a drift-net, for Soles and other fish with a trawl; Shrimps are dredged for at other times.

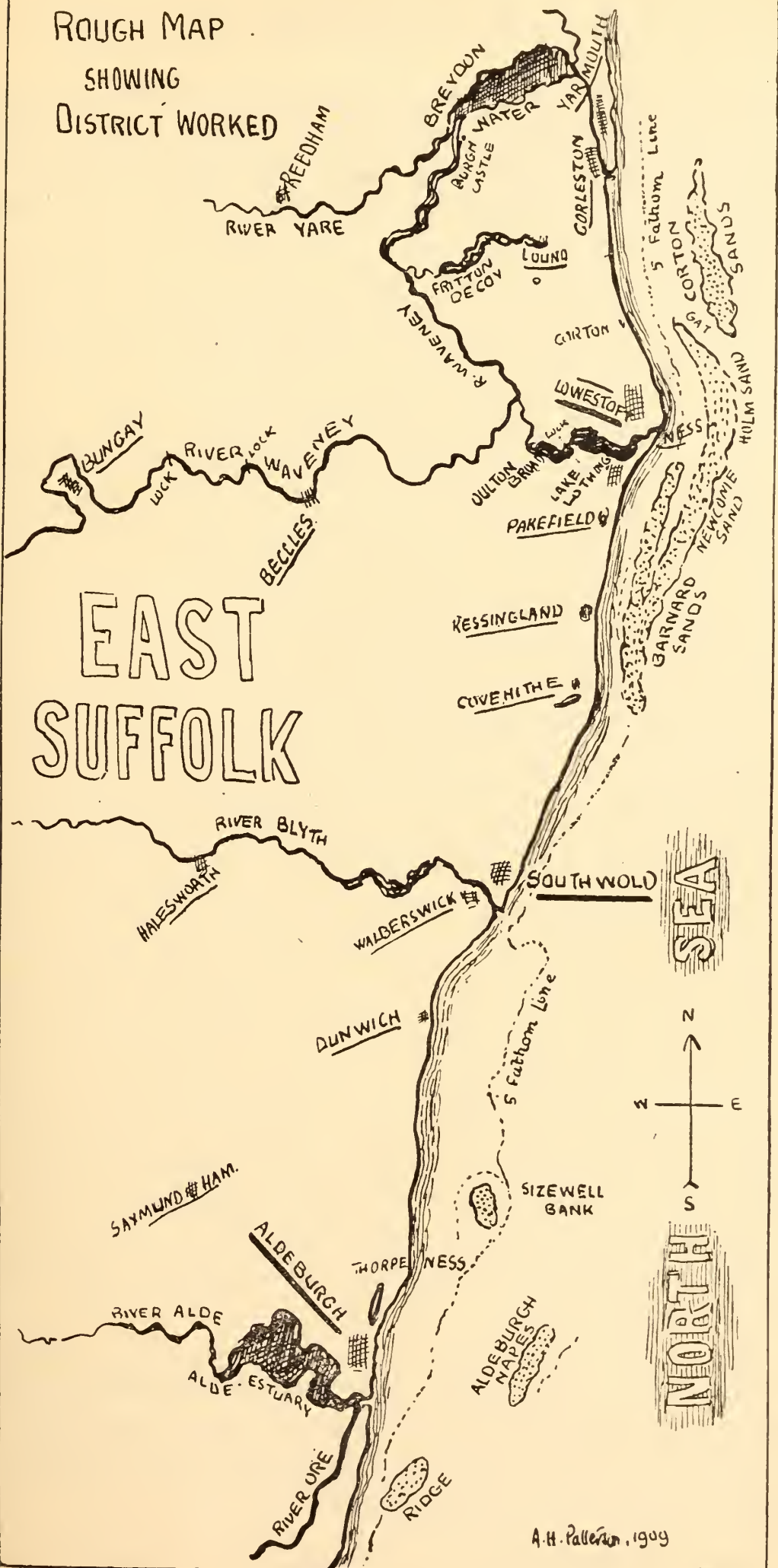
I can conceive of no more delightful an experience for an amateur fisherman, or an ardent student of marine zoology, than to ship aboard one of these little vessels and spend a fine summer's day trawling in the bay. I overhauled several of the recently returned boats, finding in the refuse among the billage quite a number of species of fish—Gobies, tiny Whittings, Bibs, Flounders, Pogges, Plaice, Soles, Suckers, &c., not to mention Sand-Stars, "Five Fingers," Swimming Crabs, Hermits, various Shells, *Alcyonium*, and even Sea-Anemones. On the sands around several of the boats, "stowed" already for the morrow's fishing, I saw heaps of "common objects" that would have delighted Gosse; but I considered the fishermen exceedingly wasteful, for many of the young Soles, Skate, and other flat fishes should have been returned to the sea.

I watched several of the fishermen measuring their catches of Soles on a piece of board notched to regulation length, those reaching a fishmonger's standard being placed in one heap and immediately gutted. I understood they obtained eighteenpence a pair for these, the smaller ones being retailed at proportionate prices by the men themselves. From forty to a hundred Soles did not seem to me to be a bad haphazard catch; but Southwold fishermen, like others, are sad grumblers, and bewail the departed glory of their offshore fishing. They may have reason, considering the waste referred to; they grumble also about the harbour, but several are beginning to use it. Among the catches I observed several Lobsters and Edible Crabs. I was severely bitten by a Swimming Crab (*Holsatus*), which has a most peevishly strong grip. My finger was inflamed for hours after, and I can quite sympathise with the fishermen's wholesome detestation of the species, which is abundant and extremely agile. I enumerated nineteen species of fish in my ramble round.

Anent the measuring of Soles, Mr. W. S. Everitt, of Lowestoft, related to me an amusing story of Frank Buckland's credulity, when visiting Lowestoft as a fish-commissioner:—

"I am delighted with your offshore fishermen," said the genial Buckland. "Why, I actually saw one fellow whom I

ROUGH MAP
SHOWING
DISTRICT WORKED



EAST
SUFFOLK

SEA



NORTH

went out with spreading Sole after Sole upon a thwart, occasionally throwing one overboard." "What are you up to?" asked Buckland. "See them snotches cut there?" asked the man; "well, them as don't touch 'em, nose and tail, goes overboard again!"

Mr. Everitt, with a smile, assured me that the wily fellows, who had wind of Buckland's enquiries, had cut these purposely for his edification. It was easy to obliterate the newness of the notches with a finger-print of grease or tar.

In a letter received later in August from Mr. R. J. Canova, he referred to "a considerable quantity of Salmon-Trout caught here in May and June, and in the autumn in draw-nets along the shore. The trawlers," he continues, "catch Brill in Sole Bay. . . . At this time of the year [August] you probably know that the alongshore boats are catching the finest Soles possible. . . . I do not know of a better place for good, well-fed Soles." This inshoreing of Soles takes place all along our eastern coasts in the warmer months, undoubtedly for the purposes of spawning. There are a number of suitable spawning-grounds, an old and intelligent trawler* assures me, as at Sizewell Bank and some other adjacent "spots." He told me an interesting incident of falling across a spawning resort for Soles near Palling (Norfolk). By accident he dropped his small trawl in "a likely spot," and brought up some fine examples packed with spawn, filling a fish-trunk with excellent fish, but some actually shed their full-ripe ova in the boat, so that the bottom-boards were covered and made slippery, and they had to mop them free of it. He and his two partners made preparations for another day's foray, highly elated, but they "didn't get a bloomin' Sole in the net." His opinion was that they "came to the day, shed their spawn, and wor gone!" I am astonished that this species should be so plentiful inshore, considering the constant pursuit of it. Buckland asserts that a Sole one pound in weight carries about 134,000 eggs.

Sprat-fishing at Southwold is pursued contemporary with that of Aldeburgh. From Mr. H. J. Sayers, of Southwold, who kindly replied to several questions submitted to him, I learn that the

* Bob Colby; an interesting character figuring in two or three of my recently published books on the East Coast.

number of boats working out of that port in Sprat-time is about fifty. Fishing commences at the end of October, and lasts until the middle of December. Sprats, he assured me, realized from three shillings to eight shillings per bushel, but I might take the average at five shillings. An average catch of some fifty to sixty bushels was the take per boat, with average earnings of from £10 to £15; £20 was reckoned exceptional. None were sold last year for manure; a few were smoked, the majority being sent away fresh.

The ridge of sandhills on which Southwold is situated extends northwards to Gorleston cliffs, Lowestoft standing midway upon the highest portion of them; immediately below Lowestoft, at the northern extremity, a range of undulating sand-dunes slopes seaward into an intermixed shore of hard sand and shingle, without clay. The south beach is narrow, a mere ribbon of sand between sea-wall and sea, upon which the wintry breakers dash with furious onslaught, often severely damaging the foreshore, notwithstanding the bold fight made by the inhabitants who spend much money and ingenuity in groining and theorising. The harbour, with its basins, divides the town into two distinct portions. Immediately behind Lowestoft are the waters of Lake Lothing and the River Waveney, the latter of which "in ancient days sought its junction with the ocean through Lake Lothing, between Lowestoft and Kirkley. Its channel, which is proved to have been shallow by the discovery of fossil Elephants' teeth, . . . was open in Camden's time."*

It would be beside the mark to enter into details of the long fight between the sea and the shifting sands which makes up the earlier history of this now navigable waterway—its irruptions, inundations, and the like. One remarkable tide, in 1791, burst over the isthmus of sand, carrying away a bridge built at Mutford in 1760; "on this occasion the salt water flowed over every surrounding barrier, and forced the fishes into the adjoining fields, where they were found, weeks afterwards, sticking in the hedges."

These possibilities for good or evil at length suggested what has since turned out to be a successful compromise with nature. In 1814 a survey was made to ascertain "whether or not it was

* 'History of Suffolk,' by Rev. A. Suckling.

practicable to open a communication with the sea at Lowestoft"; in 1821 a report was published, estimating the cost at £87,000. Yarmouth, of course, opposed this scheme. Royal assent was given in 1827, and the scheme completed in 1833. Before entire completion the sea was admitted through the lock-gates:—"The salt water," says Suckling, "entered the lake with a strong under-current, the fresh water running out at the same time to the sea upon the surface. The fresh water of the lake was raised to the top by the eruption of the salt water beneath, and an immense quantity of yeast-like scum rose to the surface. . . . At a short distance from the lock next the lake there was a perceptible and clearly defined line where the salter water and fresh met. . . . Lake Lothing was thickly studded with the bodies of Pike, Carp, Perch, Bream, Roach, and Dace; multitudes were carried into the ocean, and strewn afterwards upon the beach, most of them having been bitten by Dog-fish, which abound in the bay. It is a singular fact that a Pike of about twenty pounds in weight was taken up dead near the Mutford end of the lake, and on opening it a Herring was found in it entire."

Here we have had shown in a limited area how the fauna of a locality can be eliminated or altered. Lake Lothing has been changed from a haunt of freshwater fishes into a receptacle for shoals from the sea. All beauty has been eradicated, and the place is, as Christopher Davies* tersely remarks, "at low water . . . as malodorous as the worst of Dutch canals."

That the deep sluggish waters of the Waveney did at one time run freely into the sea *below* old Lowestoft is an undoubted fact; the same changes which affected the broadland district, joining the little archipelago of islands to the mainland (thanks to silt from the rivers and drift-sand brought from the sea), had their effects upon Lothing-land. I have shown the general appearance of East Norfolk, including Lowestoft's position, at the time of the Romans, in a recent publication, to which the reader may refer.† The history of Lowestoft (Lestoffe, Laystoft, or, as it was anciently designated, Lothnwistoft, probably acquired its name from Lothbrog, the Danish noble, who inadvertently landed here in A.D. 864), owing to its contiguity to

* 'Norfolk Broads and Rivers,' published in the eighties.

† 'Wild Life on a Norfolk Estuary,' p. 2.

Yarmouth, is very much mixed up with the beginnings and development of the larger and busier Norfolk borough, more especially as their maritime pursuits are kindred, although Lowestoft must have been in existence while the very site of the former was still under the sea. Lowestoft fishermen undoubtedly plied their trade upon the adjacent waters long ere the Yarmouth fishermen spread their nets to dry upon the rising sand-dunes on which stands the Herring metropolis, and it is equally probable that the East Coast Herring-fishery, originating at Lowestoft, in some measure transferred itself to Yarmouth.

From the earliest times considerable rivalry, which often developed into active hostilities, characterized the progress of these two ambitious towns. Dutchmen added to the discord in trying to usurp the fishery to themselves, or at least to monopolise a goodly share of it.* Frequent appeals to the successive reigning monarchs were made to adjust matters: King John, Edward I., Edward III., Henry III., Richard II.—all had a finger in the debatable pie. Charles I. did not mend matters much, although in the Civil Wars, and while Yarmouth sided with Cromwell, Lowestoft was loyal to the unhappy, wrong-headed King. The history of Yarmouth is punctuated by accounts of these long wearisome quarrels with Lowestoft, while over sixty pages of small type does Gillingwater devote to them in his 'History.' On the concluding page of these sordid chronicles he brings the contentions down to Charles II.'s reign, and to a point where Lowestoft evidently scores: "Thus," he emphatically writes, "was the last effort of the Yarmouth men to monopolise the Herring-fishery totally frustrated, and the Lowestoft people have enjoyed the free exercise thereof without any interruption ever since." During the early part of Charles I.'s reign, Nashe wrote his celebrated 'Lenten Stuffe, or the Praise of the Red Herring.' Being a Lowestoft man, he naturally took sides in the controversy against Yarmouth, and it goes without saying that it was the Lowestoft Red Herring which inspired his muse. Swinden ('History of Yarmouth') characterizes it as nothing more than "a joke upon *our* staple—Red Herrings." It would

* I must refer the reader to Gillingwater's 'History of Lowestoft,' chap. iii., popular edition, published by Arthur Stebbings, 1897, Lowestoft.

be untrue to say that Yarmouth does not to this day look upon Lowestoft with a somewhat jealous eye.

Gillingwater's* account of the Herring Fishery, with a few alterations in details, and the description of the Herring curing, are pretty well descriptive of what occurs to-day:—

“The Herring season,” he says, “begins on the Eastern Coast of England about a fortnight before Michaelmas, and continues to Martinmas. The number of the boats annually employed at Lowestoft . . . from 1772 to 1781 was about 33, and the quantity of Herrings caught in each of those years was about 714 lasts, or 21 lasts to a boat, which makes the quantity of Herrings caught by the Lowestoft boats during that period to be 7140 lasts. These Herrings were sold, upon an average, at about £12 10s. per last, which makes the whole produce arising from the sale of the said fish to be £89,250.”

The number of boats employed in the Herring Fishery and the value of the season's catches continually fluctuated. After 1781 the boats decreased to eight in number, owing to the war with the Dutch and other countries. But more peaceful times saw satisfactory developments, and Lowestoft to-day has become a most formidable, albeit peaceful, rival to Yarmouth. In 1854 there were 32 fishing boats, in 1864 they had increased to 167. The autumnal Herring voyage in that year (1864) amounted to 4675 lasts.

Frank Buckland ('Fisheries Report,' 1875), when making special inquiries into the state of the East Coast fisheries, stated that, on the authority of a well-known Lowestoft fish-merchant, the spring Herring Fishery was then of great value to the Lowestoft people, upwards of one thousand men and boys being engaged in it, and a sum arising to £30,000 was put into circulation. He gives a table of statistics that covers a period of eight years, which is appended (p. 371):—

He further stated that from eighty to ninety boats went out from Lowestoft and a number from Gorleston to catch these spring Herrings, and that a great quantity of them were sold to the Dutch and French fishermen as bait for their long lines to catch Halibut and Plaice. To my mind, that was all they were fit for, for the North Sea spring Herring is dry and taste-

* 'History of Lowestoft,' 1790.

less, differing in quality from its successor, the midsummer Herring, which waxes fat on Opossum Shrimps, *Gammaridae*, and other small crustaceans and copepods that abound in the North Sea during the warmer months.* The Herring then

HERRINGS CAUGHT AT LOWESTOFT.

Year.	Spring Herrings.	Midsummer Herrings.	Autumnal Herrings.
	Lasts.	Lasts.	Lasts.
1860	1,521	304	2,645
1861	793	261	3,613
1862	538	75	5,711
1863	1,044	17	5,226
1864	1,634	38	4,675
1873	1,887	54	10,973
1874	2,546	112	9,173
1875	1,064	106	—
			[Then not yet begun.]

makes the fattest and tastiest of bloaters, and are of a far more exquisite flavour than the fuller-roed and milted fishes of the late autumn.

In more recent times the number of boats has been hugely augmented, and the catches of correspondingly vaster proportions. In 1904 the total number of lasts taken during the twelve months was 27,174, as against Yarmouth's 40,091. The boats then fishing out of Lowestoft Harbour numbered 232 local vessels and 291 Scotch boats. In 1907 a further increase was noted; Yarmouth, with 220 local and 720 Scotch and other boats, captured 52,122 lasts, whilst Lowestoft reaped a very satisfactory harvest of 39,197 lasts (13,200 Herrings to the last), as the "take" of 251 Lowestoft boats and 413 Scotch and other vessels employed. It may be interesting to append the following returns of the separate months, which cover the spring, midsummer, and autumnal voyages. These and the return for 1908 are from Mr. T. J. Wigg's paper on the "Herring Fishery"

* From the stomach of a six-inch Herring, on April 13th, 1890, I took one hundred and forty-three Opossum Shrimps.

in the 'Transactions' of the Norfolk and Norwich Naturalists' Society:—

RETURN OF HERRINGS LANDED AT LOWESTOFT IN 1907.

Month.	Lasts.	Month.	Lasts.
January	—	Brought forward ...	1,277
February	—	July	37
March	34	August	28
April	979	September	75
May	100	October	15,602
June	164	November	18,579
	—	December	3,599
Carried forward ...	1,277		
		Total	39,197 lasts.

RETURN OF HERRINGS LANDED AT LOWESTOFT IN 1908.

Month.	Lasts.	Month.	Lasts.
January	—	Brought forward ...	663
February	—	July	48
March	20	August	26
April	550	September	252
May	40	October	15,476
June	53	November	16,701
	—	December	2,084
Carried forward ...	663		
		Total	35,250 lasts.

“Being arrived on the fishing-ground,” says Gillingwater, “in the evening (the proper time for fishing), they shoot their nets, extending about 2200 yards in length and eight in depth, which, by the help of small casks, called ‘bowls,’ fastened on one side, at a distance of 44 yards from each other, cause the nets to swim in a position perpendicular to the surface of the water. If the quantity of fish caught in one night amounts to only a few thousands they are salted, and the vessels, if they have no better success, continue on the fishing-ground two or three nights longer, salting the fish as they are caught, till they have obtained a considerable quantity, when they bring them into the roads, where they are landed and lodged in the fish-houses. Sometimes when the quantity of fish is very small they will continue on the fishing-ground a week or ten days, but in general they bring in the fish every two or three days, and sometimes oftener, which frequently happens, and instances have been known where

a single boat has brought into the roads, at one time, twelve or fourteen lasts."

In these days of steam and feverish haste the boats, independent of winds and tides, hurry to the more convenient dock-quays, often laden to an inconvenient degree with a single night's catch.

The "spitting," hanging, and smoking of Herrings still goes on as formerly, but the bulk of the catches are nowadays merely gutted and packed in brine in barrels, the deft-fingered Scotch lasses in their hundreds and even thousands, as in Yarmouth, altering the whole complexion of the curing industry. The exports now consist principally of salted Herrings; the bulk of these go to the Baltic ports, Germany and Russia absorbing the greater proportion of them.

In the early days competition and trickery evidently occurred, and frauds were even practised in the packing of smoked Herrings; bad quality and meagre-sized fishes then went to the bottom of the barrel, a trick that the workman, I will warrant, was not wholly responsible for. A complaint was made to the Government in the days of Charles II., praying that this grievance might be redressed. The purport of this complaint showed that even the barrels' cubic inches were not always above suspicion. It was decreed: "That from and after the first day of August, 1664, no white or red herring of English catching shall be put up to sale in England, Wales, or towne of Berwick-upon-Tweed but shall be packed in lawful barrels or vessels, and what shall be well, truly, and justly laid and packed; and shall be of one time of taking, salting, saveing, or drying, and equally well packed in the midst, and every part of the barrel or vessel; and by a sworn packer," &c.

The oath was as follows:—"You shall well and truly doe, execute, and perform the office and duty of packer of herrings . . . so help me God."

In its palmiest days the Mackerel fishery at Lowestoft did not reach very large dimensions. "The principal advantages which the merchants receive from the fishery," as Gillingwater points out, "is that of employing the fishermen and keeping them at home for the Herring season, more than emolument to themselves." The same reasons were assigned by the Yarmouth

merchants for pursuing there what has ever been a more or less precarious business. The Mackerel season began in the middle of May, and continued until the end of June. This restless and wandering species was ever capricious; in fine, calm weather the catches were always poor, the fish swimming deeper in the sea, and it is probable that it was sufficiently cunning and alert to avoid the nets provided for its ensnaring. Rough, breezy weather, "with plenty of colour in the water,"* as an old Mackerel catcher described it, is always most favourable, rousing the fish from below, and bringing them to the surface within reach of the fatal meshes.

"Next morn they rose and set up every sail;
The wind was fair and blew a Mackerel gale."†
—Dryden.

Gillingwater presents us with a number of statistics respecting the Mackerel Fishery in what he terms "An Account of the Mackerel Fishery at Lowestoft from 1770 to 1785 inclusive." This appertains principally to the number of boats employed annually, and the amounts realized from the sale of the fish. I append a few of these dates, omitting several for the sake of brevity:—

Year.	Boats.	£	s.	d.
1770	26	2,401	2	2½
1772	33	3,179	5	1
1774	35	2,012	13	0
1776	30	1,595	17	8½
1778	21	1,295	19	1½
1780	20	1,559	3	10
1782	16 { average per }	136	1	2
1784	20 { boat }	119	5	11½
1785 *	20	249	8	8½

[* Supposed to be the greatest Mackerel season ever known at Lowestoft.]

Gillingwater's "greatest season" was eclipsed in 1821, when the catches reached huge proportions. On June 30th sixteen Lowestoft boats caught Mackerel to the value of £5252, being an average of £328 per boat, and it was estimated that a sum of

* Most likely due to the presence of minute marine creatures upon which the Mackerel may be feeding.

† Dr. Johnson, in his 'Dictionary,' describes a Mackerel gale as "a strong breeze, such as is desired to bring Mackerel fresh to market." I prefer to take the generally accepted idea of a *stirring* wind.

£14,000 was realized by owners and men in the fisheries off the Suffolk coast on that one day.

Nall,* writing in 1866, states that "the Lowestoft catch a few years ago averaged about fifty lasts annually; latterly, from the unprofitable results of the venture, fewer boats have been engaged in it, the fishermen prosecuting in preference the spring and summer Herring fishery." At the time of writing he averred that the "Mackerel fare-ing" had almost died out. On his authority it may be stated that in 1854 twenty boats were engaged, earning £3460; 1855, six boats, earning £930; 1858, ten boats, earning £710; 1862, three boats, earning £27.

In those days the East Coast Mackerel were brought to the beach, a practice which was followed, I believe, at both ports until recent years; they were sold by private contract and by public auction. The markets for the fish were London and the principal towns in East Anglia. To London consignments were despatched in fast-sailing cutters then employed by the London fish-mongers. The introduction of railways and preservation by means of ice have tended to a wider transportation, and to more regular prices. The highest price on record for Mackerel occurred in May, 1807, when the first boat-load from Brighton realized forty guineas per hundred of six score—seven shillings each! In the following year Mackerel struck the neighbourhood of Dover so plentifully that they were sold at sixty for a shilling.

Frank Buckland brings down the history of the "Fare-ing" to a more recent date. "In former years," he says, "Mackerel realized a large price; now the merchants have to compete with very fine fish caught off the Irish coast, . . . and also with immense numbers from Norway. These are packed in ice." . . . Similar conditions prevail to-day, and it is a curious fact that, for a number of years following Buckland's inquiries, the local fishery was hardly worth pursuing, the Mackerel changing their immigration until the time of the autumnal Herring-fishing, when on some occasions they became so abundant that several Yarmouth and Lowestoft boats changed their Herring-nets for Mackerel-nets.

* 'Great Yarmouth and Lowestoft,' by John Greaves Nall.

A few items selected from Buckland's Report are appended :—

Year.	Hundreds caught (120 in each hundred).	Total amount realized.		
		£	s.	d.
1864.....	525	66	5	0
1866.....	2,367	2,598	15	0
1868.....	4,124	5,155	0	0
1870.....	6,612	8,265	0	0
1872.....	3,334	4,167	0	0
1874.....	3,147	3,933	15	0

To Mr. H. J. Henderson, the present Harbour Master at Lowestoft, I am indebted for the past two years' records :—

MACKEREL FISHING, 1908-9.

Month.	Mackerel landed.		Equal to	Number of Boats.
	1908.	1909.		
	Hundreds	Hundreds		
April	22	13	1908,	1908,
May	6,802	4,502	202 lasts.	49 boats.
June	13,344	15,484	1909,	1909,
To July 11th	94	537	205 lasts.	54 boats.
Total	20,262	20,536	407 lasts.	—

The average price for each year would be about nine shillings per hundred of one hundred and twenty fish.

Against the above, the Wharf Master's figures, at Yarmouth, are as follows :—

From April 1st, 1908, to March 31st, 1909 : Boats, 45 ; lasts, 239 = 1,390,000 fish.

From April 1st, 1909, to August 20th, 1909 : Boats, 47 ; lasts, 256 = 1,560,000 fish.

The capricious movements of the Mackerel have already been hinted at ; they seem to come as they like, and stay away when the humour seizes them. I am satisfied that these apparent eccentricities are entirely due to tidal and other influences, which

affect the natural economy of the species. Mr. W. A. Dutt* gives a graphic account of a glut of Mackerel at Lowestoft in the winter of 1897, an unusual time of the year for such an occurrence:—"In the winter of 1897," he writes, "when the Mackerel season was at its busiest, almost unprecedented catches of fish were landed on the wharves. Soon after dawn during those winter days the drifters [Herring?] came sailing in, and often by ten o'clock in the morning the Waveney Dock was so full of boats that the fish had to be heaped on the trawl-market. And still the heavily laden craft kept crowding in, until there was hardly a pier or jetty that had not a score of boats alongside. Day after day similar scenes were witnessed. . . . So close to the shore were the Mackerel shoals that the drifters were in port in little more than an hour after they had hauled in their nets, and then it was often hours before the catches were landed. . . . In early spring many of the Lowestoft boats . . . join the Cornish boats engaged in Mackerel fishing off Land's End and the Scilly Isles."

I am not prepared here to enter largely into the matter of temperatures of the German Ocean, which vary in successive years; but temperature and the varying strength of the tides undoubtedly greatly govern the peregrinations of all marine creatures, and an abundance of food naturally controls the movements of those creatures which prey upon it. The spring and summer of 1906 were exceedingly interesting to me by reason of the many species of crustaceans and fishes that came to hand. My note-book for that year was crowded with "instances" and "finds." Herring-syle and the smaller crustaceans were legion. The autumn saw many rare ichthyological visitors on our shores; among these was the rare *Scomber thunnina*, hitherto unrecorded for British waters. Off Lowestoft were captured two Thresher Sharks (in September), and another off Yarmouth. Unusually big tides set in on a north-west wind on the springs—a rather abnormal circumstance—and I noted an invasion of Sprats early in October. Probably these causes contributed to a great influx of Mackerel off the East Coast in May, 1906. The 'Yarmouth Mercury' of May 26th thus refers to this:—"A good many years ago the East Coast Mackerel

* *Vide* 'Highways, Byways, and Waterways of East Anglia,' p. 135.
Zool. 4th ser. vol. XIII., October, 1909.

fishing was one of Yarmouth's most important industries. . . . Suddenly the Mackerel left the neighbourhood, but in time they appeared in abundance off Cornwall. . . . For the last two seasons, however [the local boats which followed them to Cornish waters], they have been anything but successful. Again the centre of interest shifts. As unexpectedly as the dandies of the British Seas left one of their old haunts, as unexpectedly have they reappeared in their legions a few miles from Yarmouth. Getting well among them, . . . Saturday [May 19th] was a record day. Upwards of forty boats arrived with good catches, some having as many as a last [12,000 fish]. . . . Should it transpire that the Mackerel have returned for good in anything like their old numbers, it will be a great boon to Yarmouth and Lowestoft."

The references to caprice and unusual appearances and disappearances call to mind a remarkable inshoreing of this species in November, 1875, when the Harbour Master of Lowestoft wrote Mr. T. Southwell that a large number had been taken at that late season of the year. He remarked:—"The large quantity landed at our market this autumn is a very unusual thing, as they are only caught on this coast in May and June."

A similar abundance was recorded by myself in 'The Zoologist,'* when immense shoals struck the Suffolk coast. On Nov. 12th a glut occurred at Lowestoft; several boat owners hurriedly changed their Herring-nets for Mackerel-nets. The drifter 'Nugget' landed just four lasts, or nearly 50,000 fish. The nets were so full that one-half could not be stowed in the net-room; "the remainder, still 'gilled,' lay in a huge heap piled on the deck." In some cases nets "grounded" (sank) with the weight of fish.

There were formerly two other fisheries pursued from the East Coast ports, known as the North Sea and the Iceland Fisheries. These flourished more especially in the middle of the seventeenth century. Swinden says that, in 1644, Yarmouth sent 205 vessels, 182 going to the former, and 23 pursuing the latter. These, however, being greatly harassed by foreign foes and kingly rapacity—for the king made raids, or exacted heavy tolls (the same thing!) upon the catches for provisioning his

* *Vide* 'Zoologist,' 1908, pp. 448-9.

fleets—gradually declined, and were never afterwards revived. Lowestoft had annually sent thirty boats; in 1720 they were reduced to five. Mr. Copping, an eminent Lowestoft merchant, sent the last boat from this port to the North Sea in 1748. Cod and Ling (which proves the fishery to have been a line fishery) were the principal catches; in a good season the boats would return with four hundred for each craft.

These fishes were cured by pickling them in casks; some were dry salted. They were afterwards despatched to foreign ports. “The livers were a considerable article,” says Gillingwater, “and there is a trench still visible upon the Denes, a little to the north of Lowestoft, where stood the coppers where they used to boil the livers.”

The trawl fishery has of late years become of considerable importance to Lowestoft, thanks greatly to the fostering influences of railway patronage. In plain words, Lowestoft owes much more to the enterprise of the Great Eastern Railway Company than to the original energy of its own inhabitants. I cannot get much information with regard to the beginnings of the trawling industry in this port. At a meeting of the Royal Commission (inquiring into the East Coast Fisheries in 1863), which was convened at Lowestoft in the November of that year, Mr. J. Robertson, then Collector of Customs, in giving evidence, stated that at that moment the Herring and Mackerel boats numbered 176, with “*eight* smacks employed in the trawling only.” At that time Yarmouth had a fleet of some 150 smacks, which had increased to 400 sail in 1875. In a few years Lowestoft shot ahead. To-day the number of trawlers fishing from Lowestoft is some 300 vessels, whilst those from the port of Yarmouth are less than the number of fingers on one’s hand!

I have heard it stated that Lowestoft’s “start” dated from the advent there of Sir Morton Peto, after his rebuff at Yarmouth, whose development he had greatly desired, as well as certain political honours for himself. At any rate, to his enterprise and liberality in promoting docks and railway connections with the Great Eastern Railway, supplemented by the helping hand of the Company itself, Lowestoft owes much—indeed, most of its present-day prosperity.*

* For account of harbour developments, see White’s ‘Directory.’

The Fish-markets are situated exceedingly near to the sea. The three "basins" or docks are fairly commodious, and the wharves convenient, but the outlet to the sea is all too narrow. On certain winds, or when a rush of boats takes place, the harbour is not easy to negotiate either in or out. The Herring and Mackerel markets and the Trawl market are distinct. Most of the business in the latter takes place in the morning, whilst the Herring markets, deserted at other periods of the year, present an indescribably busy scene from early morning until late into the night during the Herring fishery. The Trawl market is carried on all through the year.

There had been a spell of fine calm weather early in August (1909); on the 11th and 12th very few smacks had landed but small catches. Prices ruled high. It was reported in a local paper that a record price had been made in Yarmouth on the 11th. The one solitary smack that came into the harbour had landed some Plaice. One "trunk" (of eight or nine stone) had realized £3 10s. This had been eclipsed by Lowestoft, a "trunk" of Plaice having gone as high as £3 14s.

I was extremely fortunate, on the 13th, in seeing no fewer than one hundred Lowestoft and other smacks in the trawlers' basin at that port, the whole area being covered by a fleet of these beautiful yacht-like craft (fifty or sixty tonners). I had left Yarmouth by an early train, with several Yarmouth fish-buyers, with their tubs, who had gone over with me to the fish-market, which presented a unique spectacle. Before nine o'clock there had been spread hundreds of "trunks" of Plaice, "Roker," Brill, Dabs, "Lemon Soles" (Smearred Dabs), Whittings, Haddock, Codlings; huge Turbots and Cods, Congers and heaps of offal (small Red Gurnards, undersized Dabs, Plaice, &c.) lay in heaps at odd corners. There rumbled, hither and thither, huge springless trollies and sack-barrows over the uneven slime-splashed concrete, emptied, or piled with "trunks" of fish, to and from the smacks, each trundled by one or two gaunt, daring, uncouth smacksmen. Then above this uproar and the riot of voices rang the ear-splitting clanging of auctioneers' bells, and the stentorian bellowing of hoarse-throated salesmen, who yelled "This way Haddock buyers!" "Now you Sole buyers!" and "This way Roker!" There would be an excited crowd

winking and nodding to a shouting auctioneer, whilst another would be shrieking his wares to an audience of four ! There was a glut—it was Friday, too, and the boats that had been held back for days had come in pell-mell on the first advantageous shift of wind. Visitors thronged to see the strange scene, and those who were slow to move got mixed up sadly with trunks and fish and barrows. I confess that I had to lay my ear close to catch the purport of the fish-salesmen’s clamorous bellowing, and had frequently to ask some bystander what the selling prices closed at. The following prices, as showing the differences attendant upon a “glut” or “famine,” may be interesting :—

Aug. 11th. Per trunk.	Aug. 13th. Per trunk.
Plaice	£3 14s.
“ Roker ”...	28/- to 30/-
Soles.....	£12 to £13
Whitings.....	17/-
Dabs	18/-
“ Lemon Soles ” (fine) ...	
	£1 15s. to 18/-
	(Price I could not catch)*
	£3 8s.
	6/- to 4/-
	4/-, 8/-, 12/-
	18/-

The fluctuations in prices shown on the 13th are to be accounted for by the differences in size and quality, as well as fewer buyers as the time passed on. I was by no means impressed by the general run of the fish ; many of the “ Roker ” (Thornback Rays) were no larger than dinner-plates, Codlings ran to about a pound in weight, Whitings were undersized, and many others were by no means “ prime ” fish. A fair-sized John Dory (*Zeus faber*) was the only fish that might be termed curious. One had need go to the wharf day by day, as Mr. Southwell did in 1901,† to see “ strangers ” thrown down upon the pavements, *e. g.* Porbeagles, Sting Rays, Sturgeon, Torpedo Rays, &c. There was nothing beyond the common-place market fishes—not a Crab, Lobster, Whelk, Squid, or Porpoise. From what information I gathered the smacks had been scraping about in the home waters of the North Sea, certainly not beyond Cromer Knowle ; and I also noticed more than one ominous shake of the head when I asked if these smacks were paying. If steam-tractlers should put into Lowestoft the sailing craft might at once cease to trawl. I am not alone in believing so. The

* There were very few full boxes of Roker.

† *Vide* ‘ Zoologist.’

trend of the fishing is northward—ever northward. Yarmouth has lost its trawling industry; I somehow fear that Lowestoft will some day follow suit. How can they long compete against the northern ports which send their ever-restless steam-fleets to the Iceland waters and the far-away north White Sea?

It was with some degree of relief that I left the Trawl-market for the quieter Herring basin, into which only a few shrimpers were sailing to sort over their catches of the morning.* These consisted mainly of Sand Shrimps (*Crangon vulgaris*) of a goodly size, among which were many small Jelly-fishes (*Cydippe pileus*), and not a little red seaweed. I noticed they did not pick the weed from the Shrimps, but shook out the crustaceans from the weed! I had armed myself with several packets of tobacco, and was speedily on more than speaking terms with the shrimpers, whose boats I boarded, and whose catches I overhauled. I was not a little astonished to find but a half-dozen "Pink Shrimps" (*Pandalus annulicornis*)—the Æsop's Prawn.

"Pink 'uns," said one fisherman, "won't sell at Lowestoft; they want brown 'uns!" which is the reverse of Yarmouth. They therefore fish on sandier bottom, avoiding the "rough" (*Sabellæ*) grounds. And whereas some of the Yarmouth catches have been as high as twenty pecks for a tide, not one of these boasted a catch of more than three pecks, and they seemed well content at that. In one boat I saw several Soles; the best of these were purchased by a fishmonger. These men seem to have regular buyers, and then dispose of the smaller fish privately.

I was not impressed by the variety of the "captures" taken with the Shrimps. In one boat was a fine Sprat (*Clupea sprattus*). Among other refuse I "noted" the Lesser Weever, Piked Dog-fish, Skulpins, small Bibs, Whitings, and Herring-syle, not to mention a number of Pipe-fishes (*Syngnathus acus*), Yellow Gobies (*Gobius auratus*), very small Dabs, Soles, Spotted and Thornback Rays, Flounders, Pogges, and a few Little Squids (*Loligo rondeletti*) and a *L. media*. I saw a few Swimming Crabs, and two beautiful examples of *Portumnus variegatus*.

* A fortnight later (Aug. 30th) this basin was crowded with freshly painted Herring-drifters, all high-busy getting nets and stores aboard for the autumnal Herring fishing.

A few boats were of the Yarmouth build and rig—broad-beamed, cutter-rigged; others were of the Southwold and Aldeburgh “punt” type, and a few of a nondescript order, one being a queerly metamorphosed yacht—some twenty-five to thirty in all. The men were not enamoured of the “rough ground” north of Lowestoft, so favourite with Yarmouth men.*

On the piers, like so many Cormorants looking for prey, sat perched in various attitudes some two hundred Atherine anglers, seeking “Sand Smelts.” One old gentleman, of philosophic appearance, armed with a light rod and a crow-quill, pulled out forty silvery-sided beauties in about an hour. These small fish anglers were still in evidence on the 30th, catching greater or lesser numbers. The Shrimp-boats had all been moored when I arrived at their quarters, and the men gone home with their catches. The retreating tide had left on the shore at the east side numbers of creatures thrown out as refuse; among them many Sand-stars (*Ophiocoma rosula*) and empty valves of the *Maetra stultorum* (the Radiated Trough-shell). I saw a *Pholas*, numerous small Whitings, and a host of three-inch Bibs.

“Them little pouts,” [Bibs] said an old salt, “die suner ’an any fish livin’; they fare to blow up and float dade directly they come out of the water. There’s lots of big ’uns come off there [indicating Lowestoft Ness] later on, and perwide good fishin’.” “You have no draw-netting at Lowestoft?” I queried. “No—none; there’s too many groynes,” he answered. “Any Smelt-ing?” “No, sir, if you mean ‘Cucumbers,’ but they catch a few in the basins ’long wi’ them silver-sided ones.”

From another interesting fellow I gathered that some sixteen Lowestoft boats engage in the November Sprat fishing, while carts from Kessingland and Southwold run up to the Lowestoft market with Sprats, and the boats from those places occasionally run in with their catches. He himself had Eel-pots in the basins. I was accosted by a young fellow, on leaving the Herring basin, who offered me some fine Flounders at a shilling per dozen. He had taken them, with some Eels, in the basin in a folding hoop-net.

On leaving the wharves I strolled around the older part of Lowestoft, situated below the cliff, taking note of the fishing premises, which do not seem of that roomy and important size

* *Vide* ‘Nature in Eastern Norfolk,’ p. 101.

one is used to at Yarmouth. The sandy dunes were being levelled (on the 30th), and prepared for the use of the Scotch girls, whose numbers are increasing each fishing season.

The most interesting trip during my holiday investigations was to Aldeburgh, on Sept. 1st. There were but few visitors on the stony beach, at the foot of whose steep incline the sea-waves have eternally rattled the rounded pebbles. There seemed in the everlasting rattle the sobbing of some disappointed great Evil Spirit. The boats were out a-trawling, Soles above all else their quest, and they would not be home till noon. So I tramped along the apex of that unbound shingly rampart—scrunch, scrunch—to Slaughden, a tiny hamlet a mile from the town.

How far its roots went down in the stone-heap I could not say, but there flourished with great grey-green leaf-tufts the yellow-horned poppy (*Glacium flavum*), a most delightful seaside wild flower; sorrel and coarse thistles grew sparsely; *Brassica oleraceæ*, *Salsola kale*, *Crambe maritima*, *Vicia lutea*, and some other shore-plants that I did not recognise, cropped up here and there. The only birds I saw were a few grey Gulls. There was not a Tern in evidence, and this, too, where there was, but three or four years since, a well-protected colony!*

At Slaughden I made the acquaintance of an entertaining old man of the sea, a Mr. Chatton, of charming personality, a boat-builder, shipwright, eel-catcher, sea-angler, and spratter in turn. From him I gathered that there were from twenty-five to thirty Sprat-boats at Aldeburgh, carrying three, sometimes four, and rarely but two hands. The boats were "punts" of about twenty feet. A "fleet" of nets carried by a spratter was composed of thirty nets, that spread a full half-mile, of small mesh, and three fathoms deep. They had no deadly stow-nets on that coast, which killed the fry of every kind of fish. The Sprat Fishery was on from the end of October until late in December, sometimes till Christmas-time, and on rare occasions Sprats were taken early in the spring. Sprats were uncertain, like Mackerel. Their presence could be detected; even if a bit windy the sea where they were would be like glass, and oily in appearance [as I have seen water in which Herrings had shoaled];

* Cf. the destruction of Terns in 'Wild Life on a Norfolk Estuary,' pp. 273-278.

sometimes they gave the water the appearance of being ruffled by the wind. "Did the sea-birds trouble them?" He assured me that the Gulls were a great nuisance; they seized on the nets and pulled them out of the water, shaking out the Sprats. Those that "worked" and those that looked on quarrelled over the spoil, to the spratter's disgust. The "Willows" (Guillemots and Razorbills) did not interfere with the nets, but dived in among the shoals, as did the Red-throated Divers. Occasionally they got fast in the meshes and were drowned.

Sprats were sold by the bushel; they were sent to London in boxes; from ten shillings to twelve shillings a bushel was a good price at the beginning of the season, which went down to four shillings and five shillings towards the latter part of it. A good catch was from forty to fifty bushels, and as much as a boat could well carry. The boats used years ago to shoot a number of bushels each into a yawl and send it to Yarmouth—this was thirty years since, but it paid better now to send the bulk to London. There were none sold off this coast, under ordinary conditions, for manure.

From him I gathered that Grey Mullet were plentiful at times in the estuary of the Alde; Bass were numerous also, and afforded great sport to sea-anglers. Smelts were netted, and Eels trawled for at night; there was fine sport sometimes in winter *pritching* for Eels.

Hanging in Chatton's boat-shed were three or four "pritches," a kind of Eel-spear, made of thin iron rod scarcely stouter than bicycle-spokes, spread like the fingers of one's hand, each point being sharp and upturned. The shaft is long and extremely light, the whole apparatus weighing about $2\frac{1}{2}$ lb., whereas a Norfolk "Eel-pick" weighs 7 lb. The "pritch" is said to have the advantage of not cutting the Eel, which often happens with the spear. . . .

At noon the boats returned; they came in on the beginning of the ebb-tide, and negotiated the steep, awkward beach with extreme care, coming straight on, carefully avoiding a broadside, which would not only be very dangerous in anything like a rough sea, but difficult to right. Two or three active fellows were in waiting at each landing with "skids," long flat spars with an iron facing, which were thrust under the stout billage-streaks of

the boats to prevent them sinking in the yielding shingle. A rope was speedily attached to the keel, and the boat heaved by a sturdy winch over the high angle of shingle on to the beach.

I noticed but few species of fish in the boats, the catches evidently being sorted when the trawl is hauled. A bag-net which averaged enough Soles to fill a bucket was invariably thrown ashore from each boat; these after being rinsed in the sea were immediately gutted on the beach. Some "Roker," Blue Skate, Spotted Ray, and Plaice of small size, with a couple of large Edible Crabs and a Lobster were all the other species noted. A few Sand-stars and some broken *Sabellæ* told of the nature of the ground "worked." The men were exceedingly courteous and communicative. The boats are marked I. H. (Port of Ipswich). I roughly paced the trawl-beams at from eighteen feet to twenty feet. The beach is woefully lumbered up with old gear, winches, boxes, broken Crab-pots, &c.

There attaches some considerable interest to the chequered histories of these East Suffolk fishing towns, figuring as they did largely on the panorama of the ages; but too much room cannot be given to a survey of them, however brief. A very condensed and succinct account of the past and successive fisheries of Lowestoft, Southwold, Dunwich, and Aldeburgh, full of curious phrasing, is given by Miss E. M. Hewett in the 'Victorian History of Suffolk,' vol. ii., in a chronologically arranged manner. I venture to quote from two short items in Hele's 'Notes about Aldeburgh,' "in respect of the fishery." They are couched in the quaint language of the period, in each case referring to rights in dispute. One is an indenture between William Saunbrugge, Prior of the Priory of our Lady of Snape . . . on the one part, and Robert Cosard, John Benselyn, Robert Bayer, &c. . . . granteth by these present writings to the said Towne and Tenements that whereas they paid in the Old time ? for every boat . . . going to fishing for sperling [Smelts] in spurling time shall pay yearly for evermore to the said Pryor," &c.

Hele also gives a copy of an indenture:—"The counterparte of an Indenture between the Citye of London and Aldburgh that the Aldburgh men should pay no duties at London for unlading Herings Spratts Coals salt and other things.—Dated 1st Dec. 1608."

Reference must be made to a sporting pastime which in-

creases in interest year by year. I refer to sea-angling, which has become not only a means of recreation to hundreds of lovers of the rod, but of a source of revenue to professional men, who cater at the various seaside resorts for those who cast angle. There are men and boats always obtainable at Aldeburgh, Southwold, Lowestoft, Gorleston, and the villages along the coast. At Aldeburgh flat-fish swarm in the bay; and there is said to be "Lobster-catching on the Thorpe Rocks in the summer." Amateurs, for a consideration, can generally find a skipper willing to ship them even during the November "spratting." Sea-fish may be taken at Slaughden; and at night, I understand, "the beach [in late autumn] is illuminated by the lanterns of enthusiastic Isaac Waltons." Mr. Clarke, of Aldeburgh, states that shoals of fish are found from one hundred and thirty to three hundred yards from the shore, while, if the sea is too rough for fishing, the waters at the back of the town are available.

At Southwold equally interesting sport may be obtained under similar conditions, while the piers are favourite resorts. Lowestoft also offers favourable opportunities for sea-angling.

Mr. F. G. Robson, Master of Claremont Pier, Lowestoft, has kindly furnished me with the following statistics:—

SEASON FROM OCTOBER 6TH TO DECEMBER 5TH.

1905.		1906.	
Whiting	41,116	Whiting	71,029
Cod	2,225	Cod	787
Dabs	383	Dabs	206
Total	43,724	Total	72,022
1907.		1908.	
Whiting	27,502	Whiting	46,008
Cod	281	Cod	4,285
Dabs	1,382	Dabs	1,111
Total	29,165	Total	51,404

In an article to 'The Zoologist' (1901), on "Lowestoft Fish-wharf," the late Mr. T. Southwell, presented us with an entertaining view of that busy fish-market, detailing an interesting catalogue of species he met with during a few days' researches among the catches of the trawlers and drifters, concluding his paper by a frank admission that "it would not be

right to claim the fish we see landed here as belonging to our immediate neighbourhood. The steam-trawlers go far afield, but there are others which make their captures nearer home, and by the exercise of due caution a shrewd guess may be formed and often accurate information obtained as to the locality of their origin." He further regretted there was "nobody living there who takes an interest in the subject." I have shared that regret, and have often wished that there was some enthusiastic Suffolk ichthyologist competent to supply such a catalogue as would bear a fair comparison with the large list of those already known to have occurred in Norfolk waters.

Both at Aldeburgh and Southwold, as well as at Lowestoft and the fishing villages between, rare fish must occasionally be met with. It was quite by accident that, since I had penned the greater part of this paper, I fell in with Robert Wake's 'Southwold and its Vicinity' (1839). In this interesting volume there is a bare list of the marine species of that neighbourhood, with but two lines of introduction. He, however, concludes the list with a sort of footnote, remarking: "Besides the above, numberless nondescript small fish are occasionally taken in the trawl-nets." What an interesting array these "nondescripts" should make! Wake gives us a list of fifty-one species, from which two so-called species must be eliminated, and two allowed to remain with a ?. These will be noted in the list that follows.

Thanks to Mr. Southwell's paper for providing me with an incentive to research, my endeavours to draw up a *bona fide* list of respectable dimensions afforded me a most interesting series of flying visits to the chief fishing stations in East Suffolk. It has been my pleasure to verify species already recorded, and to add several hitherto unnoticed. I previously possessed a number of "records" of fish which had come into my hands, and there were a few, of rarer sorts, figuring in the lists included in the 'Transactions' of the Norfolk and Norwich Naturalists' Society, which were of service to me. I suppose I may term this an initial collective list of the East Suffolk species; I hope its publication will offer inducement to still further research. I may add that I consider greater credit is due to him who, already having had the ground prospected, fills up gaps (which I have certainly left) and adds fishes hitherto unrecorded.

The Freshwater Fishes of the East Suffolk district are necessarily few, and should be thoroughly "worked out" with ease; the Marine species, however, from the vast scope of the constantly moving salt tides, must always afford a chance of finding and identifying new-comers and stragglers, the uncertainty of whose advent, coupled with their probability, should always keep the investigator on the *qui vive*.

Fritton Lake, to which is attached Lound Run, lying midway between Yarmouth and Lowestoft, is a long, narrow, tree-embowered sheet of water, over two miles in length, nearly half a mile across at its widest part; its waters, in the hotter months, hold in suspension a vast amount of vegetable organisms, which give them a peasoup-like appearance. Shoals of large and very slimy Bream inhabit its depths, and form the greater part of the anglers' catches. Roach and Perch are abundant, as are Tench, and Crucian Carp, which, however, rarely take the hook. Pike are plentiful, but seldom trouble the angler in summer-time. This lake is exceedingly beautiful, and a great resort of Wild Duck, Wigeon, Tufted Duck, and others of the *Anatidæ*, great numbers of which are taken annually in the decoys.* Oulton Broad, a wide, clear, yacht-crowded expanse of water, contains about one hundred acres, and is joined to the Waveney by a "dyke" a mile and a half long, which the uninitiated fail to distinguish from the river itself. Perch-fishing was at one time a noted pastime here, the fish resorting to the vicinity of the lock for the sake of the Shrimps that abounded. Grey Mullet were at one time numerous in the neighbourhood of Oulton Broad and Lake Lothing at certain periods.

Than Mr. W. S. Everitt, a noted yachtsman and sportsman, whose estate borders on Oulton Broad, no one knows this beautiful lagoon better, he having lived in its vicinity for several decades. In the course of a chat with him on Aug. 17th last he greatly added to my interest in this favourite Broad. He could not tell me offhand as to its degrees of salinity, which is heavier than that of the Norfolk Broads, for a certain quantity of salt water constantly escapes into it through the lock which divides it from Lake Lothing. He assured me there were still a few small Rudd therein, and that the Perch are much smaller than of yore; that

* Cf. 'Nature in Eastern Norfolk,' pp. 54-57.

Carp, which never take a hook, and Tench also are found. On one occasion some ditches had been "fyed out," and the great accumulation of *Anacharis* and other weeds removed, when hundreds of very small Tench took up their quarters there, and grew most rapidly. He referred to the partial migration of Bream which at certain periods came to the Broad in shoals, returning to the rivers at other seasons—a subject well worth studying. The Mullet, that in the earlier half of the last century were abundant on the Oulton Broad in August, were now much scarcer, and came in May; they delighted in lukewarm water that was constant around certain works.

Mr. Everitt, in conjunction with some other sportsmen interested in game-fishes, near the end of the seventies turned down in various directions sundry "finger-length Rainbow Trout, Salmon (*Salmo salar*), and half-breds" from Bungay downwards, but they were never afterwards heard of, probably falling a prey to Eels, Pike, and other ichthyophagous creatures. Golden Tench, nine inches in length, were turned out into various ponds at Haveringham, Oulton, and Park's Hill. At the former places they did not thrive, the Herons no doubt finding them out. At the latter place they seem to have done well, growing to fourteen inches and scaling three pounds. There were also small ones discovered, which suggests multiplication.

Some "Looking-glass" Carp (*Cyprinus specularis*) were turned into a North Cove pond at a little later period, but did not prosper; Mr. Everitt thinks that the Otters, which he pronounced "still too common" (!), found them out and destroyed them.

I visited Lowestoft on July 22nd (1909), taking a ramble on my way around Oulton Broad and Lake Lothing, my principal objective being an inspection of the natural history specimens exhibited in the well-known 'Wherry Hotel' at Oulton. Herein I found a very interesting collection of birds, including a Purple Heron (*Ardea purpurea*), Spoonbill (*Platalea leucorodia*), Pallas's Sand Grouse (*Syrrhaptes paradoxus*), and others, all shot in the neighbourhood. Here also were numerous cases of preserved fishes, of rare or record celebrity, among them being a Bream (*Abramis brama*) of 6 $\frac{3}{4}$ lb. With it is cased a 2 $\frac{3}{4}$ lb. fish which I believed to be a hybrid Bream \times Roach. Both fish were taken on Aug. 13th, 1881. A Black Bass (*Centropristes*

atrarius) is exhibited as the only survivor (!) captured out of a consignment from Austria that had been deposited in local waters; the others, it is believed, were all devoured by the Oulton Pike. Tench, Rudd, and Dace are represented, and a Golden Tench of 2 lb. from a pond near Lowestoft. There are some fine Perch, taken from one catch, and a well-preserved plaster cast of a fine lot of Roach, which suggests Buckland. Host Horne believes that the falling-off in the numbers of fresh-water fishes in that locality is greatly due to the disturbance caused by motor and steam launches, which fling a turbulent wake into the reeds, beating the vitality out of the ova thereto attached. There would seem some truth in this theory.

On the edge of a small arm of Lake Lothing, cut off from the main Broad by a railway embankment, and probably scarcely so salt, although connected by a sluice, I found dead examples of *Gasterosteus aculeatus*, varieties of both the Rough-tailed and Quarter-armed Stickleback. These had probably been killed in sexual fights; they were males in good colour, but had been bitten, apparently by crustaceans. It was odd to see stretches of reeds and sedges forefronted by "Raw" (*Chætomorpha linum*) and "Cabbage" (*Ulvæ lactuca*), species of semi-marine plants so commonly found on Breydon mud-flats, in among which I saw *Idotea* and *Sphæromida*, which were lively and busy enough. In the basins of the outer harbour Atherines were abundant, and Herring-syle was flashing in the sunlit waters.

There are numerous ponds, mostly private, scattered about East Suffolk which I should like to have explored, as well as riverways, locks, &c. I visited the Waveney on Aug. 12th, in company with Mr. H. E. Hurrell, who is keen on Rotifera and Polyzoa, and from what I saw of the *life* teeming in its translucent depths, and in odd corners rank with water-plants, I sincerely envied those whose opportunities to study it were better than mine. The Waveney, the Blythe, and the Alde, with their circuitous meanderings and marshy connections, invite careful research; while further to the south-east of the county still more magnificent opportunities offer in the wide-spreading estuaries of the Deben, the Orwell, and the Stour, whose marine fauna should provide excellent lists.

To come back to the marine fishes of East Suffolk—there is

much to be done by careful observation ; draw-netter's catches are to be watched to some profit, whilst shrimpers and wolders and punters, who trawl and dredge in the shallows and deeps around the Corton, Newcome, and Barber Sands, the Holm, the Sizewell Bank, and Aldeburgh Napes and the Ridge—the “rough grounds” and the sandy stretches—meet with a great variety of *genera*, some of which, as the *Gobidæ*, the Blennies, and the flat-fishes, muster quite a number of individual species. As a case in point—on June 16th, 1906, during a walk along Southwold beach, on which I casually looked into the boats drawn up awaiting the morrow's tide, I recognized no fewer than eighteen species, among them the Pogge, Spotted and Thornback Rays, Tope, Picked Dog, Greater Weever, and a very beautiful fresh Pilchard.

To further augment the list, investigations should be carried on in winter as well as in summer, for during storms and severe weather curious fishes, as the Opah and the Ray's Bream, muddled among the sand-banks, might be washed ashore. Some of my rarest finds at Yarmouth, *e.g.* the Müller's Scopelus (*Maurolicus borealis*) and the above-named species, have been thus unceremoniously tumbled upon the beach. The good-fellowship and co-operation of fishermen should be enlisted; there are ways of winning their help and sympathies besides an occasional screw of tobacco, and were they assured that a reasonable price attached to the bringing in of a strange although to them a worthless fish, it would soon find its way into the hands of a generous collector. The good offices of sea-anglers also are not to be despised, and even the urchins who loaf around quaysides may be made useful in adding to a naturalist's happiness.

The List of Species which follows is by no means a complete one; there are many gaps, even among the commoner species, to be filled in—fish which I am certain are to be found, and have been, but, as I have not had proper verification, have been necessarily left out, to be discovered and added by any person having time as well as inclination to follow my lead.

The abbreviations are as follow:—Nor. N. S. means ‘Transactions’ of the Norfolk and Norwich Naturalists’ Society; [], not indigenous or doubtful.

(To be continued.)

SOME SWISS BIRDS OBSERVED AT THE RHONE
GLACIER, KLEINE SCHEIDEGG, AND MACOLIN,
JURA BERNOISE, IN 1909.

BY REV. CHARLES W. BENSON, LL.D.

I HELD for some weeks in July and August, 1909, three chaplaincies in Switzerland:—

1. Rhone Glacier, 5742 ft. above sea-level.
2. Kleine Scheidegg, 6768 ft. above sea-level.
3. Macolin-over-Bienne, 2883 ft. above sea-level.

I venture to contribute some observations of the birds noted at these three stations, and also on the Grimsel Pass and the Furka, and up to a height of 8120 ft.

July 9th we left Meiringen in the diligence with five horses for Gletsch, the Rhone Glacier Hotel. When we had been out for about four hours we arrived at the Handeck Falls and Hotel, and were there told that further progress was impossible, as the Grimsel Pass was blocked with snow. We therefore reluctantly returned to Meiringen for the night. Next day we set out again, and were enabled providentially to get through, as rain had set in. But on the following day—Sunday—this changed to snow, and the Grimsel had seven feet deep of snow in it, and icicles, I was assured, at least one foot and a half long. The wires were all down, and even the iron rails fastened on stone posts on the road. Of course all communication was stopped, and travellers who came down by the Furka intending to pass over the Grimsel had to remain at the Rhone Glacier Hotel. The authorities told me that this was quite an unparalleled state of things in their experience—such a snowfall in July was a thing unheard-of before. Large numbers of soldiers with pioneers in front and many labourers set to work and opened the Pass for traffic by the Wednesday following. Before the great snowfall reached the valley, I noticed some Common Swifts and Wheatears not very far from the hotel, but they seemed to disappear

after the first day of the snowstorm, and I did not see them again.

My list for the Rhone Glacier Valley proper did not include more than half a dozen birds. Linnets and Redpolls were very numerous, Black Redstarts, Water Pipits, White Wagtails, and House-Martins were about all. When the weather moderated, however, and we were able to walk over the Grimsel and Furka roads, we added to the number. Wrens were very plentiful and in full song almost to about 7000 ft., and to my great surprise I heard Bonelli's Warbler and the Garden-Warbler at the same height. A few Alpine Choughs and Snow-Finches were also seen. Descending towards the Oberwald, 4316 ft., I observed the Wood-Warbler, the Whinchat, and many Goldcrests, and for the first time the House-Sparrow, though I had observed the Hedge-Sparrow on the Furka Strasse. A bird which I heard near the top of the Grimsel Pass was quite new to me, and I am very anxious to identify it if possible. The height was about 7000 ft., and the note of the bird, constantly repeated, sounded exactly like "Titchi, duck, duck."* There were evidently two birds answering each other, and in exactly the same phraseology. I never heard these notes before nor have I since, though on two occasions I revisited the spot, hoping to see and hear the utterers.

When I approached the spot where the birds were, they were immediately silent, but shortly after I saw on a rock some distance away, and one which I could not approach, a brown bird with pale breast, somewhat like a Garden-Warbler. I could not, however, be sure that this was the bird whose notes attracted me, though I think it was.

Near the Grimsel I also observed a Rock Thrush descending singing with uplifted wings close to the Todten See, "Lake of the Dead." I once had a similar experience on the Pilatus Kulm. Some distance above Grindelwald was the only place where I noted the Meadow-Pipit, and, at Interlaken only, the Serin Finch, but Chaffinches and Redpolls were extraordinarily numerous.

At the hotel on the top of the Furka Pass I found the House-Martins nesting, and circling at a great height in the air at an

* Mr. Warde Fowler suggests a Wheatear.

elevation of about 8000 ft., but nowhere did I find Swallows higher than about 3000 ft.

The Marmots in the Rhone Valley kept up their shrill whistling all day long, but it was difficult to sight them.

When we left the Rhone Glacier Hotel our next post was the Kleine Scheidegg, 6768 ft., and there I was led to expect many bird residents, such as "Blackcocks, Mountain Cocks (*sic*), Mountain Swallows," &c., but I could only find the following:—Crow, Redpoll, Black Redstart, Water-Pipit, and Siskin, or "Zeisig," as this little bird is called in Switzerland; but on the rocks over the Eiger Gletscher Station, 7620 ft., the first station on the wonderful Jungfrau Railway, there were many Alpine Choughs, and the air was filled with their shrill cries. I thought, also, that on one evening I saw one of the Ravens reported from the Lauberhorn circling round the station.

Redpolls were very numerous, and were to be found all along the descent from the Kleine Scheidegg to Grindelwald. On the Lauberhorn, 8120 ft., and the Männlichen, 7695 ft., there were no birds whatever.

My third chaplaincy was at Macolin-over-Bienne, Jura Bernoise, 2883 ft., a lovely spot with views embracing the distant Alps from Sentis to Mont Blanc, and there I noted thirty-two species; the most remarkable being the Common Buzzard, the Black Kite over the Lake of Bienne, and the Alpine Swift—numbers of these birds were circling round the Stadtkirche at Bienne; but I saw none at Berne, where, at one time, they were so numerous. Jays were also very plentiful in the pine-woods, and Willow-Warblers and Chiffchaffs were calling; Crested Tits were also common. I should think that in May this would be a splendid station for observing birds, as the woods are really magnificent, reaching down 1500 ft. and more to the lake below. It is easy also of access from England, being only about two hours from Bâle, whilst it can be reached even more speedily from Belfort.

On the whole, I noted fifty-two species in Switzerland, but I should probably have observed more were it not that my localities were for the first month at such high altitudes, and for the last in August, one of the most unfavourable months in the year for bird observation.

Macolin was reached from Bienne by a funiculaire in fifteen minutes, and at the station in Bienne Swallows had a nest near the roof, and the second brood were just beginning to fly as we were leaving at the end of August. Everything had been done to ensure their safety, perches and other conveniences had been provided, and the station was each year frequented by these birds.

In one year we were told that they built in the carriage itself which went up and down every hour about 1500 ft. to Macolin; they hatched out a brood going backwards and forwards with the car, and when the young were fairly well grown, allowed them to go up by themselves, and waited until they came down again to give them food.

NOTES AND QUERIES.

AVES.

The Whinchat at Wilsden.—*Pratincola rubetra* is not nearly so numerous as it was in the sixties in this district. Its scarcity, however, has been most marked within this last decade. Whether this may be due to natural or artificial or to both causes it would be difficult to say. The almost total disappearance of whin-covers from this neighbourhood may be one contributory, but cannot be the sole determining factor in the problem, since it is by no means confined to such places, but used to be quite at home nesting in our meadows, and next to the Titlark was the nest in which the Cuckoo used to deposit its egg; but I never once found the egg of the Cuckoo in the nest of this species that resembled the egg of the fosterer in the least degree, not even the type which approaches that of a Pied Wagtail. My only wish is that in the future it may yet return to our district in greater numbers to breed on our heathy wastes. Its well-known call-notes amid such associations, even now, awaken many pleasant memories.—E. P. BUTTERFIELD (Wilsden).

Marsh-Warbler in Bucks.—Two years ago I observed the nesting of the Marsh-Warbler at Thorpe, in Surrey, and recorded the same (Zool. 1908, p. 137), it being the first known instance of *Acrocephalus palustris* breeding in the county. Two nests were then found, the first with four eggs on June 14th, and a second nest on the 25th, also with four eggs. Last year I spent considerable time throughout the summer in trying to rediscover the birds around the same place, but was not successful, and I came to the conclusion that their occurrence was merely accidental. I was on the river on June 14th this year, and went ashore to inspect a very dense nettle-bed not very far away from the historic Magna Charta Island. Immediately on landing I found a Reed-Warbler's nest in an osier along the river front, which contained two eggs and one Cuckoo's. In proceeding to make my way through the tall dense nettles, I came suddenly upon the nest and two well-marked eggs of the Marsh-Warbler, and here also there was a Cuckoo's egg, though of a different type to the one I had just

previously found in the Reed-Warbler's nest. I was very surprised and pleased to again find the Marsh-Warbler breeding, and especially so at finding a Cuckoo's egg in the nest, for there are very few instances of its occurrence in England. The nest was placed some twelve yards back from the river on firm though damp ground; it was not more than eighteen inches from the ground, and was composed entirely of dry round bents, fairly substantially made, and having two live nettle-stems woven into the sides. The actual spot was in the parish of Wraysbury, in the county of Bucks (Wyrardisbury, as it used to be called), and is not more than five miles from the Surrey plantation where I met the birds in 1907. I informed my friend Mr. Edward Pettitt, of Wraysbury, of my find, and, as he is interested in ornithology, asked him to let me have any further news of the birds. On June 30th he succeeded in finding another nest in the same nettle-bed, and within a yard or two of my previous nest; this nest contained four Marsh-Warbler's eggs and one Cuckoo's, the latter being of a third type—that is to say, quite distinct from either the egg I found in my Marsh-Warbler's nest or in the Reed-Warbler's. This second nest was again built of dry bents and placed about eighteen inches from the ground, and had two pieces of dead loosestrife and two live nettles woven into the sides. It may be that the Marsh-Warbler is attempting to establish itself along this part of the Thames, but more evidence is required before one can form an opinion on this point. I may say, however, that previous to 1907 I had never met the bird in these parts, though I had worked along the river for many years, and always hoped to meet it one day.—GRAHAM W. KERR (Ditton Lodge, Datchet).

Raven in Surrey.—On the 12th September last I both heard and saw a Raven (*Corvus corax*) flying overhead here. The peculiar croaking sound was unmistakable. I believe this bird has not been previously, or at all events for many years, recorded in Surrey.—N. P. FENWICK, JUN. (The Gables, Esher, Surrey).

Cormorant in Warwickshire.—Replying to Mr. Smalley's suggestion (*ante*, p. 350), the bird I recorded (*ante*, p. 315) was of course, as I stated, a Cormorant and not a Shag. The Common Cormorant varies considerably in size, but the usual length seems to be about 36 in.; wing from 12·5 in. to 14·00 in. The bird I referred to was a small, young example, and thin. Its wing was 13 in.—O. V. APLIN (Bloxham, Oxon).

Nordmann's Pratincole in Yorkshire.—A specimen of Nordmann's Pratincole (*Glarcola melanoptera*) was shot at Reedholme, near Danby Wiske, on August 17th. It was flying with a flock of Green Plover at the time. — R. FORTUNE (5, Grosvenor Terrace, East Parade, Harrogate).

Machetes pugnax in Co. Mayo.—It may interest some readers of 'The Zoologist' to know that a Reeve was shot by Mr. H. Knox, of Greenwood Park, on August 30th last near Daleybann Lough, Bellacorick, Co. Mayo. This is only the fourth specimen that I know of shot in this western district, all being solitary birds shot during the autumn migration.—ROBERT WARREN (Moy View, Ballina).

NOTICES OF NEW BOOKS.

The Kea: a New Zealand Problem. By GEORGE R. MARRINER, F.R.M.S. Williams & Norgate.

APART from the ornithological point of view little can be said in favour of this bird; to the sheep-farmers it is too frequently a cause of heavy loss, to the sheep themselves it is a cruel and fatal vivisector. It has, however, been said—and Dr. Wallace in his 'Darwinism' largely popularised the idea—that the bird actually burrows into the living sheep, eating its way down to the kidney, which forms its special delicacy, an erroneous statement and unnecessary, for the Kea's record is black enough without this suggestion.

Mr. Marriner has written an excellent and exhaustive life-history of this destructive bird, and clearly proves, apart from the kidney myth, that if extermination at the hands of the sheep-farmers eventually ensues it will have earned its fate, though it is probable that it will survive in greatly diminished number rather than be added to the list of extinct birds. It inhabits the alpine regions of New Zealand, where the severity of the winter is especially felt, and "builds its nest, lays its eggs, hatches and rears its young, all during the severest months of the winter." It appears that all Keas do not kill or even

attack sheep; "usually one or two old birds, known as 'sheep-killers,' do the killing, and the others share the spoil"; neither do the Keas "choose the lambs or weaklings, but in most cases the choicest of the flocks is killed." Their depredations may be estimated by the complaint of one sufferer: "One year I had a bad muster; four hundred woolly sheep came in at the beginning of winter, when the snow fell and the sheep could not get away. I placed them, as I thought, in a safe position, on the hillside close to where I lived. In spring, when I went to have a look at them, the Keas had killed about two hundred of them." It is not surprising to read that a price has been put upon the heads of these marauders, usually 2s. 6d., though sometimes as much as 10s. We may feel a certain amount of pity for the destruction of birds who poach over our agricultural lands and orchards, but for the Kea, who puts the sheep to a particularly cruel and lingering death there need be little clemency. There will never be perfect peace between man and other animals; the most humane and tender-hearted florist would gladly sign a decree for the utter extermination of slugs by the most efficacious means. Some teachings of Socialism, the right to live with the right to share, fortunately fail with the treatment of the Slug and the Kea.

There can be little doubt that the Kea has, comparatively speaking, recently acquired its carnivorous propensities, and the different theories proposed to account for this change in habits are fully discussed by the author, who has successfully shown how a small volume can be written on a single bird, readable from beginning to end and containing all we want to know. The pages are well and fully illustrated.

Correction.—The publishers of 'The Wild Beasts of the World,' reviewed in our last issue (*ante*, p. 358), are T. C. & E. C. Jack, and not T. C. & E. C. Black, as printed.

THE ZOOLOGIST

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AN OBSERVATIONAL DIARY ON THE NUPTIAL HABITS
OF THE BLACKCOCK (*TETRAO TETRIX*) IN
SCANDINAVIA AND ENGLAND.

BY EDMUND SELOUS.

(Part I. SCANDINAVIA.)

IN the spring of 1907 an opportunity was given me through the kindness of Mr. Biesert, a Swedish gentleman of distinguished political and other attainments, to study the nuptial habits of Blackcocks in the neighbourhood of his wood-pulp manufactory in Wärrmland. Mr. Biesert being absent from home, on account of his health, and the old friend, for some years a member of his household, with whom I had been going to pass the time, having also to leave, through some unforeseen circumstances, I found myself in the novel position of being alone in a handsome and luxurious residence on the borders of a beautiful lake amidst Scandinavian pine-forests, with servants the most obliging and accommodating, in attendance, to whom, however, I was unable to say the shortest sentence except through the *Engelsk-Svensk* volume of a large dictionary, thoughtfully left on the table, which, if it were a question, would be answered, again by means of the *Svensk-Engelsk* portion. On the same basis less the dictionary which was not of portable size, I had also a forester; but Herr Höglind, the courteous and talented manager of the adjoining works, was always at hand through the telephone to

adjust matters whenever, in the way of difficulty, they "grew to a point." With all this, however—the romantic or novelistic part of the story—ornithology has nought to do, and I, therefore, leave it, to come, at once, to the scientific results of my visit—for field natural history is as scientific as astronomy, or any laboratory work.

April 12th, 1907.—This morning, having failed with the Capercailzies, I tried the Blackcocks, getting to the shelter I had put up, a day or two before, some time between three and four. At about 4 there was the angry "whush-ee" note of a Blackcock on the ground, and, shortly afterwards, the musical rookooing one—the "whirble" as I call it—of several from surrounding trees. This continued at intervals till, at about 5, three or four cock birds appeared on the ground, but at a considerable distance from where I sat. Also they kept getting behind a young fir, by which, though it was only some three feet high, and proportionately small, they were yet very much hidden. Still I was able to see most of what went on. The great feature was the spreading out of the tail, by which the curled feathers on either side became a very marked feature, much enhanced by the bunch of white ones between them. The two white spots on the shoulders were also very conspicuous, and beyond all, perhaps, the red comb or sere above the beak. The birds would stand or walk with the tail expanded in this manner, and the head held down except when, at intervals, with a little start and a note that seemed to express sudden impatience they craned it upwards, and sometimes, but by no means always, gave a little leap into the air. A quick succession of such movements on the part of some became a sort of dancing over the ground, in which I recognized, but very faintly, the astonishing performance of which on one occasion only, now some 8 or 9 years ago, I was a witness in Norway. Besides this, some birds faced, and even sparred a little at each other, but it was a very feeble and half-hearted affair, suggesting either that these particular individuals were not good fighters, or—which is perhaps more likely—that the season is as yet too early for the martial spirit to have become properly developed.

April 13th.—Started very early with Jacobsen (the forester), but wasted valuable time in unsuccessful quest of Capercailzies,

and it was only on our return, much later, that we visited the *lek* of the Blackcocks, and, creeping up the rocky ridge bounding it on one side, saw two or three of them on the ground. It was the same thing as yesterday, but even poorer, since it was almost over. Still there was a dance or two over the ground, more particularly of one bird, but if this was intended as a challenge, it was not responded to by any of the others, so that there was not even the semblance of a fight. The running and jumping were, each time, ushered in by a short flight, low over the ground, from the place where the bird had up to then been standing, and with the impetus of this, as it were, the leaping began. It was, I think, accompanied with some angry notes, but if so, they were hardly to be heard, so that the vocal effect produced by the bird I saw in Norway, which hissed and spluttered like an angry cat, was wholly wanting, and the dance itself not comparable in intensity. After a little of this the bird flew into one of the surrounding fir-trees, where it sat making the rough yet musical notes which are as characteristic of these northern fir-forests as is the Wood-Pigeon's cooing of our own woods. It then flew down again, and continued its ground performances for some time longer, and, when it next left, was accompanied by another bird, the two flying from one tree to another, and settling, at length, in closely adjoining ones, where they whirled at one another. In the display of the Blackcock some of the white feathers of the tail are seen above the black ones, even when the bird stands fronting one. There are also *two* white spots, violently conspicuous, on each shoulder, or thereabouts.

What part, if any, is played in all this by the hen bird? As yet I have not seen one anywhere, though probably, had any been about in the open, my glasses would have searched them out. This, however, is quite in keeping with the nuptial doings of the Ruff. She has no doubt yet to make her entry into the drama.

Though unsuccessful in seeing what I wanted to, with the Capercaillies, this morning, yet I had a good view, through the glasses, of one, a hen bird sitting on the very top of a fir-tree, which may be the accustomed perch chosen. The Blackcocks

also fly up into the tops of their trees, if not always into the top bough.

April 15th.—Up at 3 and went with the forester to the Blackcock *lek*, where he left me. I did not go into the shelter, but sat under a small fir-tree on the ridge, which commanded a much better view. From about 4, when it was still dark, the birds were noisy, first the rookling or whirbling note from the trees around the open space, and then, from the ground, apparently, those curious, loud, angry notes, having a sort of wheezing, whishing or sneezing sound in them, intensified sometimes, during the excited “dance,” as I have myself heard, before now, into a sort of hiss. The best rendering of the note I can give on paper is “to-whāsh” or “to-whāy.” It comes very suddenly and scrapily out of the gloom. Mingled with this I now hear, from time to time, a softer, quite different note, which may possibly be that of the hen; but it is impossible for me to see anything, and this is mere conjecture.

A little before 4.30 there is a pause, both the “to-whāshing” or “to-whāying” note—this last, I think, is nearer—from the ground, and the “rookling” one from the surrounding trees, cease, and with this it becomes gradually light. The place seems entirely deserted, and it is only in the distance, over a wide stretch of country, that I hear the latter occasionally.

The stillness now, at 5, is striking.

It is now 5.15, and, for some time, I have not caught the faintest note of a Blackcock. It seems as though there was a short space of nuptial activity amongst the birds, the first thing in the morning before light, and then, with the coming of daylight, a long pause.

5.25. — The whirbling now in evidence again, but very slightly.

At 5.45 a Blackcock comes sailing, like a Pheasant with spread wings, across the open space, and settles in a fir, just skirting it. He sits there erect, on its very top, his head held well up, as though listening for any impudent rooklings. Now they begin, but far off. He does not answer, and his first note is that angry “to-” or “tir-whāy” which I had connected with the bird being on the ground, but proves now to be independent of situation. Afterwards when three more males sit in firs

skirting the space—two, again, at the very tip-top—it is heard from one or another of them, and now the first-comer begins to rookle continuously. The note is now longer than before, and has a greater volume of sound in it. It is a sort of talking, and begins to sound, after a preliminary “roor” or two, wonderfully like the sentence, “Give him his coppers; he’s going to take the electric.” This may be fanciful, but so I suppose is the constantly repeated remark, or dark allusion, of the “Brain-fever” Bird in India, and having heard the thing once it is impossible not to go on hearing it, with increasing distinctness, every time the sound goes up, which it does continually, or almost so, during a whole hour, till I leave. At long intervals the bird stops to utter the more angry-sounding note, which is the only relief from this distracting hallucination.

At 7.30 no other birds are there, and I go.

April 17th.—Up at 3, and get to the place about 3.40.

First “tir-whāy” note at 3.45, and now come some very loud and striking ones. Then the rookling, and that other and more plaintive-sounding note that I have spoken of. With them all the air is now quite vocal. It is all amongst the belt of trees, however, and probably from amongst their branches. “Choc-choc-kerade,” in soft, complaining, yet resonant tones, represents, fairly well, the plaintive-sounding note.

4.5.—I can now see some birds—at least two in the arena; three or four, as it turns out, for all at once, now, at 4.15, there is a sudden and instantaneous flight of all of them back into the trees.

4.25.—It is now light, and the pause I spoke of, the other day, seems to have commenced. All around the arena silence reigns.

At 5.30 three birds, and then another one, fly down into the arena. They stand, or make a step or two, spreading out their tails, as described, and then two approach each other, uttering that note which I have called the plaintive one—very soft and plaintive-sounding it is—and conjectured might belong to the hen, but which would now seem to be the note of war *par excellence*. Once or twice the birds approach in this manner, but the utmost they do is to make a slight feint at one another. Then, all at once, all four—for there are not more—rise and fly into

the trees. From these rookling now proceeds, and the "Give him his coppers; he's going to take the electric" is as apparent as ever. It seems likely, therefore, that when I heard all these notes in the darkness the other morning some of the birds, at any rate, were in the arena, though it being, perhaps, a little darker then, I did not see them. Whilst still dark it is a good deal warmer than at and after daybreak, and whether for this reason or that the sexual stimulus is not yet fully developed, the birds seem shy, as yet, of remaining for long on the ground—certainly shyer than some days ago, when the weather was finer and warmer. These last two mornings—Monday and Wednesday—there has not been any of that darting and flying about over the ground, and springing into the air, that, though little compared to the tremendous "dance" which I *once* saw in Norway, in May, has yet been the most noticeable feature of these present nuptial performances. The difference between the earlier and later form of this sexual whirlwind, as it may be called—between the breeze and the whirlwind—is very great, insomuch that one would hardly at first, or without the evolutionary habit of thought, suppose that the one could have passed into the other. Nevertheless, the last is merely the first intensified, or, at any rate, if one imagines a constant addition, can very well be seen in this light.

In speculating on the meaning of this frenzy, as at its height it may be well called—indeed it then beggars description—of the Blackcock, its probable course of development must be considered. At first, as shown by my observations of the 12th and 13th, the actions indulged in are no more than slight exaggerations of ordinary flying and running about over the ground. There is little or nothing suggesting some special object to which they are adapted. They seem the outcome of general excitement, or, speaking more accurately, the more or less generalised outcome of a special kind of excitement, which we must hold to be the sexual kind, since, though the sexual instinct may be the greatest provocative of the combative one, we cannot identify it with this, but must suppose it to be anterior to and producing the other, as a consequence of itself. All creatures, whether combative or not, become thus excited during the pairing-time, such excitement standing, as I suppose, in direct connection

with the physiological development proper to the season. I would consider, therefore, that these violent motions are, in their incipency, at any rate, sexual rather than combative, to whatever end and object they may have been ultimately shaped, whether to that of terrifying rival males by a warlike display, or rousing the amatory feelings of the hen by a courting one. Also, should evidence of any more special end be wanting (end is perhaps the better word, as not implying consciousness), the benefiting of the bird through mere violent activity—erotic athletics one might call it—would be a quite sufficient one.

Observation is the only path by which we can arrive at true notions in regard to all this. At present I have observed that the birds, when they have seemed most like fighting, when they have most made believe of it as I may say—for of true fighting there has been as yet nothing—have sometimes, at any rate, if not always, approached and thus fainted, without any previous display of this sort—at least that seemed to stand in any immediate connection with it. This was certainly the case, this morning, when there was a little of this advancing, confronting, and half-hearted threatening—only a very little certainly—but not any previous saltatory movements. Probably Blackcocks sometimes quarrel and fight out of the breeding-season. It would be interesting to observe whether they then indulge in these antics. If not, they are, probably, not of the war-dance order. The same argument might even be applied in the case of a quarrel with another species, since if such actions, whatever their origin, have now become fighting ones, or such as usher in fighting, then fighting at any time and for any reason ought, one would think, to produce them. Thus male Stone Curlews, when threatening one another in the spring-time, fan the tail very effectively—which I look upon as essentially a sexual display. I have, however, seen one of these birds—when the two species were intermingled over a sandy area—make a rush at a Pheasant, who fled most ignobly, and the tail was not then fanned. Surely if the action had been evolved along lines of intimidation it would have become so essential a point in combat that it could never be dropped. So much then, for the present, in regard to the war-dance or challenging theory of these actions. As to that of sexual display, the hens have not yet put in an

appearance, which, however, is far from conclusive against it, since not merely association of ideas, in rivalry, but the season itself, without their presence, would be sufficient to produce them.

In the evening I questioned the forester, through the interpretership of Herr Höglind, in regard to certain statements which I had dimly understood him to make, as to certain winter habits of the Blackcocks here—to wit, their burrowing in the snow and eating their own excrements. From finding so many little collections of these in the forest—the whole country is either lake or forest, with open spaces of rock, moor, or peat-hag—I had surmised that it was the habit of the birds to void them in one spot, either coming to it singly, or at different times, or else collectively, for, from such heaps being frequently found in the open, they could not be accounted for as having fallen from their roosting-trees. Jacobsen, however, says that such collections are made by one and the same bird that has burrowed down in the snow and remained there for several days, or even weeks, if I understood him correctly—or say a week or ten days—eating their excrements many times over. He says that hard weather and scarcity of food oblige them to do this, and that it is their regular habit. Asked if several birds might not burrow in the snow together, like this, and the number of excrements be thus accounted for, and if they did not go together in winter, he said that they did go together, but that each one would make its own hole in the snow, so that there would be one here and another there, close together perhaps, but not united—a sort of Blackcock warren in the snow, it would seem. It seems to me possible, however, that though each bird makes its own separate hole in the snow, which indeed one would expect, yet that several may come together under it and stay thus for the sake of warmth. Yet even thus they would occupy some space, and it would, in fact, be impossible for such compact heaps as I have found to be produced by more than one bird, unless they had a special habit of voiding their excrements in one particular spot—and this seems highly improbable. I do not, however, see how the fact of the birds eating their excrements, as a means of nourishment, is made out, since Jacobsen did not profess to have actually seen them do so, which would have been difficult under

the circumstances. Not that the thing seems unlikely in itself, but since excrements are supposed to be the waste products of food, how should the birds be nourished by them, many times in succession? Moreover, the explanation would seem to be destructive of the phenomenon to be explained. Such heaps, however, certainly seem the products of a considerable space of time, and if the bird is all that time in the one spot, under the snow, which is what Jacobsen says, how is it nourished? As Jacobsen has passed his whole life in these forests, his father having been forester (the equivalent here of gamekeeper, or rather game-getter) before him, he may be supposed to have intimate knowledge of the bird's habits. The Capercailzie, he says, does not burrow in the snow, its food consisting entirely of pine-needles, so that it would never be driven to do so. In explanation of a large heap of over a hundred droppings of this bird under a tree, he said it would be from the same one roosting always on the same branch. To me it seems more likely that the Blackcock burrows under the snow to get food. But to do this it would have to move about, and, here again, these compact heaps of droppings seem rather curious.

April 18th.—To-day, unfortunately, was a blank, for having arranged with the forester not to call me any more, since I could now find my way to the *lek* alone, even in the dark, I overslept myself.

April 19th.—Called by the night watchman at 2.30, and started shortly after 3, getting to the ridge from which I watch in the first twilight of dawn. It is night, however, in the dark forest, and, as yet, silence. Then, just as I get settled and composed, in my rugs, comes the first almost sleepy "tir-whāy," then a pause, and another—still sleepy—and then several others no longer so, and now I hear the flight of a bird or two down, as I think, into the arena, where I seem for a moment, amongst the shadows, to distinguish one black form. Then comes the first imperfect whirble with another or two in the distance, whilst the "tir-whāying" increases, though with fluctuations.

Another near rookle. I can take no note of the hour, my watch (price 7s. 6d.) having become incapacitated for the second time. I have hardly been here ten minutes, however.

Some loud, fierce-sounding "tir-whāys," whilst the full

rookle—"give him his coppers, &c."—sounds now here and there. I can make out no birds, but from the sounds, some seem to be down, and might even be fighting. Very loud, harsh and fierce, now, are the "tir-whāys" (or "choc-heys"), and a white tail or two, as I think, gleams for a moment through the mist and frost of the bog—for it is in a part of a large swampy "peat-hag" or "moss"—which is the Swedish word—only just crossable, that the birds gather or should gather. I can see one now, clearly, and then the black body—blacker than night—whilst, from the sounds, birds seem to be flying and leaping, here and there, over the ground. The only one, however, that I can see distinctly, and keep in view, seems to be pretty quiet. Rookling comes all round about, now, as light slowly struggles out of the darkness. Before this, too, I have heard the plaintive-sounding, but really bellicose, "choc-choc-kerada" note. Now, however, when morning has really come, I can make out no birds.

Yes, one now—a coal-black blot. But the early pause has come, and there are none on the arena. Frost is over moss, grass, and bog-heather, and amidst the sombre green of the fir-trees the slender white stems of the birches—here mere saplings—slash the air in innumerable perpendicular cuts. All the sky to the westward is now a deep, dusky blue—almost purple—whilst slowly, from the eastern horizon, a brightness begins to climb. The silence and still beauty of the scene is impressive, and one might think that the birds were impressed with it, since, for a considerable time, now, there has not been a note of one.

Now, after a long interval, and in broad daylight—though the sun has not yet topped the firs, only fired them a little—the whirbling recommences, having been preceded by the harsher note.

A hen bird now flies down into the arena, and is courted first by one and then another cock that I had not seen before. She alights at some distance from either, and one comes over to her some time before the other. He courts her much in the way of the common Pheasant, passing by her, first on one side and then the other, and, as he does so, tilts his whole body sideways and downwards, towards her, so that she gets a near view of its

whole upper surface, the upper part of the farther side* (owing to the tilt) and the whole nearer side, consisting principally of the carefully drooped and spread wing. There is also the crimson-combed head, held down, with the swelled, glossy neck for her inspection, and of course the ornate tail. Thus poised, as it were, the bird passes in front of her, coming from behind, and then round on the other side, when he turns and repeats, and it is noticeable that the part wanting to complete the full circle is where, if he were to make it, he would pass directly behind her. Thus she gets as much of all the decorated parts as it is possible for her to do in a single *coup d'œil*—the tail, if I mistake not, being also tilted, so that the whole Cupid's bow of it is visible. The thick white feathers behind it do not seem so capable of being shown in this posture. A considerable portion of their ends, however, project over the black arch—or between the double arch—of the tail, and the rest must also be conspicuous, at least in flashes, and particularly when the cock passes in front of the hen, before turning to repeat his display on the other side. She has then a full view. Now when cock birds face one another, to fight, and when they strut, or face, or turn, by themselves, the tail is fanned, the wings lowered, and the head, though sometimes lowered, generally held erect. But this particular tilt of the body, as also a certain pace and look, which belong to it, is entirely wanting. This is most significant, for the object of the tilt is unmistakable, and demands the presence of the hen. Also it is to the female alone that one wing only—that nearest her—is presented and spread in a very particular way.

The hen bird seems by no means unalive to these attentions, which, however, may be not now so ardent as they probably become later on. Her manner is very conscious, and she has almost a nervous look. She does not, however, yield to them, but walks forward in a series of little starts, with pauses between. After a while the other (or another) cock comes up, and the two court her, in the above-described way, one on each side, but I again notice that the courtship does not seem very ardent, nor do the cocks, though they have made a show of fighting before,

* This seems to me now a little doubtful, though I have it on my notes (like Justice Stareleigh). It is unimportant—the bird shows quite enough.

show any signs of doing so now. The hen passes on, and after awhile flies into the surrounding fir-belt, and now that she is gone the two cocks again advance against each other, and there are the beginnings of a half-hearted fight between them. Thus the presence of the hen, on this occasion, has not brought about a combat, but rather diverted it. It is the very same observation which I have made, day after day, in the case of the Ruffs, whilst these were in the very height of the sexual frenzy. It is, in fact, obvious that if male birds assemble specially to court the hens, fighting must interfere with this object, so that if the courting is really the more important matter of the two, we might expect it to become gradually weaker, and, as it were, broken up, in birds which have developed these habits. On the other hand, if fighting, rather than courting, were the object of such assemblies, it is strange that ordinary observation gives quite a contrary idea. According to their relative importance, the one element, as it seems to me, must be weakened by the other, so that by what we see, in the presence of the hen, we may judge of such relative importance.

This is not the only hen that has appeared this morning. Another has sat on a baby fir within the arena, with a cock beside her on another one, whilst several others have flown over the ground and come down in the trees that encircle it. A greater number of cocks, too, than I have before seen have swept from this tree to that, whilst some half-dozen, perhaps, have come down upon the place, or sat in small firs close upon it, two of the former rookling continually. During this rookling the head is lowered, and the feathers of the neck swell and move. Then, with a sort of start, the bird raises its head, gives a little jerk of the wings, and stretching upwards, utters the fierce "choc-kai" note. There have been some little runs over the ground, but not very vigorous, and the leaping off it has been almost, if not quite, wanting. It was entirely wanting in the presence of the hen, forming no part of the display. All this last has been in the bright sunshine, which floods now both trees and arena. It is, however, most bitterly cold, and I can sit still no longer. But all, I think, is over for this morning.

The birds, therefore, are obviously in a more coming-on

disposition than they were, either the day before yesterday or any morning since I came, before it, nor is it likely that they were more forward before I came, since it is evident now, as I feared, and as is confirmed by Jacobsen, that I have come too early. Were it not for my oversleeping myself yesterday, I might almost say positively that this has been the first appearance of the hen upon the scene; yet, even now, only one has actually come down into the arena. In all, perhaps, some half a dozen cock birds entered it, but never all at the same time—four, I think, was the limit, exclusive of the one hen. When one or other of the cocks advanced towards another, to fight—or, at any rate, with this thought in its mind—it would make a sort of elastic quick step—hardly or only just a run—but not those remarkable leaps into the air, even as I have seen them made here, much less as I have in Norway (only, however, as I have before said, on one occasion). The war-dance—to call it so, for convenience sake—seems a special feature, which, as yet, has hardly come into play. I cannot say, as yet, therefore, whether it has more to do with fighting or courting.

(To be continued.)

ROUGH NOTES ON THE FISH AND FISHERIES OF EAST SUFFOLK.

BY ARTHUR H. PATTERSON.

(Continued from p. 392.)

LIST OF EAST SUFFOLK FISHES.

THREE-SPINED STICKLEBACK (*Gasterosteus aculeatus*).—It is safe to state that this species in its several varieties is plentifully distributed in all the ponds and ditches in the county. I found near Lowestoft examples of the Rough-tailed (*G. trachurus*) and Quarter-armed (*G. gymnurus*).

TEN-SPINED STICKLEBACK (*G. pungitius*).—I have found this in company with the Three-spined, in ditches bordering on the Waveney. Mr. C. W. Long informs me it is found in ditches near Oulton, and also in the Ham, between Lowestoft and Oulton Broad.

FIFTEEN-SPINED STICKLEBACK (*G. spinachia*).—Said to have been taken in the estuary of the Alde.

PERCH (*Perca fluviatilis*).—Much has been written of “the bold-biting Perch” as an inhabitant of Suffolk waters. Browne* makes reference:—“Perca or Pearch great & small. Whereof such as are in Braden on this side Yarmouth in the mixed water make a dish very daintie & I think scarce to bee bettered in England.” Lubbock† referred to the species (1848) as plentiful in the Bure and Waveney. He cites St. Olave’s as a “celebrated station for anglers,” where, “if Shrimps are up as high as the bridge, it is generally found that Perch are there also.” The favourite bait used by anglers was the Ditch Prawn (*Palæmon varians*), which abounds in the brackish marshland ditches. To-day St. Olave’s would be the last place chosen for Perch-fishing,

* ‘Natural History of Norfolk,’ by Sir Thos. Browne. Edited by the late T. Southwell, p. 52. 1902.

† ‘Observations on Fauna of Norfolk,’ by Richard Lubbock. Second edition, with notes and additions, by the late T. Southwell, p. 191. 1879.

although Bream and Roach are still occasionally to be taken on the neap-tides. The deepening of Yarmouth Harbour has "let in" so much more salt tide, which pushes up the rivers sometimes to an alarming extent. Christopher Davies* gives an account of a Perch taken in the "new cut" (between Haddiscoe and Reedham), weighing 7 lb. (!); and of a barber in Beccles who had captured "eleven Perch, weighing 2 lb. each, in one spot, in a couple of hours, using Gudgeon as bait." One is recorded as taken at Geldeston Lock, of 4 lb. weight.

AMERICAN ROSE PERCH (*Scorpaena dactyloptera*).—On April 24th, 1894, I obtained what I believe to have been the first of this species taken off the East Coast. It was captured in a Shrimp-net; length, $5\frac{3}{4}$ in. An 8 in. example came to me from Lowestoft, on Dec. 11th, 1895; and yet another was sent me by Mr. F. C. Cook in the spring of the present year (1909).

BASS (*Labrax lupus*).—Locally known as "Sea-Perch," this species is by no means rare off the Suffolk coast. Wake, of Southwold, curiously enough, omits it. Several have been captured off Claremont Pier, Lowestoft (Robson). Mr. Clarke, of Aldeburgh, had known one netted there weighing 18 lb., and one taken on a rod in August, 1906, scaling $16\frac{3}{4}$ lb. This fish is rarely taken off Yarmouth, and then runs of very small size. Mr. Whistler, of Aldeburgh, assures me that spinning for Bass provides excellent sport in the estuary of the Alde.

[BLACK BASS (*Micropterus salmonoides*).—An introduced species, which did not flourish; had it done so I think anglers would have very soon desired the extirpation of so voracious a fish.]

RUFFE (*Acerina vulgaris*).—Plentifully found in Fritton Lake, giving anglers who fish in shallows considerable trouble by its persistently taking the baits. The wisest thing to do when discovered by it is to shift to another spot as soon as possible.

SURMULLET (*Mullus surmuletus*).—Mostly taken among Mackerel. Mr. Howard Bunn states that "very fine specimens are taken [Lowestoft], and at times very plentifully."

SEA-BREAM (*Pagellus centrodontus*).—"Once or twice I have seen this on the [Lowestoft] market" (W. A. Dutt). Mr. Howard Bunn states that examples up to 4 lb. are brought in.

* 'Norfolk Broads and Rivers,' new edition, p. 21. 1884.

GILTHEAD (*Chrysophrys aurata*).—An accidental visitor. One is recorded from Pakefield, near Lowestoft, in April, 1829. This fish is named the "Gilthead" because of the brilliant golden spot or crescent between the eyes.

MILLER'S THUMB (*Cottus gobio*).—Mr. Dutt informs me that, when a boy, he used to catch Miller's Thumbs in a "beck" connected with the Waveney at Ditchingham, near Bungay. Mr. C. W. Long assures me there are a goodly number of this species to be found at Beccles.

FATHER-LASHER (*C. scorpius*).—Taken in Shrimp-nets, and known at Lowestoft and at Aldeburgh as the "Bull-rout." This large-headed, spine-armoured species (which is nicknamed at Yarmouth the "Hummer") Dr. Day ('British Fishes') suggests is "a degenerated variety of the Greenland Bull-head." Very beautifully coloured examples of *Cottus grœnlandicus* are occasionally brought into Yarmouth by the shrimpers. It undoubtedly extends its range further south.

BUBALIS (*C. bubalis*).—Occasionally brought into Yarmouth by shrimpers fishing between the port and Corton. It does not run so large as the preceding, from which it is easily distinguished by the very long spines upon the gill-covers.

FOUR-HORNED COTTUS (*C. quadricornis*).—On March 3rd, 1907, I received three examples of this species, the longest measuring $8\frac{1}{2}$ in., from the neighbourhood of Lowestoft.* I have since seen one taken off a pier at Yarmouth. The *Cottidæ* are distinguished by their bulky heads and the fan-like spread of the pectoral fins.

RED GURNARD (*Trigla cuculus*).—Small ones occasionally taken off Lowestoft with Shrimps. I saw one there on August 30th, about 8 in. in length, thrown out with the refuse from a Shrimp-boat. Southwold (Wake).

TUB-FISH (*T. hirundo*).—Fine examples brought to the Lowestoft wharf in May and June from the deep seas. Mr. Whistler informs me it has been taken off Aldeburgh. Locally known as the "Latchet."

STREAKED GURNARD (*T. lineatus*).—An example of this short-nosed Gurnard, taken off Lowestoft on March 9th, 1896, came into my hands.

* Cf. 'Zoologist,' 1907, p. 461.

POGGE (*Agonus cataphractus*).—Sir Thomas Browne calls it: "A little corticated fish about 3 or 4 inches long ours answering that weh is named piscis octangularis by Wormius, cataphractus by Schoneueldeus. Octagonis versus caput, versus caudam hexagonius." "A MS. note in Berkenhout says it was called at Lowestoft a Beetle-head (1769)" (T. Southwell). Abundant along the east coasts. I found numerous examples at Southwold among "refuse," and many small ones at Aldeburgh, Sept. 1st (1909). This queer little fish is entirely encased in bony plates.

GREATER WEEVER (*Trachinus draco*).—Common enough on Lowestoft wharf among "offal." An example taken on a hook off Claremont Pier (Robson). Referring to the poisonous properties of its first dorsal fin, Sir Thomas Browne says: "If the fishermens hands bee touched or scrached with this venemous fish they grow paynful and swell." This detested although toothsome fish is still notorious for its dangerous properties, while seine- and deep-sea fishermen still cautiously approach it when freshly shot out of the nets.

LESSER WEEVER (*T. vipera*).—Taken in shallow waters abundantly along the Suffolk coast. When strolling by the bank of the Blyth, at Walberswick, in company with Mr. Percival Westell, on August 4th, 1909, we came across quite a small heap of these fishes that had evidently been flung out of a boat, or had been, as he suggested, hooked by some urchin. Numbers are taken off Gorleston in draw-nets. On August 26th, 1909, I saw some visitors' children playing "fish-shops" with quite thirty of these fish, some of unusual size; they were handling them with impunity. Yarmouth smelters show the utmost disgust with this species, and are very careful not to handle it. At Southwold (Wake).

MAIGRE (*Sciaena aquila*).—A fine specimen of this noble fish, a straggler undoubtedly from the Mediterranean, where it is well known, was cast ashore at Thorpe, near Aldeburgh, on August 30th, 1868; length, 5 ft.; weight, 84 lb. The man who secured it thought it was a monster Bass, a fish it somewhat resembles, the spiny-rayed first dorsal fin much resembling that of the commoner fish. The tail, however, is truncated or rounded, that of the Bass being concave or forked. Two others

are recorded for the Norfolk coast, as having been taken in the Herring-nets.

MACKEREL (*Scomber scomber*).—"Scombri are mackerells in greate plentie," says Sir Thomas Browne, "though . . . a common fish yet our seas afford sometimes large & strange ones as I have heard from fishermen & others. & this yeare 1668 one was taken at Lestoffe an ell long by measure & presented to a Gentleman friend of myne." This must have been either a Tunny or a Bonito (3 ft. 9 in.!). The largest Mackerel I have ever seen was one taken off Yarmouth on October 21st, 1898; weight, 3 lb. 7 oz.; length, 21¼ in.; girth, 12 in.

[SCRIBBLED MACKEREL (*S. scriptus*).—This by some authorities is referred to as a variety of *S. scomber*. Occasionally found at Lowestoft among the preceding. There chance-time is found among the Mackerel a variety (*concolor*), blue-backed, but entirely without the familiar stripings.]

TUNNY (*S. thynnus*).—This is the species that Browne (see Mackerel) referred to. The Pagets* mention "small specimens [as] not infrequently taken during the Mackerel fishery." In Lowe's 'Notes' is a record from Mr. Gurney as follows:—"An immature specimen, taken off the Suffolk coast near Southwold, I believe, is preserved in the Norwich Museum" (Nor. N. S.).

PILOT FISH (*Naucrates ductor*).—The late Mr. J. H. Gurney (Nor. N. S.) says:—"Many years ago I saw a specimen freshly caught off the Suffolk coast, and sent for preservation to the late Mr. J. Tims, of Norwich, in whose house it was unfortunately destroyed by a fire on the premises."

DORY (*Zeus faber*).—"The local trawlers catch an occasional John Dory at Southwold" (R. J. Canova). "Occasionally in the Aldeburgh trawls" (Whistler). Is in no repute in East Anglia for the table.

BOAR-FISH (*Capros aper*).—Mr. T. E. Gunn, of Norwich, in his 'Catalogue of Fishes,' exhibiting at the Great International Fisheries Exhibition in London, 1883, refers to an example which was "caught off Lowestoft in May, 1881." I have seen only two—one taken in a Shrimp-net the same year; the other was washed up on the beach in May, 1882.

* 'Sketch of the Natural History of Great Yarmouth,' by C. J. and James Paget. 1834.

SCAD (*Trachurus trachurus*). — “Frequent off Lowestoft” (J. H. Gurney in Nor. N. S.). “Has been taken off Claremont Pier, Lowestoft” (Robson). “Not so frequent off Aldeburgh” (Whistler). “Before the herrings there comonly cometh a fish,” says Sir Thomas Browne, “about a foot long, by the fishermen called an horse . . . of a mixed shape between a mackerell & an herring.” It is known generally as the “Horse-Mackerel.”

SWORD-FISH (*Xiphias gladius*). — One brought into Lowestoft on Sept. 27th, 1893. Length, 9 ft. It had been entangled in a Herring-net. Another landed there, Sept. 27th, 1897. I understand that one was also recorded in November, 1882.

LITTLE GOBY (*Gobius minutus*). This tiny fish frequents the estuaries all along the Suffolk coast. Haunts muddy resorts.

YELLOW-SPECKLED GOBY (*G. auratus*). — Preferring a sandy habitat, this species abounds off the eastern coasts. I found examples in the Southwold and Lowestoft boats.

WHITE GOBY (*Latrunculus albus*). — I found one specimen in a Southwold boat in June, 1906. [I have six Gobies on my Yarmouth list, and am convinced that they all would be found off the Suffolk coast if carefully looked for.]

YELLOW SKULPIN (*Callionymus lyra*). — Abundant off Gorleston. I saw several at Lowestoft, August, 1909, in the Shrimp-catches.

LUMPSUCKER (*Cyclopterus lumpus*). — “By some esteemed a festiuall dish though it affordeth butt a glutinous jellie & the skin is beset with stony knobs after no certain order” (Browne). On Mr. Gunn’s ‘Fish List’ he refers to a fine example caught off Lowestoft on Jan. 30th, 1882; weight, $11\frac{3}{4}$ lb.; length, $20\frac{1}{4}$ in.; girth, 26 in. The roe was developed and contained thousands of eggs: Mr. Howard Bunn assures me that he has had this fish “in all colours,” and up to 28 lb. in weight. I have seen numerous young ones taken by the Shrimp-boats in spring the size of walnuts, which they much resemble in shape, of a rich emerald-green colour. Hele, in ‘Notes about Aldeburgh,’ mentions “an enormous specimen, weighing over fifteen pounds,” captured off that place, March 15th, 1868. Length, $22\frac{1}{2}$ in. “Occasionally at Aldeburgh in trawl-nets” (Whistler). Southwold (Wake).

SEA-SNAIL (*Liparis vulgaris*). — Abundant all along the East Coast. I found it plentiful among the “refuse” on Southwold

beach, and at Aldeburgh. Several at Lowestoft (August, 1909). This species is variously striped and marbled.

MONTAGU'S SUCKER (*L. montagui*).—I found two at Southwold, August, 1909.

ANGLER (*Lophius piscatorius*).—On the authority of the late Mr. T. Southwell, quite a number of this species were captured in the Mackerel-nets of Lowestoft in the autumn of 1897, a most unusual circumstance, I should consider, for such a sluggish, clumsy, ground-loving species. Mr. Dutt has seen examples at Lowestoft. "Fishing-Frog," Southwold (Wake).

WOLF-FISH (*Anarrichas lupus*).—"Catfish." Mr. Dutt mentions seeing several on the Lowestoft fish-market. This species, filleted and smoked, and made bright yellow with anatto, has of late years come into favour, and is sold as "Grimsby Haddock." The flesh is excellent eating, but not in much request, except under the disguise of smoked fish, or when fried at the fish-shop, where questions are seldom asked.

BUTTER-FISH (*Centronotus gunnellus*).—Known as "Nine Eyes," from the spots on the extended dorsal fin, and also as the Spotted Gunnel, this species is a common capture off Gorleston. I failed however, although carefully searching for it, to find it at either Aldeburgh or Southwold. A fine example brought me from a Lowestoft Shrimp-boat, September 9th, 1909, by Mr. F. C. Cook.

VIVIPAROUS BLENNY (*Zoarces viviparus*).—Common. Has been taken off Claremont Pier, Lowestoft. I saw a fine one netted in the Herring-basin, August 30th, 1909. "Caught at Aldeburgh" (Whistler). Breeds on this coast.

ATHERINE (*Atherina presbyter*).—This beautiful little fish seems to be remarkably abundant in all the Lowestoft basins throughout the summer months. It is most industriously angled for by young and old, and is known as the "Silver Smelt." "Occasionally at Aldeburgh" (Whistler).

GREY MULLET (*Mugil capito*).—This species used to swarm up Breydon fifty years since, and was common twenty-five years ago; thence it found its way up the Waveney and other local rivers, showing up in numbers in Oulton Broad. Col. Leathes ('Rough Notes') refers to a plan that was successful in its capture. Two men would row over the Broad, one holding a

light barbed spear, which he would adroitly throw into a shoal of Mullet, "success very often attending the cast." He was not smitten with the fish's edible qualities. Numerous at times at Aldeburgh, where it has been known to attain a weight of $9\frac{3}{4}$ lb. A nine-pound example is my largest recorded fish for Great Yarmouth. Southwold (Wake). Mr. Gurney writes:—"I have seen some fine specimens taken on the Suffolk coast, at the mouth of the River Orwell" (Nor. N. S.).

[LESSER GREY MULLET (*M. chelo*).—On November 10th, 1890, an example of this little-known species was foully hooked on Breydon. Length, $7\frac{1}{2}$ in. Dr. Günther identified it as a variety known as *M. septentrionalis*. I have no doubt this example was not alone, but that in all probability it (with its companions) was making for the waters of the Waveney.]

BALLAN WRASSE (*Labrus maculatus*).—"A young one, about eight inches long, was taken with hook and line in the outer harbour of Lowestoft in August, 1852"—"J. H. G." in Lowe's 'Notes' (Nor. N. S.). Mr. Howard Bunn has had several examples in for preservation. [The Jago's Goldsinny (*Ctenolabrus rupestris*) has on several occasions been brought to me by Yarmouth shrimpers during the past three summers. I cannot positively describe this as a Suffolk species, although the boats fish often as far south as Corton, and in all probability one or two, if not more, may have been taken off the Suffolk coast. It would be interesting to look for this fish, which grows to a span in length, is of a lively, almost goldfish-red when freshly taken, with decided black spottings on the base of the tail and on the anterior part of the dorsal fin. Other Wrasses undoubtedly occur.] The *Labridæ* are widely distributed in British waters, preferring rocky haunts. They run to a considerable size, and by some are adjudged good eating. The flesh to me is soft and glutinous, with the bones over-much pronounced. Their colours are brilliant, especially during the breeding season.

(To be continued.)

CHECK-LIST OF THE GENERIC NAMES OF LEECHES,
WITH THEIR TYPE SPECIES.

BY ROBERT T. LEIPER, M.B., F.Z.S.

Helminthologist to the London School of Tropical Medicine.

- Abranchus*, Johannson, 1896. Type: *A. brunneus*, Johannson, 1896.
- Acanthobdella*, Grube, 1850. *Type: *A. peledina*, Grube, 1850.
- Actinobdella*, Moore, 1901. *Type: *A. insquiannulata*, Moore, 1901.
- Adenobdella*, Leidy, 1885. Type: *A. oricola*, Leidy, 1885.
- Albione*, Savigny, 1820. Type: *A. muricata*, Linnæus, 1767.
- Archeobdella*. (Original not found.)
- Astacobdella*, Vallot, 1840. Type: *A. branchialis*, Vallot, 1840.
- Aulastoma*, Moquin-Tandon, 1826. *Type: *A. nigrescens*, Moquin-Tandon, 1826.
- Batrachobdella*, Viguier, 1879. *Type: *B. latastei*, Viguier, 1879.
- Bdella*, Savigny, 1820. (*Type: *Hirudo nilotica*, Savigny, 1820), preocc. 1795.
- Blennobdella*, E. Blanchard, 1849. *Type: *B. depressa*, E. Blanchard, 1849.
- Branchellion*, Savigny, 1820. *Type: *B. torpedinis*, Savigny, 1820.
- Branchiobdella*, Odier, 1823. *Type: *B. astaci*, Müller, 1806.
- Calliobdella*, v. Beneden et Hesse, 1863. Type: ? *C. lophii*, v. Beneden et Hesse, 1863.
- Centropygus*, Grube, 1858. *Type: *C. jocensis*, Grube, 1858.
- Chthonobdella*, Grube, 1865. *Type: *Hirudo limbata*, Grube, 1865.
- Clepsine*, Savigny, 1820. Type: *Hirudo bioculata*, Bergmann, 1757.
- Codonobdella*, Grube, 1872. Type: *C. truncata*, Grube, 1872.
- Cyclicobdella*, Grube, 1871. Type: *C. lumbricoides*, Grube, 1871.
- Cyclobdella*, Wegenbergh, 1877. Type: *C. glabra*, Wegenbergh, 1877.
- Cystobranchnus*, Diesing, 1859. ? Type: *C. respirans*, Troschel, 1850.

* Type, only species originally in the genus.

† Type, designated.

- Dactylobdella*, v. Beneden et Hesse, 1864. *Type: *D. musteli* v. Beneden et Hesse, 1864.
- Dermobdella*, Philippi, 1867. Type: *D. purpurea*, Philippi, 1867.
- Diestecostoma*, Vaillant, 1890. Type: *D. mexicana*, Baird, 1869 (for *Heterobdella*, Baird).
- Dina*, R. Blanchard, 1892. †Type: *D. quadristriata*, Grube.
- Dineta*, Goddard, 1908. *Type: *D. cylindrica*, Goddard, 1908.
- Diplobdella*, Moore, 1900. *Type: *D. antellarum*, Moore, 1900.
- Entobdella* Blainville. (Original not found.)
- Epibdella*, Blainville, 1828. Type: *Hirudo hippoglossi*, Linnæus, 1767.
- Erpobdella*, Blainville, 1828. Type: *Hirudo vulgaris*, Linnæus, 1767.
- Eubbranchella*, Baird, 1869. Type: *Hirudo branchiata*, Menzies, 1791.
- Geobdella*, Blainville, 1828. Type: *Trocheta viridis*, Dutrochet, 1817.
- Geobdella*, Whitman, 1886 (preocc. 1828).
- Glossiphonia*, Johnson, 1816. Type: *G. tuberculata*, Johnson, 1816.
- Glossobdella*, Blainville, 1828. Type: *Hirudo complanata*, Linnæus, 1767.
- Glossopora*, Johnson, 1825, nomen novum for *Glossiphonia*.
- Gnatho*, Goldfuss et Schinz, 1828. Type: *Hirudo piscium*, Müller, 1774.
- Gyrocotyle*, Diesing, 1850. Type: *G. rugosa*, Diesing, 1850.
- Hæmadipsa*, Tennent, 1860. Type: *H. ceylanica*, Bosc., 1802.
- Hæmentaria*, Filippi, 1849. Type: *H. ghiliani*, Philippi, 1849.
- Hæmocharis*, Savigny, 1820. Type: *Hirudo piscium*, Müller, 1774.
- Hæmopsis*, Savigny, 1820. Type: *Hirudo sanguisuga*, Linnæus, 1767.
- Helobdella*, Blanchard, 1896. †Type: *Hirudo stagnalis*, Linnæus, 1767.
- Heluo*, Oken, 1815. (Type: *Hirudo complanata*, Müller), preocc. 1813.
- Hemibdella*, v. Beneden et Hesse, 1863. *Type: *H. soleæ*, v. Beneden et Hesse, 1863.
- Hemiclepsis*, Vejdovsky, 1883. †Type: *Hirudo marginata*, Müller, 1774.
- Herpobdella*, vide *Erpobdella*.
- Heterobdella*, v. Beneden et Hesse, 1863. Type: *H. pallida*, v. Beneden et Hesse, 1863.

- Heterobdella*, Baird, 1869. (Type: *H. mexicana*), preocc. 1863.
Hexabdella, Verrill, 1872. *Type: *H. depressa*, Verrill, 1872.
Hippobdella, Blainville, 1828. Type: *Hæmopsis sanguisorba*, Savigny, 1820.
Hirudella, Munster, 1842. Type: *H. angusta* or *H. tenuis*, Munster, 1842 (doubtful fossil).
Hirudinaria, Whitman, 1886. Type: *Hirudo javanica*, Wahlberg, 1855.
Hirudo, Linnæus, 1767. Type: *Hirudo medicinalis*, Linnæus, 1767.
Histriobdella, v. Beneden, 1858. *Type: *H. homari*, v. Beneden, 1858.
Hybobdella, Wegenberg, 1877. Type: *H. doringii*, Wegenberg, 1877.
Ichthiobdella, Blainville, 1827. Type: *I. geometra*, Blainville, 1827.
Jatrobdeella, Blainville, 1828. Type: *Hirudo medicinalis*, Linnæus, 1767.
Leptostoma, Whitman, 1886. (Type: *L. pigrum*, Whitman, 1886), preocc. 1837.
Limnatis, Moquin-Tandon, 1827. Type: *Hirudo nilotica*, Savigny, 1820.
Limnabdella, Blanchard, 1893. †Type: *L. mexicana*, Blanchard, 1893.
Liostomum, Wagler, 1831. *Type: *L. coccineum*, Wagler, 1831.
Lophobdella, Poirier et Rochburne, 1884. *Type: *L. quatrefagesi*, Poirier et Rochburne, 1884.
Lumbricobdella, Kennel, 1886. Type: *L. schæfferi*, Kennel, 1886.
Macrobdella, Philippi, 1872. *Type: *M. valdiviana*, Philippi, 1872.
Macrobdella, Verrill, 1872. *Type: *Hirudo decora*, Savigny, 1820.
Mesobdella, Blanchard, 1893. *Type: *H. gemmata*, Blanchard, 1893.
Microbdella, Blainville, 1845. (Original not found.)
Microbdella, Moore, 1900. Type: *M. biannulata*, Moore, 1900.
Mimobdella, Blanchard, 1897. Type: ?*M. japonica* or *M. buttkoferi*, n. spp., Blanchard, 1897.
Myzobdella, Leidy, 1851. *Type: *M. lugubris*, Leidy, 1851.
Nepheleis, Savigny, 1820. †Type: *Hirudo vulgaris*, Müller, 1774.
Nepheleopsis, Verrill, 1872. *Type: *N. obscura*, Verrill, 1872.
Notostomum, Levinsen, 1881. *Type: *N. læve*, Levinsen, 1881.
Ophibdella, v. Beneden et Hesse, 1863. *Type: *O. labracis*, v. Beneden et Hesse, 1863.

- Orobdella*, Oka, 1895. Type: *O. whitmani* (probably), or *O. ijimai*, *O. octonaria*, n. spp., Oka, 1895.
- Oxyptychus*, Grube, 1848. Type: *O. striatus*, Grube, 1848.
- Oxytonostoma*, Malm, 1863. Type: *O. typica*, Malm, 1863.
- Ozobranchus*, Quatrefages, 1852. ?Type: *O. branchiatus*.
- Pachybdella*, Diesing, 1850. Type: *P. rathkei*, Diesing, 1850.
- Pæcilobdella*, Blanchard, 1893. †Type: *Hirudo granulosa*, Savigny, 1820 (subgenus of *Limnatis*).
- Palæobdella*, Blainville, 1828. Type: *Hirudo nilotica*, Savigny, 1820.
- Philæmon*, R. Blanchard. (Original not found.)
- Philobdella*, Verrill, 1872. Type: *P. floridana*, Verrill, 1872.
- Phormio*, Goldfuss et Schinz, 1820. Type: *Hirudo muricata*, Linnæus, 1767.
- Phytobdella*, Blanchard, 1892. *Type: *P. meyeri*, Blanchard, 1892.
- Pinacobdella*, Diesing, 1850. *Type: *P. kolenatti*, Diesing, 1850.
- Piscicola*, Blainville, 1828. Type: *Hirudo piscium*, Müller.
- Placobdella*, Blanchard, 1893. ?Type: *P. raboti*, Blanchard, 1893.
- Planobdella*, Blanchard, 1892. Type: *P. modesta*, Blanchard, 1892.
- Platybdella*, Malm, 1863. ?Type: *P. sexoculata*, Malm, 1863.
- Podobdella*, Diesing, 1850. *Type: *P. endlicheri*, Diesing, 1850.
- Pontobdella*, Leach, 1815. Type: *P. verrucata*, Leach, 1815.
- Praobdella*, Blanchard, 1896. Type: *P. büttneri*, Blanchard, 1896.
- Protoclepsine*, Moore, 1898. *Type: *P. sexoculata*, Moore, 1898.
- Protoclepsis*, Livanow, 1902. *Type: *Hirudo tessellata*, Müller, 1774.
- Pseudobdella*, Blainville, 1827. Type: *Hæmopsis nigra*, Savigny, 1820.
- Pseudobranchellion*, Apathy, 1890. *Type: *P. margoï*, Apathy, 1890.
- Saccobdella*, v. Beneden et Hesse, 1865. Type: *S. nebalia*, v. Beneden et Hesse, 1865.
- Salifa*, Blanchard, 1897. *Type: *S. perspicax*, Blanchard, 1897.
- Sanguisuga*, Savigny, 1820. Type: *Hirudo medicinalis*, Linnæus, 1767.
- Scaptobdella*, Blanchard, 1897. *Type: *S. horsti*, Blanchard, 1897.
- Schlegelia*, Wegenberg, 1877. (Type: *S. nepheloides*, Wegenberg, 1877), preocc. 1864.

- Scorpenobdella*, Saint-Loup, 1886. Type: *S. elegans*, Saint-Loup, 1886.
- Semiscolex*, Kinberg, 1866. †Type: *S. juvenalis*, Kinberg, 1866.
- Semilageneta*, Goddard, 1908. *Type: *S. hilli*, Goddard, 1908.
- Theromyzon*, Philippi, 1867. *Type: *T. pallens*, Philippi, 1867.
- Torix*, Blanchard, 1898. Type: *T. mirus*, Blanchard, 1898.
- Trachelobdella*, Diesing, 1850. Type: *T. mülleri*, Diesing, 1850.
- Trochetia*, Dutrochet, 1817. *Type: *T. subviridis*, Dutrochet, 1817.
- Typhlobdella*, Diesing, 1850. Type: *T. kovatsi*, Diesing, 1850.
- Whitmania*, Blanchard, 1887. Type: *Leptostoma pigrum*, Whitman, 1886 (for *Leptostoma*, preocc.).
- Xerobdella*, Frauenfeld, 1868. *Type: *X. lecomtei*, Frauenfeld, 1868.

The following generic names are not included in the lists published by Scudder ('Nomenclator Zoologicus'), the 'Zoological Record' (Index, 1880-1900):—

Archeobdella, *Astacobdella*, *Chthonobdella*, *Dermobdella*, *Dina*, *Eubbranchella*, *Gnatho*, *Hæmadipsa*, *Microbdella*, *Notostomum*, *Whitmania*, *Xerobdella*.

ON THE HYMENOPTEROUS PARASITES OF RHYNCHOTA.

BY CLAUDE MORLEY, F.E.S., F.Z.S.

(Concluded from p. 347.)

95. *Aphis papaveris*, Fabr.

From an *Aphis* on *Papaver somniferum*, Giraud bred (Ann. Soc. Fr. 1877, pp. 415-427) *Praon volucre*, Hal., *Trioxyys auctus*, Hal., *Allotria castanea*, Htg., *Encyrtus atheas*, Walk., *Pachyneuron aphidiphagus*, Ratz., *Isocrates æneus*, Nees, and *I. vulgaris*, Walk. Reinhardt, however, bred quite different insects from *Aphis papaveris* (Berl. Ent. Zeit. 1857, p. 77; *l. c.* 1858, p. 12; et Stett. Ent. Zeit. 1859, pp. 194-6), since these were *Pachycrepis clavata*, Walk., *Aphelinus flavicornis*, Först., *A. tibialis*, Nees, and *Tetrastichus diaphantus*, Walk. (*cf.* Gaulle, Cat. 103-107).

96. *Aphis cardui*, Linn.

Aphidius cardui, Marsh. (Bracon. d'Europ. iii. 594) was bred by Bignell in Devon very commonly from this species in the middle of July, while of *A. cirsii*, Hal., he bred but one, in June, and it is to this species that Marshall is of opinion (*l. c.* 589) Buckton refers as the commoner parasite. From an *Aphis* feeding on *Carduus nutans* Kieffer records his new *Lygocerus antennalis*, var. *subserratus*.

97. *Aphis instabilis*, Buck.

Only Bignell has recorded (Trans. Devon. Ass. 1901, p. 690) the presence of parasites upon this species; he bred *Aphidius cirsii*, Hal., from it in South Devon, on June 13th, 1883.

98. *Aphis sambuci*, Linn.

Gaulle tells us that the Cynipid, *Allotria circumscripta*, Htg., has been bred from this species, which is said to be common in Britain (*cf.* Cat. 26). I took it at Cosham, Hants, July, 1909.

99. *Aphis myosotidis*, Koch.

Three direct parasites have been bred from this species by Bignell in Devon. The commonest probably is *Aphidius avenæ*, Hal., with its hyperparasitic *Allotria cursor*, since he bred but two of each sex of *A. matricariæ*, Hal., on Oct. 22nd, 1884, and but once, on the same date, *A. polygoni*, Marsh. (cf. Br. d'Europ. ii. 572, 592, 603).

100. *Aphis amygdali*, Fonsc.

The figure of Buckton's inadequately described *Cynips atriceps* (Mon. Aph. ii. 106 et 150, pl. lxxiii. fig. inf.), which he bred from this *Aphis*, clearly shows it to be a Cynipid and no "*Diplolepis*," to which, believing it a genus of *Proctotrypidæ* (!), he wished later (ii. addenda) to ascribe it. Cameron was unable to interpret it, and I have failed to find the type in Buckton's collection, now in the British Museum; but a study of the figure leads me to believe it an "artistically" drawn female of *Allotria minuta*, Htg.

101. *Aphis aparines*, Kalt.†

Allotria posticus, Htg., was bred from an Aphid under this name by Kirchner (Cat. 31).

102. *Aphis euphorbiæ*, Koch.

From Aphides on *Euphorbia paralias*, supposed by Marshall to be this species which is not mentioned as British by Buckton, Bignell bred two males of the new *Aphidius euphorbiæ*, Marsh., on July 4th, 1885.

103. *Aphis crithmi*, ? auct.

Bignell bred *Aphidius crithmi*, Marsh., from this species in

† It is not now known to which of our *Aphidiinæ* such aphidiphagous species as *Ichneumon aparines*, Schr., *I. dipsaci*, Schr. (employed by Giraud), and *I. aphidiphagus*, Schr. (F. B. ii. 308, Bavaria), *I. aphidum*, Linn. (F. S. 1643, misplaced by Spinola and restored by Fallen to the *Aphidiinæ*), or *Cryptus aphidum*, Fab., may belong. It was, I believe, Van Leeuwenhoek who first noticed Hymenopterous parasites upon *Aphididæ* in his 'Arcana Naturæ' in 1695. Frisch, Cestoni, and De Geer first gave accurate accounts of their metamorphoses. *Ichneumon aphidum*, L., is synonymised by Haldaday, with some doubt, with his *Aphidius cirsii* (Ent. Mag. 1835, p. 101), and Westwood (Introd. ii. 132) refers the "Cinips de l'Ichneumon des Pucerons" of Geoffroy (ii. 305) to the *Chalcididæ*.

Devon on July 2nd, 1884, and *A. loniceræ*, Marsh., from it on the following day (Trans. Devon. Ass. 1901, p. 689).

104. *Aphis pteridis*, ? auct.*

From an Aphid under this name Dalla Torre (Cat. iii.) tells us that Reinhard has bred *Aphelinus euthria*, Walk.

105. *Aphis medicaginis*, ? auct.*

Three parasites, all apparently indirect, are said by Kieffer to attack this species, or, more correctly, his *Lygocerus aphidum* and *L. subtruncatus* are recorded from an aphid on *Medicago sativa*, which we may suppose to belong here. The other Cynipid is *Alloxysta scutellata*, Kief.

106. *Aphis monardæ*, ? auct.*

Howard tells us in his 'Revision of the *Aphelinæ* of North America' (p. 24) that an *Aphis* of this name is attacked by *Aphelinus mali*, Hald.

107. *Aphis primulæ*, ? auct.

Both Dours† and Gaulle (Cat. 87) record *Aphidius rufus*, Gour., as parasitic upon this species, which is not indicated by Buckton, though probably the same as that mentioned by Newman (Ent. Mag. 1836, p. 208) as inhabiting the cowslip, but not primrose.

108. *Hyalopterus pruni*, Fabr.

His *Macrostigma aphidum* is recorded from this species by Rondani (Bull. Soc. Ent. Ital. 1874, p. 134 et *l. c.* 1877, p. 184).

109. *Hyalopterus arundinis*, Fabr.

His *Lygocerus antennalis* has been mentioned by Kieffer as preying upon *Aphis arundinis* (André, Spp. Hym. Europ.).

110. *Chaitophorus populi*, Linn.

The only known parasite of this common species is *Hypsicamara ratzeburgi*, as given by Reinhard (Stett. Ent. Zeit. 1859, p. 195).

† Goureaux's breeding of *Aphidius rufus* was, I believe, first published by Dours (Cat. Hym. France, 1874, p. 81), and he ascribes the parasite to Förster. Dours' hosts are so unreliable as a whole, however, and have recently been so thoroughly revised by my friend M. de Gaulle, that I have not troubled to examine his work, mainly culled from Goureaux in this respect, very closely.

111. *Chaitophorus aceris*, Linn.

Haliday described (Ent. Mag. 1833, p. 490) his *Trioxya aceris*, of which he says, "Prodiit mihi ex Aphidibus Aceris Pseudoplatani Julio mense," from the same specimen as is figured and described by Curtis (B. E. pl. et fol. 383) under the name *Aphidius cirsi*, through the latter erroneously supposing it to have been bred from an aphid on *Cirsium (Carduus) arvense*. Curtis's name should, however, be restored, on account of its two years' priority. *Aphidius restrictus*, Nees, and *A. rosæ*, Hal., are also given as preying upon this species by Gaulle (Cat. 87). Ratzeburg's *Chrysolampus (Sphegigaster) aphidiphagus* is probably a hyperparasite; he says of it (Ichn. d. Forst. i. 181 et ii. 184), "Später hat Hr. Bouché dasselbe Thier aus *Aphis Aceris* erzeugt." Buckton gives (Mon. Aph. ii. 125) a remarkable account of receiving two oviparous females of this species from Montpellier, which had deposited three apparently normal eggs *en route*; the latter were left exposed, and the following morning were found to consist merely of shrivelled membranes. Their parents had already been parasitised by a species of *Aphidius*, and Buckton suggests that the latter's larvæ had penetrated the eggs within the Aphides' bodies. He, however, thinks that the parasites may have been *Pteromali*, one species of which, *P. ovulorum*, Först. (given at *l. c.* 154, though not associated), is known to lay its eggs within those of Aphids; and of it Buckton says: "The parasitic egg afterwards discloses the young grub, which attacks the aphid hardly older than itself." But I have never heard of an egg, containing a Hymenopterous parasite, attaining the larval state. Surely the mere pressure of a foreign substance within the host-egg, to say nothing of its ruptured shell, would preclude development; and certainly the whole account requires confirmation.

112. *Pterocomma pilosa*, Buck.

Six females of *Aphidius pterocommæ*, Marsh. (Bracon. d'Europ. ii. 579), were bred in Devonshire on June 24th, 1889, by Bignell from this species.

113. *Cryptosiphum gallarum*, Kalt.

Allotria victrix, Westw., and Kieffer's new *A. orthocera* are said by Gaulle to have been raised from this species (Cat. 26, 27).

114. *Callipterus betularius*, Kalt.

Marshall knew but a single female of his *Trioxys betulæ*, and this had been bred from the present host by Bignell in Devonshire (Bracon. d'Europ. ii. 554).

115. *Callipterus coryli*, Goet.

The Chalcid, *Myina flava*, is said by Buckton (Mon. Aph. ii. 156 et iii. 18) to oviposit freely in the larvæ of both this and the following species. Cameron (Phyt. Hym. iii. 2331, following Kaltenbach) records *Allotria brachyptera*, Htg., from an Aphid on *Fraxinus*, which is probably referable to the present species, since it is the only one mentioned by Buckton as feeding on ash.

116. *Callipterus quercus*, Kalt.

The common and polyphagous *Praon volucre*, Hal., is said by Marsh. (Bracon. d'Europ. ii. 540) to prey upon this common species, together probably with its hyperparasites, *Allotria ullrichi*, *Isocrates vulgaris*, and *Lamprotati*. Bignell also bred in Devon the unique specimen of *Aphidius callipteri*, Marsh. (l.c. 610) from this host. Giraud bred his *Tetrastichus aphidum* from an "*Aphis sur Quercus*" (Ann. Soc. Fr. 1877, p. 432), and *Myina flava* also attacks it, as noticed under the last species.

117. *Pterocallis alni*, Fabr.

This abundant species is said by Kieffer to be parasitised by his new *Alloxysta transiens*.

118. *Pterocallis juglandicola*, Kalt.

In the middle of September, 1907, at Sibton Abbey in Suffolk, I took a large winged female of this species, whose dead body was attached to the cocoon of an already emerged species of *Praon*.

119. *Pterocallis tiliæ*, Linn.

Praon flavinode, Hal., a rare species with us and unknown on the Continent, has been bred from this species in Devonshire by Bignell on Oct. 1st, 1883 (Trans. Devon. Ass. 1901, p. 688); its hyperparasites may be Kieffer's new *Allotria albipes*, which he records from *Aphis tiliæ*, and the Chalcid, *Myina flava*, of whose parasitism upon the present host Buckton (Mon. Aph. iii. 18) was doubtful.

120. LACHNUS.

Giraud gives two parasites, *Allotria forticornis*, Gir., and *Megaspilus fuscipes*, Nees, as preying respectively upon the Aphids of *Pinus pumilio*, and, according to Perris, on those of *P. maritimus*. These probably belonged to this genus (*cf.* Ann. Soc. Fr. 1877, pp. 416, 434).

121. *Lachnus pini*, Linn.

Aphidius pini, Hal., has been bred from this species on *Abies excelsa* by Bignell in Devonshire on Feb. 16th, 1886, the host of which had been captured during the preceding September, and possibly a different one of the same genus on *Pinus sylvestris* and *Abies larix* by Haliday (Marsh. Bracon. d'Europ. ii. 567). Marshall's unique female of his *Aphidius abietis* was also bred by Bignell ten days after capturing the host on *Abies excelsa* in Cann Woods, Devon, on Aug. 6th, 1886 (*l. c.* 566). *A. (Cælonotus) pictus*, Hal., is also recorded from this species by Gaulle (Cat. 86), as is *Notanisus versicolor*, Walk. (p. 96). Kirchner (Cat. 30) tells us *Allotria circumscripta*, Htg., has been bred from *Aphis pini*, Klt.

122. *Lachnus australis*, Ashm.*

Ashmead has described three parasites upon this American species: *Lygocerus (Chirocerus) floridanus* (Trans. Amer. Ent. Soc. 1881, Proc. p. xxxiv.), *Encyrtus lachni* (*l. c.* 1885, p. xvi.), and *Pachycrepis lachni* (*l. c.* 1887, p. 193).

123. *Stomaphis quercus*, Linn.

In describing his *Aphidius wissmannii*, Ratzeburg says (Ichn. d. Först. ii. 59): "Hrn. Wissmann verdanken wir die Entdeckung des schönen Insectes. Er erzog es in Menge aus *Aphis (Lachnus) quercus*. Die daneben befindlichen aufgeblähten braungrauen Blattläuse haben die Dicke eines Hanfkorns." This was in Hanover.

124. *Schizoneura lanigera*, Hausm.

The only known parasite of this most injurious species is *Aphelinus mali*, Halde., as recorded by Howard (Revis. Aphel. N. Amer. 24).

125. *Schizoneura ulmi*, Linn.

Both sexes of *Aphidius ulmi*, Marsh., have been bred from this species in Devon by Bignell on June 20th, 1884 (Bracon. d'Europ. ii. 577), and *Praon exoletus*, Nees, is also said to prey on it by Gaulle (Cat. 86). The Chalcid, *Decatoma biguttata*, Swed., var. *variegata*, Curt., has been indicated by Dalla Torre (Cat. v. 327) to have been recorded by Rondani, with no reference, from *Aphis ulmi*, which is the only Hemipteron there intimated, among a dozen *Cynipidæ*.

126. *Schizoneura aquatica*, ? auct.*

Encyrtus schizoneuræ has been described from this species by Ashmead (Proc. Amer. Ent. Soc. 1885, p. xvi.).

127. *Pemphigus bursarius*, Htg.

Buckton (Mon. Aph. iii. 119) says that this species is preyed upon by an undetermined "aphidiphagous ichneumon."

128. *Pemphigus flaginis*, Fonsc.

Allotria longicornis, Htg., was bred from *Pemphigus gnaphalii*, Klt., by Kirchner (Cat. 31), and Cameron (Phyt. Hym. iii. 233) tells us that Hartig bred the same hyperparasite from—(?) an Aphid concealed in—galls of *Nematus gallicola* (*Pontania proxima*, Lep.).

129. *Pemphigus bumeliæ*, Schr.

This British (*cf.* E. M. M. 1898, p. 6) species is given by Cameron (Phyt. Hym. iii. 233), upon Kaltenbach's authority, as one of the hosts of *Allotria* (*Pezophycta*) *brachyptera*, Htg.

130. *Pemphigus fraxinifolia*, ? auct.* 131. *Glyphina eragrostidis*, ? auct.*

In America, Howard (Revis. Aphel. N. Amer. 24) says these species are attacked by *Aphelinus mali*, Halde.

132. CHERMES.

Howard tells us (*l. c.* p. 38) that an American species of this genus is destroyed by *Coccophagus scutatus*, Howd. The insects given under this genus by Giraud belong to the *Coccidæ*.

133. *Chermes corticalis*, Kalt.

Probably both the *Chermes piceæ*, from which Ratzeburg records his *Pteromalus coccorum*, and the *Chermes strobi*, from *Zool. 4th ser. vol. XIII., November, 1909.*

which he bred *Tridymus aphidum* (Ichn. d. Först. ii. 183 et 197), were Coccids; or, if Aphids, were synonymous with *C. corticalis*, Kalt.

134. *Chermes abietis*, Linn.

Gaulle (Cat. 98) records the Chalcid, *Encyrtus scaurus*, Walk., from *Physokermes abietis*.

135. *Chermes laricis*, Htg.

His *Aphidius laricis* was first bred by Haliday from an Aphid on *Larix europæa*, and probably of the present species; he says of it, "Habitat in Larice e cujus Aphidibus prodiit mihi" (Ent. Mag. 1835, p. 97). It has not again been bred in Britain, but the same host is doubtless referred to by Giraud, who says (Ann. Soc. Fr. 1877, p. 416) that he raised both *Aphidius pini*, Hal., and *A. laricis*, Hal., from an Aphid on *Pinus larix*; and, from apparently the same species of host, he also bred (*l.c.* p. 434) his *Megaspilus laricis*. Gaulle (Cat. 113) records the Proctotrypid, *Lagynodes pallidus*, Boh., from *Chermes laricis*.

136. *Chermes bauhini*, ? auct.*

A Chalcid, *Psilophrys (Encyrtus) longicornis*, Walk., is recorded (Cat. 98) by Gaulle from this species.

137. *Phylloxera caryæ-scissa*, Riley.*

From this Floridan species Ashmead (Trans. Amer. Ent. Soc. 1881, Proc. p. xxx. et 1894, p. 328) records the emergence of his *Phylloxeroxenus phylloxeræ*.

138. *Tychea phaseoli*, Pass.

Bignell bred *Praon abjectum*, Hal., from this species in Devonshire on July 23rd, 1883 (Marsh. Bracon. d'Europ. ii. 534), together with the abundant *Aphidius ervi*, Hal., and probably the latter's hyperparasite, *Isocrates æneus*, Nees.

139. *Rhizobius pilosellæ*, ? auct.*

The only mention I find of parasites upon this species is in Gaulle's 'Catalogue' (p. 103), where the Chalcid, *Asaphes vulgaris*, Walk., is said to prey upon it.

140. UNDETERMINED APHIDIDÆ.

From the following list of parasites, which have been recorded from unidentified members of this family, I have omitted all

such as have hitherto been mentioned, since they may be supposed to have been bred from the same species, and in any case their repetition is valueless. The Aphids on *Ervum hirsutum*, however, whence Haliday first bred his *Ephedrus lacertosus* and *Aphidius ervi*, can hardly have been *Myzus cerasi*; he says of the former (Ent. Mag. 1883, p. 486): "Habitat, in agris passim Aphides Ervi forsitan et alias pungens. . . . In oviposition it carries the abdomen like the genuine *Aphidii*, but pierces the back of the Puceron, for which the slight inclination of the borer seems adapted, and the contact is less instantaneous, being often prolonged for several seconds." *Trioxys minutus*, Haliday, was first bred by him from Aphids on *Buxus balearica*. He also raised his *Aphidius salicis* from a species of Aphid on several different kinds of willow in July and August, along with the hyperparasites, *Allotria fulviceps*, Curt., and another species of the same genus. Curtis (Farm Ins. 75) says that Mr. T. Carpenter bred a *Cynips*, doubtfully referred to *C. quercus-inferus*, Linn., "from small Aphides"; Curtis describes this *Allotria* in Morton's 'Cyclopædia of Agriculture' (2 vols., London, 1855), but Cameron (Phyt. Hym. iii. 260) failed to recognise it. Rondani records (Bull. Soc. Ent. Ital. 1877, p. 199) *Telenomus truncatus*, Nees—his *Teleas linnæi*—from Aphids, but the association appears to be doubtful, since it has also been bred from *Bombyces*. All the other direct parasites not assigned to specific hosts are, I think, comprised in Marshall's Bracon. d'Europ. ii. pp. 540, 574, 582, 589, 591), and in Giraud's "Liste des éclosions d'Insectes" (Ann. Soc. France, 1877, pp. 415-6 et 427).

Buckton gives (Mon. Aph. ii. 154) a list of aphidiphagous Hymenoptera, upon Dr. Reinhard's authority, which comprises *Agonineurus flavicornis*, Först., and *A. subflavescens*, Westw., *Callimome auratus*, Fourc. (probably *in errore*), *Mesosela elongata*, Walk., *Myina chaonia*, Walk., *Pteromalus aphidivorus*, Först., and *Spalangia nigra*, Latr. And Bignell (Trans. Devon. Assoc. 1901, p. 692) indicates *Allotria perplexa*, Cam., *A. basimaculata*, Cam., *A. ancyclocera*, Cam., *A. tscheki*, Gir., *A. longicornis*, Htg., and *Lygocerus serricornis*, Boh., as having been bred by himself in Devonshire from unspecified Aphides, through doubtful direct parasites.

ADDENDA.

There are a few American species of Rhynchota, with whose classified position I was not sufficiently familiar to place them in the body of my paper; thanks to Mr. A. Butler and the Editor, however, I am now enabled to refer them to their approximate situations.†

Brochymena arborea, Say.*

Trissolcus brochymenæ is given as preying upon this species, of whose position I am still uncertain (though *Brochymena* is a genus of Pentatomids), by Ashmead (Florida Agric. 1881, p. 193).

Euschistus servus, Say.*

From this Pentatomid, Ashmead has recorded (Bull. U. S. Nat. Mus. 1893, p. 162) his Proctotrypid *Trissolcus euschisti*.

Murgantia histrionica, Hahn.*

This is another Pentatomid, from which the same author (*loc. cit.* p. 163) records his *Trissolcus murgantiæ*.

Acanthocerus galeator, Fabr.*

Some doubt exists respecting the parasitism of *Hadronotus rugosus*, How., upon this Coreid, as given by Ashmead (*l. c.*, p. 232).

Acanthocephala femorata, Fabr.*

This Coreid is destroyed by *Hadronotus floridanus*, Ashm. (Amer. Entom. 1887, p. 148; *cf.* also D. T. Cat. v. 498).

Anasa tristis, De G.*

Two species of the Proctotrypid genus *Hadronotus* attack this Coreid; *H. anasæ* is reported from it by Ashmead (Bull. Ent. U. S. Dept. Agric. 1887, p. 23), and Dalla Torre tells us (Cat. v. 498-9) that Riley and Howard have raised both this species and *H. rugosus*, How.

† It is not within my province to investigate the error which led Dalla Torre to insert (Cat. v. 67) *Misocampus nigricornis* as the Rhynchotal host of *Eulophus verbasci*. It is, of course, itself a Chalcid of the genus *Torymus* as placed by D. T. himself (*lib. cit.* 310). That notice should be drawn, however, is necessary, since the statement is copied by de Gaulle (Cat. Hym. France, 109).

Largus succinctus, Say.*

From a species of this Pyrrhocorid genus, under the above name, has been described his *Hadronotus largi* by Ashmead (Bull. U. S. Nat. Mus. 1893, p. 231).

Dysdercus suturellus, Herr.-Sch.*

The well-known Pyrrhocorid, the "Cotton Stainer Bug," is also said by Howard ('Insect Life,' 1888, p. 242) to fall a victim to *Hadronotus rugosus*.

Zelus bilobus, Say.*

This Reduviid is said to be preyed upon by *Hadronotus leptocorisæ*, How. (Hubbard, 'Orange Insects,' 1885, 215).

Zelus longipes, Linn.*

A Chalcid, *Eupelmus zeli*, has been described from this species by Ashmead (Trans. Amer. Ent. Soc. 1886, p. 130).

Ceresa bubulus, Say.*

Ashmead gives (Canadian Entom. 1888, p. 107) the Chalcid *Trichogramma ceresarum* as attacking this Membracid.

NOTES AND QUERIES.

A V E S.

Household Visits by Sand-Martins and Swallows.—Knowing that you always take the greatest delight in hearing anything about your little friends in "bird-life," I thought I would let you know of an interesting incident which happened to me on Thursday night (Oct. 28th). I reside in the country near Weybridge, and as much as possible live in the open air, sleeping with both my windows wide-open. On going to bed on that night, accompanied by my black spaniel "Nibs," who always sleeps at the foot of my bed, I noticed, after lighting the gas, the dog gazing intently at a picture on the wall, and also heard a little twittering. I then saw that perched on the picture-frame were two little Sand-Martins, huddled up close together for warmth, the poor little birds being very cold and miserable. I put my hand up and took them off, and after having warmed them up a little I put them back again on their perch. On waking in the morning the first thing I saw was one of them flying round the room, and to my astonishment it pitched down on my dog's back, and there started to plume itself. Good old "Nibs" just glanced at it, wagged

his tail, and went to sleep again, while the bird, evidently attracted by the warmth of the dog's body, crept down and nestled close up under his shoulder. It was quite a pretty sight, but, as I thought the other little bird ought not to be left in the cold, I tumbled out of bed and took the wee mite into my warm hands, where it was quite happy, and twittered away gaily. After a while I took the other little chap away from "Nibs," and put the two of them on the windowsill, where, after pluming themselves for a time, and chirruping a thankful farewell, away they went. I hope they had a safe passage to a more genial clime.

Some years ago, at Bexhill-on-Sea, and in the early autumn, I had my bedroom invaded by a horde of Swallows, every conceivable perch being occupied, and the birds roosting several deep on the dressing-table, &c. As you may imagine, they were all welcome guests, and I took the greatest care not to needlessly disturb my little friends. In the morning I had a busy time assisting them to find their way out, a considerable number having become jammed in the window-sashes, &c. However, at last all were safely despatched on their long journey.—A. E. DARLING (32, Harrington Road, Queen's Gate, S.W.).

Sooty Tern near Barmouth.—I presume the occurrence of the Sooty Tern (*Sterna fuliginosa*) in Britain is sufficiently rare to be noted and put on record. I see that Seeböhm gives two instances, and Howard Saunders enumerates three of its captures, but am not aware whether others have been obtained since. I thought it would be of interest to ornithologists to know that a specimen was picked up within about a mile or so of Barmouth on August 17th last, and brought to me as "a Petrel"! I say "picked up" rather than "knocked down" (though the bird was alive), to prevent it being remarked that "it is a great pity this rare species was thus ruthlessly destroyed, as if it had been spared it would probably have remained to breed on our shores"! as has been said of birds quite as unfitted for nesting in Britain. It was in fair plumage, though the sixth and three next primaries and the outermost tail-feathers seem recently moulted, being more ash-coloured and fresher-looking than the rest of the plumage. The middle toe-nails are long, and have an inward lateral curve, as though bent from long standing on an unyielding ground. It weighed five ounces, and measured in length 16 in. Breadth, wings expanded, $22\frac{1}{2}$ in. On dissection it proved to be not at all emaciated, though rather thin and without any subcutaneous fat. The stomach contained small sand-eels, some fresh, others partially digested. It was a male. The bird has been mounted, and is still in my possession.—F. C. RAWLINGS (Barmouth).

NOTICES OF NEW BOOKS.

The Cambridge Natural History. Vol. IV. By GEOFFREY SMITH, M.A.; HENRY WOODS, M.A.; A. E. SHIPLEY, M.A., F.R.S.; CECIL WARBURTON, M.A.; and Prof. D'ARCY W. THOMPSON, C.B., M.A., &c. Macmillan & Co., Limited.

By the issue of the present volume a notable publication has been completed, and the Editors, Dr. Harmer and Mr. Shipley, are to be congratulated on the successful termination of sixteen years' labour in promoting the knowledge of authoritative zoology, for, though "Natural History" is the title, animal life is the subject. The ten volumes which constitute and complete this series will be studied by students, consulted by specialists for information outside their more limited survey, and afford a referential refuge for the something more than general reader.

The subject of Crustacea, originally undertaken by the late Prof. W. F. R. Weldon, and of which we read the "chapter on the Branchiopoda is all he actually left ready for publication," has been with that exception written by Mr. Geoffrey Smith, and forms the first section of the volume. Mr. Henry Woods has written on the Trilobites and Eurypterida; Mr. Shipley has given an Introduction to Arachnida and King-crabs, and described the Tardigrada and Pentastomida; the Scorpions, Spiders, Mites, Ticks, &c., are dealt with by Mr. Warburton; and Prof. D'Arcy Thompson is the authority for the Pycnogonida. It will thus be seen that the volume is the work of specialists, and if criticised it must be from the pens of specialists.

The present volume, like its predecessors, is a truly biological publication, though not restricted to that particular study of animal life; many bionomic facts have been compiled, and the references to the works and records of other naturalists are of no inconsiderable assistance, especially to those who cannot be specialists in all orders. One remark by the writer on Crustacea (Paguridea) reflects the biological standpoint; in his account of the Robber-crab (*Birgus latro*) he states, and truly, that, disregarding the legends attached to this creature, "the philosopher

may well find its structure more strange than fiction, and the consideration of its morphology an intellectual feast."

Egyptian Birds ; for the most part seen in the Nile Valley. By
CHARLES WHYMPER. Adam & Charles Black.

THE question is often asked as to the best plan for writing and publishing a book on the birds of some Continental or other favourite resort of visitors. In this volume Mr. Whympers has gone very far in answering that inquiry ; but, as he states in his "Foreword" : "The scientific man will find little that is new in these pages ; they are not meant for him—they are alone meant for the wayfaring man who, travelling this ancient Egypt, wishes to learn something of the birds he sees." Some fifty birds are selected, a very representative sample, and these form the subject of individual coloured plates, some of which are absolutely fascinating in fidelity and background. The above remarks are sufficient to explain that this volume is naturally outside works like those of Shelley or Von Heuglin on the same subject, and no comparison is intended, but it will nevertheless have a considerable ornithological importance if the book is taken up by Egyptian visitors, for it should have a recognition in Cairo. There are true lovers of birds who are in no sense ornithologists, and there are some ornithologists who in the true sense can scarcely be called lovers of birds ; in fact, it might as well be claimed that the hunting man is a lover of foxes or the angler a lover of fishes. To the first-named circle we commend this book.

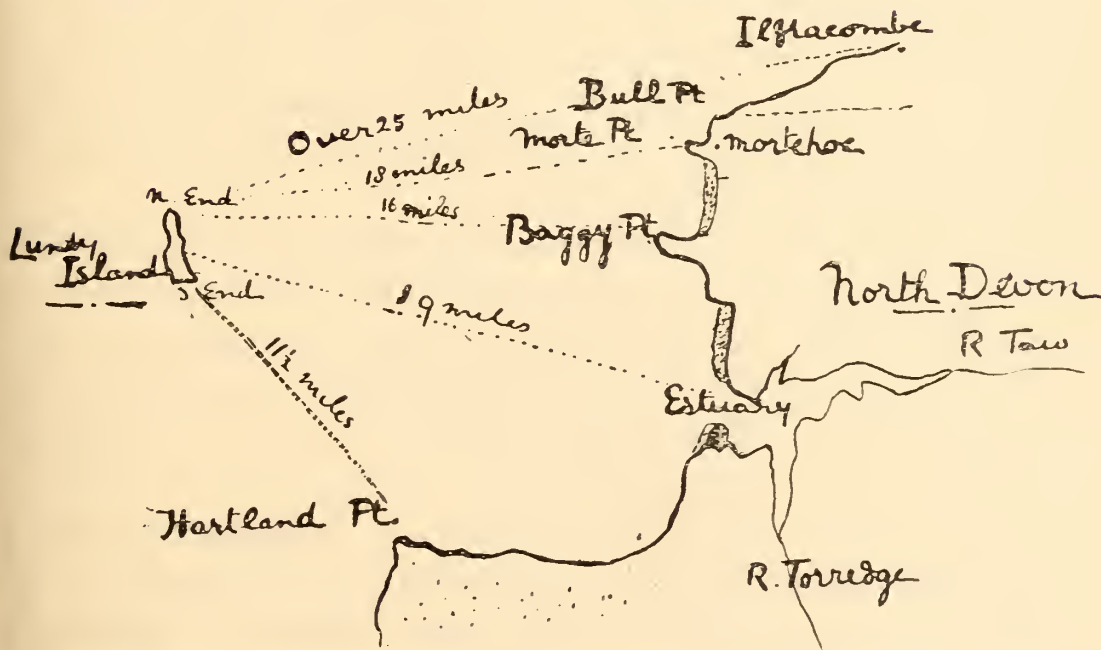
There is an interesting though somewhat regrettable statement respecting the Senegal Sand-grouse (*Pterocles senegallus*). Capt. Shelley, in 1872, gave localities where they might be found, "and ever since he gave that information there has been each winter a regular invasion of British and other ardent sportsmen to each of the places named to have a little Sand-grouse shooting. Result : at those places there are now none whatever, and no one living there seems to know anything more about Sand-grouse than that annually large numbers of men come with shooting equipment ready to make record bags, and go away without firing a shot."

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NOTES ON THE FAUNA OF LUNDY ISLAND.

BY BRUCE F. CUMMINGS.



Sketch Map of Lundy and the North Devon Coast (showing distances).

LAST June I spent a few days on Lundy Island—from the 3rd to the 10th inclusive—and occupied myself with the Mammals, Birds, and Terrestrial Isopods. I took with me a good supply of traps for the mammals, but, although Rats were plentiful, I failed in the principal object of my visit—that of securing a series of Shrew-Mice, which are quite numerous on the island, but, in the summer, exceedingly difficult to trap.

In a paper read by Mr. T. A. Coward in December, 1907, before the Manchester Literary and Philosophical Society, on the Mammals of Lundy, it is stated that a Shrew sent to the British Museum by Dr. Norman Joy was identified as *Sorex minutus*. Mr. Coward himself was successful in obtaining only one specimen, and that also proved to be *S. minutus*. A third specimen of *S. minutus* from Lundy I obtained from one of the lighthouse keepers of the North End, who told me that Shrew-Mice are very plentiful in the autumn, and one or two are even caught by their cat in the lighthouse itself. This specimen was captured by their dog "Gyp." It is a male, measuring in head and body 43 mm., and in tail 38 mm., hind foot 10 mm. My identification has been confirmed by Mr. Coward. I failed to trap any Shrews.

The only other Lundy Shrew which has been examined was thought by its captor, Mr. A. J. R. Roberts, to be the Common Shrew (*S. araneus*), but Mr. Coward considers that, judging by its measurements, it was either *S. minutus* or a young specimen of *S. araneus*. It is probable that Lundy resembles Ireland and the Isle of Man in possessing only the Lesser Shrew, the Common Shrew and the Voles being absent.

The House Mouse (*Mus musculus*) and the Norway Rat (*M. norvegicus*) are common. I also captured an old English Black Rat, which I think belonged to the *M. rattus alexandrinus* subspecies, and which Mr. Coward suggests as representing the mysterious Red Rat of the islanders. Mr. Coward took a series of both this form and *M. rattus rattus*.

Several Goats have broken loose from captivity, and have been inhabiting the cliffs in a completely feral condition.

Rabbits are plentiful, but Mustelids, Moles, and Bats are absent, although the latter are said to occur occasionally. The Seal is by no means an uncommon animal off the coast, but only *Halichoerus grypus* has been identified for certain.*

In regard to the birds, there has taken place an unfortunate but not unexpected change since the Rev. F. L. Blathwayt's article on Lundy was published in 'The Zoologist' (cf. Zool. 1900, p. 375), for the Gannet (*Sula bassana*) has become locally extinct. The other sea-birds—Puffins, Guillemots, and Razorbills—con-

* Mr. Coward, *loc. cit.*

tinue to breed there year by year in their accustomed legions, the chief resort being the North End. The Gulls were nesting in prodigious quantities, especially the Herring-Gulls and Kittiwakes. The Lesser Black-backed was also common, but the fourth species of Gull, the Great Black-backed, is very rare, and will probably be locally extinct shortly. Perhaps not more than two pairs are now left, one of which nests near the Shutter Rock.

The numbers of the Cormorants and Shags appear entirely insignificant beside those of the other sea-birds, but they appear to be maintaining their hold, breeding especially on the Gannet Stone.

One's general impression of the island, ornithologically, and apart from the sea-birds, consists of Linnets, Meadow-Pipits, Stonechats, and Larks.

Mr. H. J. Ross, who last winter, in conjunction with Mr. A. H. Rousham, read a paper on Lundy birds before the Exeter R. A. M. Field Club and Nat. Hist. Society, records that he discovered about three pairs of Whinchats (*Pratincola rubetra*) on the island in the preceding June. He writes to me that he is quite satisfied with his identification, as he is well acquainted with the species, although he has never seen it in Devon before. I have never seen the Whinchat in North Devon, where, if it occurs, it must be a very rare bird, nor did I observe it on Lundy during my visit. Messrs. Matthew and D'Urban, in 'The Birds of Devon,' after remarking on the rarity of the Whinchat in North Devon, suggest that in the list of Lundy Island birds (presumably that drawn up by Mr. J. R. Chanter in his monograph on Lundy) the Whinchat was confounded with the Stonechat. But Mr. Blathwayt (*loc. cit.*) records it again, and his testimony, together with Mr. Ross's, is quite sufficient to show that the Whinchat is, in fact, a summer visitant to Lundy. Mr. Ross observed them in June, and Mr. Blathwayt in May, but no nest is reported to have been found, although it appears very probable the birds are resident. In any case, their occurrence on the island and their probable absence from the mainland is sufficiently interesting.

Within the past twelve years or so the House-Sparrow and the Starling have established themselves on the island, but the

latter is far from common—not more than two pairs, I believe, during last June.

The Jackdaw, which flocks around and freely breeds on the coast of the mainland, comes only occasionally to Lundy Island. The Carrion-Crow is resident, and nests in the cliffs with the Kestrel.

There is an eyrie of the Peregrine Falcon in which eggs are regularly laid, but from which young birds do not so regularly fly away; the cliff-climbers appreciate the value of the eggs and of the young birds.

Among other birds I also observed:—Buzzards, Wheatears (common), Blackbirds, which are in larger numbers than the Thrush, Swifts, House-Martins, Sand-Martins and Swallows, Ring-Plover, Oystercatchers (which breed on the island but nowhere else, so far as I am aware, in North Devon), Robins, Wrens, Cuckoos, Curlews, Goatsuckers, Wood-Pigeon (only one), Whitethroats (a pair with a nest), Blackcap (I only saw one bird, but it seemed to have a nest near which I was unable to find), Willow-Warbler (one singing in the garden of the owner of the island, the Rev. H. G. Heaven), Goldfinches (one pair), Rock-Pipits, and Turtle-Doves (one pair, which disappeared the day after I had seen them).

Among the birds that I did not see were Buntings, Wagtails, Tits, Bullfinches, Lapwings, and, of course, the Woodpeckers, Tree-Creepers, &c.

A bird which I did not see, but which I heard one night, was the Manx Shearwater (*Puffinus anglorum*). Although long suspected of being a resident species, it was only actually discovered nesting a few years ago by Mr. A. J. R. Roberts, who mentions his discovery in the "Bird Book." Their nesting haunt is on the east side of the island, near the granite quarries. Perhaps the Stormy Petrel (*Procellaria pelagica*) also breeds, but a careful search, especially among loose stones at the South End, was unsuccessful in revealing any signs of it.

The number of species of birds which have been recorded for Lundy is a fairly long one, but the number of species to be found there at any one time varies considerably, and is very low. All the land species of birds are very poor in individuals, if we except the Linnets, Stonechats, Pipits, Larks, and Blackbirds.

The Red Admiral (*Pyrameis atalanta*) was the only butterfly which could be said to have been common. I also saw the Small Copper (*Chrysophanus phlæas*), the Blue (*Lycæna alexis*), the Brown Argus (*L. astrarche*), the Small Heath (*Cœnonympha pamphilus*), the Cabbage White (*Pieris rapæ*), and the Meadow Brown (*Epinephele ianira*).

Among the Coleoptera, the Rose Chafer (*Cetonia aurata*) was exceedingly plentiful; so, too, was the Tiger Beetle (*Cicindela campestris*). I observed incidentally *Helops striatus*, *Silpha tristis*, *Nebria brevicollis*, *Calathus cisteloides*, *Corymbetes æneus*, and *Steropus madidus*.

The ubiquitous Cockroach (*Periplaneta*) does not appear to have reached Lundy Island, as none of the inhabitants of whom I inquired recollected having ever met with it.

I collected eleven species of Land Isopoda (*vide* the Annals and Mag. Nat. Hist., October, 1909), two of which, viz. *Cylisticus convexus* and *Trichoniscus pygmæus*, have not yet been discovered in North Devon. A more extended study both on the mainland and on the island is necessary before any opinion can be expressed on the relation of the Land Isopods occurring in the two localities.

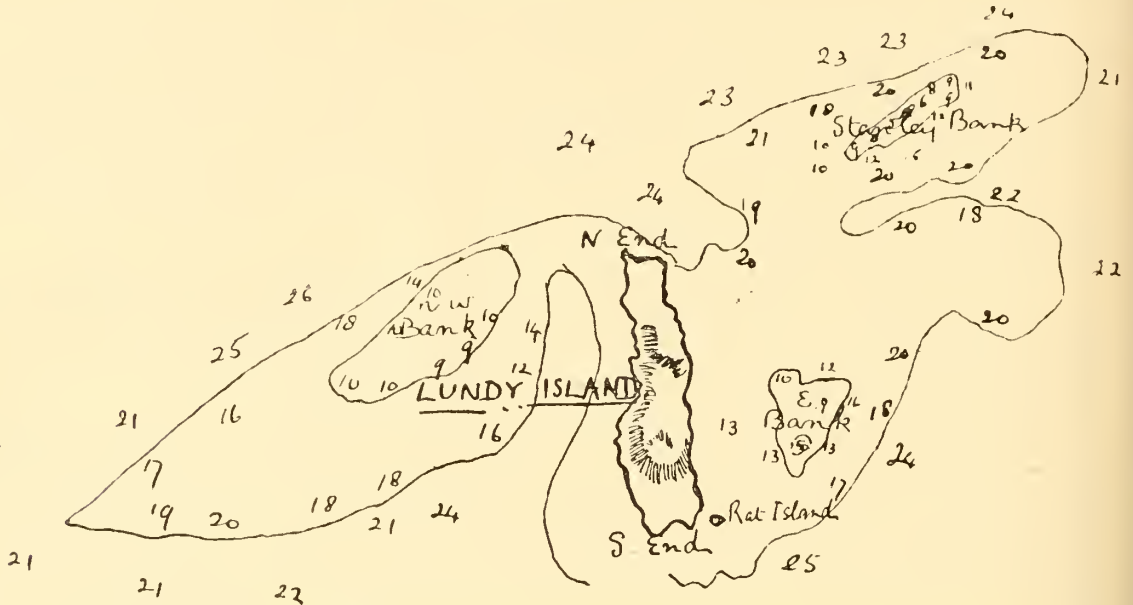
There are a number of fresh-water ponds and water-pits on Lundy, and a qualitative and quantitative study of their microscopic fauna particularly would be very valuable.

No Frogs, Newts, Lizards, or Snakes occur.

The accompanying sketch-map shows the depths of the water around the island, and also the three banks, which possibly represent granite bosses, similar to that of the island itself. According to soundings made during the Admiralty Survey of 1880, the water between the North End and Ilfracombe along a line in the direction of north-east over the Stanley Bank ranges between twenty-one and twenty-four fathoms, Ilfracombe being over twenty-five miles away. The water due east between the island and Morte Point, only eighteen miles distant, reaches a depth of twenty-seven fathoms, while the water between the island and the nearest land, Hartland Point, is the deepest of any, attaining a depth of thirty-two fathoms. The water on the further side of Lundy rapidly increases to thirty-two fathoms and more.

It would appear quite possible that the last connection

between the island and the mainland was not *viâ* Hartland as has been suggested by Charles Kingsley,* but *viâ* the Stanley Bank in the direction indicated by the arrow in the map, towards a point between Ilfracombe and Bull Point. But after allowance has been made for silting, the eight or ten fathoms difference in



Sketch Map of Lundy Island, showing soundings around the island and the three banks.

Exact Geographical Position (at the old Lighthouse): Lat. $51^{\circ}9'48''$ N., long. $4^{\circ}39'27''$ W. Greatest height above sea-level, 525 ft. (Beacon Hill). It is about $3\frac{1}{2}$ miles long, but of very irregular breadth.

depth along the Hartland and the Ilfracombe directions is not much; moreover, all the evidence so far obtained from a study of the fauna, especially the coleopterous fauna, indicates that Lundy is an island of considerable antiquity.

* In 'Prose Idylls,' p. 248, under the heading "Morte."

ROUGH NOTES ON THE FISH AND FISHERIES OF EAST SUFFOLK.

BY ARTHUR H. PATTERSON.

(Concluded from p. 421.)

COD (*Gadus morrhua*).—Plentifully taken all along the Suffolk coast by sea-anglers, and in nets. Col. Leathes tells a gruesome tale about a large Cod captured off Corton by a fisherman, who found inside it “an entire full-grown baby with its chin slightly cut by the knife used by him.” The Colonel gives the name of the fisherman, and I give the story on *his* authority (‘Rough Notes’). At a sea-angling match held at Lowestoft in 1905, seventeen Cod were taken which totalled a weight of 170 lb. Mr. Canova tells me that he has known Cods taken at Southwold up to 50 lb. weight, but that they have fallen off greatly in recent years. The largest for 1908–9 was 30 lb.

[DORSE (*G. morrhua callarias*).—This much-discussed fish—a rich brown coloured fish—is classed by Dr. Day, our best authority, as a mere variety of *Gadus morrhua*, although claimed as a true species by some other authorities. Wake lists it for Southwold. One is described by Mr. J. H. Gurney in Dr. Lowe’s List (Nor. N. S.) as “caught at Lowestoft, on May 16th, 1851, and called there by the fishermen a ‘lord,’ resembling the variety . . . figured by Yarrell.” Length, 15½ in.]

HADDOCK (*Gadus æglefinus*).—Once plentiful enough locally, it is now not common by any means. It is on the Southwold list (Wake). Numbers are brought by fishing-smacks into Lowestoft, the larger supplies hailing from Grimsby.

BIB (*G. luscus*).—Variously known as Whiting-Pout and Bastard-Whiting. Lowestoft (J. H. G.). Numbers of very small, finger-length Bibs are caught by boys on hooks in the basins. I found a number dead from the Shrimp-boats, August 13th, 1909. When once taken out of the water they must perish,

the eyes becoming inflated with air, so that they cannot afterwards sink themselves. This is reputed to be from terror!

WHITING (*G. merlangus*).—An abundant species, particularly in the colder months, affording excellent sport to sea-anglers. Fishing from a boat, in 1905, some Lowestoft anglers secured three hundred Whitings. “Plentiful off Lowestoft. . . . On the coasts of Norfolk and Suffolk only attains about two-thirds the size of those on the Devonshire coast” (J. H. G.). Mr. Canova informs me that a 7 lb. example was taken off Southwold on a long line laid for Cod. Mr. Dutt, on the authority of Calver, the old Waveney water-bailiff, informs me that “one November morning in 1900, two small Whitings were taken in an Eel-set at the mouth of the dyke connecting Flixton Decoy with the Waveney.”

COAL-FISH (*G. virens*).—On the authority of Wake this species occurs off Southwold: I suspect it cannot be by any means rare, especially in a juvenile state, but I have not myself observed it in Suffolk. Has been captured off Claremont Pier, Lowestoft (Robson). Mr. H. Bunn has “seen bushels brought into Lowestoft.”

POLLACK (*G. pollachius*).—Small examples under a pound weight often taken by sea-anglers. Southwold (Wake).

HAKE (*Merluccius vulgaris*).—Not by any means common off East Anglian coasts [30 in. example recorded, Feb. 1847, at Sherringham]. Southwold (Wake). Mr. H. Bunn states that “the fishermen think a lot of it for eating.”

LING (*Molva vulgaris*).—Given for Southwold in Wake’s list. Mr. Charles Clarke, in a ‘Popular Guide to Aldeburgh,’ states that “if the angler care to prolong his trip [to late autumn], and go to the rocks at the northern end of the town, he will have good sport with the Codling and Cod, now and then getting a *Ling* and a Conger.”

BURBOLT (*Lota vulgaris*).—Described by Sir Thomas Browne as found “in the rivers of marshland, resembling an Eele and a Cod.” “In Norfolk it is taken in small numbers in the Yare, Bure, and the *Waveney*, penetrating up to their sources” (Dr. Day *). I have never seen an example, except those preserved in Norwich Museum. Old Breydoners, in describing it to me,

* ‘British Fishes,’ vol. i. p. 311.

have differentiated between it and the Viviparous Blenny, describing the latter, which it slightly resembles, as the "Sea Eel-pout," and the former as the "River Eel-pout." The late Dr. Norman hooked one weighing 2 lb. 2 oz. some years since at the entrance of the Waveney. Southwold (Wake).

THREE-BEARDED ROCKLING (*Motella tricirrata*).—A 14 in. example was sent by the late Sir E. Newton to Mr. T. Southwell on Jan. 19th, 1894, from Lowestoft, which, I believe, is now in the Norwich Museum. One taken to Mr. Howard Bunn, Jan. 1st, 1901; another a "few days after," W. A. Dutt.

FIVE-BEARDED ROCKLING (*M. mustela*).—I know of some taken off Gorleston Pier. A very fine specimen brought to me on Sept. 9th, 1909, by Mr. Cook, of Lowestoft. On Wake's Southwold list appears the "Mackerel Midge, *Motella glauca*." Dr. Day ('British Fishes') assures us that the so-called Mackerel Midge is the young of *M. mustela*.

[LESSER FORKBEARD (*Raniceps raninus*).—Dr. Day makes mention of the following examples of this rather obscure little fish, as taken at Cromer, Sherringham (Norfolk), and again in the Crouch, Essex. And then "Newman, in 'The Zoologist,' stated that he had observed among the *Sprats* brought to Billingsgate Market an occasional specimen of this fish." I have had a fine example brought me that was washed ashore on Yarmouth beach. I am convinced that careful research would place this species on the Suffolk list beyond doubt.]

LARGER SAND-LAUNCE (*Ammodytes lanceolatus*).—A lad hooked one of this species at Lowestoft when angling for Atherines, Aug. 1909. Southwold (Wake). Day gives it for Suffolk.

LESSER SAND-LAUNCE (*A. tobianus*).—As the Sand-Eel occurs on Wake's 'List' for Southwold. I have no doubt is common enough off sandy beaches, as it is off Norfolk.

HALIBUT (*Hippoglossus vulgaris*).—Large examples from the North Sea are sometimes landed at Lowestoft. Wake gives it on his Southwold list; and Mr. Howard Bunn, for Lowestoft, remarks: "Only very small ones."

TURBOT (*Rhombus maximus*).—Very small examples taken in nets by the small trawlers. "A large Turbot, in excellent condition, alive and in full vigour, was brought to me in Lowestoft, having been caught in the deep channel which runs close to the

shore. . . . A respectable fisherman, in whose veracity I place full confidence, told me that he once caught two large Turbots at once, at the head of Lowestoft inner harbour, just below Mutford Lock," J. H. G., quoted by Dr. Lowe (Nor. N. S.).

BRILL (*R. laevis*).—I have seen very small ones occasionally in the trawl catches. Southwold (Wake). "The trawlers catch Brill in Sole Bay" (Canova). Two beautiful varieties in Norwich Museum with brown blotches on a white ground, both of which are from Lowestoft. I met with an albino variety in Feb. 1892.* The very remarkable example figured (*ante*, Plate IV.) was brought to me from Lowestoft on June 29th, 1909.

MEGRIM (*Arnoglossus laterna*).—I am somewhat astonished to find this species marked for Southwold by Dr. Wake, which speaks well for his power of discernment. Some of the longer *Pleuronectidæ* have been roughly termed Megrims, but his definition of it as Scald-fish is sufficiently convincing. The tender skin is most easily abraded, giving the fish the appearance of having been scald, hence the trivial nickname. For some years I sought this species off the coast of Norfolk, and in the end obtained two examples, both taken in Shrimp-boats—one in April, 1906, the other in July, 1906.† Each was just over 4 in. in length.

PLAICE (*Pleuronectes platessa*).—Taken off the Suffolk coast in some numbers, but of no very great size, although Mr. Canova wrote me on August 19th, 1909, that "the boats had been getting some fine Plaice catches at Southwold." I saw some with exceedingly bright spots at Aldeburgh on August 30th, 1909.

DAB (*P. limanda*).—Common all along the Suffolk coast. Mr. Canova furnishes me with some good records. His largest *seen* was $2\frac{1}{4}$ lb.; largest taken from Southwold Pier, 1 lb. $10\frac{1}{2}$ oz. From the 'Anglers' News' I glean the following:—Taken there by amateur fishermen: 1907–8—examples, 1 lb. $6\frac{1}{2}$ oz. and 1 lb. 4 oz.; 1908–9—examples, 1 lb. $7\frac{1}{2}$ oz. At Aldeburgh, in Nov. 1908, one was taken weighing 1 lb. 12 oz.

SMEARED DAB (*P. microcephalus*).—Many hundredweight are landed yearly by Lowestoft trawlers, but it does not seem at all common inshore. Two or three shrimpers have assured me

* *Vide* 'Notes of an East Coast Naturalist,' pp. 228–231.

† 'Zoologist,' 1906, pp. 453 and 456.

they have taken it off the Suffolk coast. To the trade it is a "Lemon-Sole." Shrimpers term it the "Cock-Sole."

FLounder (*P. flesus*).—Abundant. Mr. Canova tells me he captured two in two minutes at Southwold weighing respectively 3 lb. 8 oz. and 2 lb. 8 oz. I saw a young fellow on Lowestoft wharf with a small heap of this species on August 30th, which he had taken in a jointed hoop-net. He offered me fine ones at a shilling the dozen. Col. Leathes ('Rough Notes') informs us he once took up a bow-net in Fritton Decoy with a live Flounder in it; it must have come up from the river Waveney, "and passed into the Run Dyke, and . . . jumped through the trap in the lock, and eventually reached the fresh water of the lake." He further informs us he "made a breakfast off Flounder next morning." It is possible that practical jokers are not exclusively a Norfolk product (!). The Flounder at certain seasons is an excellent fish for the table, but locally is not of much commercial value at any time.

SOLE (*Solea vulgaris*).—Taken in some numbers all along the Suffolk coast. I saw catches brought in at Lowestoft, Southwold, and at Aldeburgh. Sir Thomas Browne in noting the Sole goes on to say: "Also the Lingula or small Sole all in very great plentie." In a footnote (p. 45) Mr. T. Southwell remarks: "It is possible that Browne may have Latinised the trade name by which small Soles are known to the market as 'slips' and 'tongues.'" In Norwich Museum are two abnormally coloured examples taken off Lowestoft: one, 14 in. long, of a rich salmon colour, taken Oct. 5th, 1903, and one with a yellowish ground, with blackish blotches, 10 in. long, dated 1872.

SALMON (*Salmo salar*).—Southwold (Wake). "Salmon no comon fish in our riuers," says Browne, "though many are taken in the Ouse, in the Bure . . . in ye waveney or south riuer." An example was netted in Breydon on Aug. 2nd, 1909, weight $14\frac{3}{4}$ lb., which was in all probability making for the Waveney. Paget's remark that "small ones have very rarely been taken in the Mackerel-nets" may apply equally to Lowestoft drifters.

[AMERICAN BROOK TROUT (*S. fontinalis*).—"The Fish Acclimatization Society has hatched out and deposited a large number of various species of *Salmonidæ* [including this] in the

rivers of Norfolk and Suffolk, but I cannot learn that their efforts have, at present, been attended with much success" (T. S. in Lowe's 'List,' Nor. N. S.)]

SALMON TROUT (*S. trutta*).—Lubbock ('Fauna of Norfolk') says that "a few Sea Trout are still found every autumn in the Yare; but these fish, although common at the harbour's mouth at Gorleston, do not come much into the river. . . . The Waveney [is] also visited occasionally by these fish. Just below St. Olave's bridge, where the water is deep and rapid, has always been a favourite resort." An example, 13½ lb., has been taken off Claremont Pier, Lowestoft (Robson). One at Lowestoft in October, 1907, weight 9 lb.; this had been taken on a hook with Herring-bait. Is taken in draw-nets both at Southwold and Aldeburgh. "One at Wainford Mills, Ditchingham, near Bungay" (Tilney).

[The so-called Bull Trout (*S. eriox*, of Yarrell), although ignored by Dr. Günther as "not attributable to definite species," has as much title to the distinction of a true species as the Twait and Allis Shads. It occurs off the East coast. Is of a ruddier hue.]

SMELT (*Osmerus eperlanus*).—Common; coming regularly up rivers in spring to spawn. Great numbers netted in the lower waters of the Waveney. No fishing specially for this fish at Lowestoft, but is netted at Southwold and Aldeburgh. To the discredit of Aldeburgh fishermen, the Tern colony on Orford Ness has been exterminated owing to an ignorant belief that this bird depletes the Smelt shoals!* The Smelt is an excellent fish for the table, and is in great request; the catches are mostly dispatched to London.

PIKE (*Esox lucius*).—In 'Rough Notes' H. M. L. relates some very remarkable Pike stories from Fritton Lake. The late Dr. Norman is reported to have also seen a monster there fast upon a "ligger." By the help of some keepers, who were asked to assist in its landing, they managed to lose the fish. During the "play" it actually disgorged a 12 lb. Pike which had previously taken the Dace on another "ligger," become hooked, and in its turn had been seized by this much larger Pike. The doctor, who had a good view of the monster, declared it between five

* *Vide* 'Wild Life on a Norfolk Estuary,' pp. 273–278.

and six feet in length! A typical angler's story! Oulton Broad is noted for its Pike.

GARFISH (*Belone vulgaris*).—Sometimes numerous taken in Herring- and Mackerel-nets. Mr. Whistler, of Aldeburgh, informs me of some men fishing from a barge in the Alde taking three Garfish on hooks baited with Lugworms, an unusual circumstance. This fish is not in much repute, although good eating. It is esteemed oily, and prejudice exists against its green bones; these are, however, perfectly innocuous.

GREATER FLYING FISH (*Exocætus volitans*).—I place this very rare straggler upon this list with a certain amount of reserve, and only on the authority of Wake (Southwold). There is a pectoral fin from a fish of this species now in Norwich Museum, of which Mr. T. E. Gunn makes statement as follows:—"Specimen caught off Yarmouth, May 23rd, 1868. . . . Only known instance on this part of the eastern coast. I submitted it to the late Dr. J. E. Gray, of the British Museum, who identified the species for me." I am not myself disposed to doubt Dr. Wake's statement. It has on several occasions been taken off the English coasts.

CARP (*Cyprinus carpio*).—I have once or twice known examples taken, half-dead, on Breydon, brought down stream by the ebb tides; one of them scaled 7 lb. Occurs in some Suffolk ponds; also in Oulton Broad, but is seldom taken. "Large one netted at Lound Run in 1907, weight 12 lb." (C. W. Long).

GOLD-FISH (*C. auratus*).—Acclimatized in some private ponds.

CRUCIAN CARP (*Carassius vulgaris*).—This species occurs in Fritton Lake, and from what I gather from Mr. R. J. Canova, in more than one Suffolk pond. The species grows to a length of some seven inches, but is exceedingly deep-bodied and thick. Whereas the iris of the Common Carp is golden, that of the Crucian is silvery-white: a 3½ in. example sent me by Mr. Canova in July, 1909, from the neighbourhood of Southwold, exhibited these features, the deep-set eyes being curiously staring. It was large with ova. It is known to hybridize freely with the Common Carp; and Day very truthfully records its hardiness; like the Prussian Carp, it will live "in localities wherein the impurities are sufficient to destroy most other fish."

PRUSSIAN CARP (*C. gibelio*).—It was with considerable trouble

that I was enabled at length to discriminate between this fish and the preceding, having had but one of the Crucian Carp for examination. *C. gibelio* is altogether a more shapely fish than *C. vulgaris*, which is almost quadrangular in shape. The back is less elevated; it has a blunter head, and the tail fin is more deeply forked. I captured several in August, 1908, in a horse-pond at Lound, near the main road, a shallow, stagnant, weed-smothered pit gathered from the drainage of the roads. They have lived happily ever since in a tank, the water in which is seldom changed, and have grown considerably, having nothing else but vermicelli for food. They are somewhat indolent, have become exceedingly tame, taking food from my fingers, and sleep at night on the stones at the bottom of the tank with their eyes open and their mouths shut for considerable periods. I caught an example in the same pit in August, 1909, which weighed five ounces. Mr. C. W. Long, of Lowestoft, showed me a small example in August, 1909, which he had captured in a private pond at Corton.

MIRROR CARP (*C. specularis*).—I was extremely pleased to see for the first time on August 30th, 1909, a small living example of the large-scaled variety of the Carp, the so-called *Spiegel-Karpfen*, which is, I believe, of German “*manufacture*.” Mr. Long, of Lowestoft, in whose aquarium it was, assured me it was taken from a pond in the neighbourhood of Lowestoft.

GUDGEON (*Gobio fluriatilis*).—Found in Fritton Lake.

ROACH (*Leuciscus rutilus*).—Abundant in Suffolk rivers and ponds. Very capricious on the Waveney, seldom biting at an angler's bait. The largest “record” I have for Beccles was reported to me by Mr. Tilney, who informs me “it was taken below the church steps”; weight 2 lb. 14 oz. Another example, 2 lb. 4 oz.

[CHUB (*L. cephalus*).—I picked up an 11 in. dead Chub in the Waveney on April 20th, 1890. Against this I have the statement of Lubbock: “It is entirely unknown in the Bure, Yare, and, I believe, the Waveney; is very large in some Norfolk rivers—the Ouse, the Thet, and the Wissey, near Stoke Ferry.” It would be interesting to settle its claim to be an inhabitant of Suffolk waters.]

RUDD (*L. erythrophthalmus*).—Growing to a large size in

Norfolk waters, but does not seem to attain to such dimensions in Suffolk. It is found in Oulton Broad.

DACE (*L. vulgaris*).—Occurs at Oulton Broad, but of small size. Mr. Tilney, of Beccles, tells me that a brother-in-law of his had good sport with this fish when angling with the fly in the vicinity of the Ellingham Mills in the evening.

MINNOW (*L. phoxinus*).—Mr. C. W. Long assures me that Minnows are to be caught in East Suffolk, but was not sure himself of the precise locality.

TENCH (*Tinca vulgaris*).—I saw a nice example captured in the Waveney near the church steps on Aug. 13th, 1909. One had been captured there weighing 3 lb. 2 oz. The late Dr. Norman caught one “near Yarmouth” in the seventies, most probably at Fritton Lake, weighing 5 lb. 14 oz. Christopher Davies (*‘Rivers and Broads,’* p. 21) mentions that “a bow-net set just below the town of Beccles had sixteen brace of fine Tench in it when taken up. The attraction in this case was a bright-coloured bunch of flowers fastened inside.”

[GOLDEN TENCH.—Has become naturalized in several ponds, and appears to have thriven fairly well. They were first introduced into this country when Frank Buckland was so keen upon pisciculture. He wrote: “These were first brought over by Sir Stephen Lakeman from Pomerania, at the time of the dinner of the Acclimatization Society in St. James’s Hall.” Writes Dr. Day: “Although this variety renders it a valuable addition in pieces of ornamental water, its colours, on the other hand, cause it to be readily perceived by its enemies, including poachers.”]

YELLOW BREAM (*Abramis brama*).—Common. Large examples occasionally taken in the deep waters of the Waveney, at St. Olave’s, on the neap tides. Very large and very slimy in Fritton Lake. Found at Oulton. An example caught at Beccles in August, 1907, weight 6 lb.

WHITE BREAM (*A. blicca*).—Mr. T. E. Gunn exhibited a case of these fish at the Fisheries Exhibition, London, in 1883, labelled thus: “Group of four fish caught in Fritton Broad, Sept. 1881, by T. E. Gunn, the largest weighing 3 lb.”

[POMERANIAN BREAM (*Leuciscus buggenhagii*).—One, undoubtedly a cross between *Abramis* and the Roach, is exhibited at the Wherry Hotel.]

LOACH (*Nemachilus barbatulus*).—Mr. W. A. Dutt writes: “When I was a small boy I used to catch Loaches, with Gudgeons and Miller’s Thumbs, in a shallow, gravelly beck connected with the Waveney at Ditchingham, near Bungay.”

HERRING (*Clupea harengus*).—Common; in great shoals every autumn off the coast; found also in some numbers all the year round. The immature, termed “whitebait,” is abundant in the summer months. Under the name of *Clupea alba*, Wake erroneously records “Whitebait” for Southwold. A record price was realised for Herrings at Lowestoft in December, 1905, the best catch for the season brought in realising 80s. per cran, which is equal to £40 per last.

PILCHARD (*C. pilchardus*).—Occasionally strays to the coasts of East Anglia, and is taken with Herrings. The Pagets refer to an immense number being taken off the coast in 1780 and in 1790; while, “in 1799, so many were taken that one ‘tower’ [fish-house hand] received upwards of a last [13,200] as his perquisite.” Undoubtedly the Lowestoft fishermen that year also met freely with this species. I saw a fine specimen, just out of the sea, at Southwold, in August, 1906. Genuine Sardines are the young of the Pilchard.

SPRAT (*C. sprattus*).—Abundant in November. I saw an example in a shrimper’s catch at Lowestoft on August 13th, 1909. On February 18th, 1896, I found some Sprats at Yarmouth (sent up from Suffolk) so advanced in ova that on my pressing the abdomen between my fingers it oozed forth like ripe mustard-seed. I have seen “drove” Sprats infested with a crustacean (*Idotea linearis*). Day had three examples of Sprats sent him from Aldeburgh in 1882, measuring $6\frac{1}{2}$ inches in length.

ALLIS SHAD (*C. alosa*).—Occasionally taken with Herrings and Mackerel. “Two specimens, male and female, caught at Lowestoft in May, 1840, weighed—the male $3\frac{1}{4}$ lb., the female $4\frac{1}{4}$ lb. Both are preserved in Norwich Museum” (J. H. G. Nor. N. S.). Has been taken at Aldeburgh.

TWAIT SHAD (*C. pinta*).—Lowestoft: “a fine specimen caught with hook and line, June, 1867; weight upwards of 2 lb.” (T. E. Gunn).

COMMON EEL (*Anguilla vulgaris*).—A common enough species

in all the rivers and estuaries. In Dr. Day's 'Fishes' is a note from Mr. T. Southwell, as follows:—"Mr. Gurney informs me that he used to find the Sharp-nosed Eel at Lowestoft along the coast, sometimes nearly a mile from the harbour's mouth—very healthy but *never large*: 2 lb. would be the maximum weight of these salt-water Eels." A Yellow Eel, 1 ft. long, is stated to have been taken in the Waveney in 1875, and sent to the Kensington Museum (Palmer's 'Perlustration of Great Yarmouth'). There are a few Eel-sets on the Waveney. In the Catalogue of the International Fisheries Exhibition, 1883, is an Eel listed among the exhibits shown by W. Howlett, of Newmarket, as follows:—"Freshwater Eel, taken in Suffolk; weight 30 lb.

CONGER (*Conger vulgaris*).—This exclusively marine species is common off Southwold and Lowestoft. I saw one brought by a "punter" into Aldeburgh in August, 1909. Is taken off Claremont Pier, Lowestoft, by sea-anglers. Example taken in Southwold Bay in January, 1907; weight 53lb.; length 6 ft. 8½ in. The dorsal fin commences much nearer the head in the Conger than in the Common Eel.

BROAD-NOSED PIPE FISH (*Siphonostoma typhle*).—Three sent me from Lowestoft, March 3rd, 1907.

GREATER PIPEFISH (*Syngnathus acus*).—Lowestoft: I saw four young ones in a shrimper's catch on August 13th, 1909.

WORM PIPEFISH (*Nerophis lumbriciformis*).—Southwold (Wake).

HIPPOCAMPUS (*Hippocampus antiquorum*).—Of this species Mr. Dutt assures me that "Mr. F. Stebbings, who used to live in Lowestoft, had a specimen which was said to have been taken locally, but I could not learn its history." A small example is stated to have been taken in a fisherman's net in 1861, at Lowestoft (Palmer's 'Perlustration of Yarmouth').

SUNFISH (*Orthogoriscus mola*).—This species has occasionally been taken entangled in the Herring-nets off the East Coast. Mr. Dutt informs me that he "can remember three being exhibited in fishmongers' shops here" (Lowestoft). Mr. Howard Bunn tells me he has only received *two* examples for preservation in twenty years. Southwold (Hele).

STURGEON (*Acipenser sturio*).—Recorded for Southwold

(Wake). "On October 7th, 1904," writes Mr. Dutt, "an example between 10 ft. and 11 ft. long, and estimated by Mr. G. Barbor, the fish merchant, to weigh between 36 and 40 stone, was brought in by a steam-trawler." Very rarely travels up the Waveney, but in my recollection two have been taken on Breydon, which joins that river. Suckling records one taken at Beccles in 1733; weight 11 stone 2 lb.; length 7 ft. 8 in. T. E. Gunn recorded one in 1866, an example taken off the Suffolk coast weighing 156 lb.; length 12 ft. 2 in. A 7-stone example taken in a trawler at Aldeburgh.

BLUE SHARK (*Carcharias glaucus*).—Lowe, on the authority of Dr. Hele, of Aldeburgh, records the capture of one at that place: "it was carefully verified by him" (Nor. N. S.).

TOPE (*Galeus vulgaris*).—Occasionally entangled in Herring-nets. I obtained one at Lowestoft in 1890. Have seen it washed up dead near Gorleston, having been, undoubtedly, thrown out from the Herrings.

PORBEAGLE (*Lamna cornubica*).—This is the commonest of the larger North Sea Sharks, and the most frequently taken in the Herring-nets which, in its struggles, it most woefully entangles and destroys. Mr. Dutt informs me that he has seen several landed at Lowestoft, but it seemed so frequent that he did not trouble to "note" the dates of occurrences. He had *heard* of others also taken.

[WHITE SHARK (*Carcharias lamia*).—There is a reference to a *White Shark* in Palmer's 'Perlustration of Great Yarmouth' (vol. iii. p. 400). Stated to have been taken off Kessingland, near Lowestoft. It is stated to have had eight rows of teeth, and weighed a ton. Wake also makes mention of a *White Shark* at Southwold, under the name of *Carcharias vulgaris*. Against these records it would be well to be guided by Day ('British Fishes,' vol. ii. p. 289), who states: "Although the *White Shark* (*Carcharias lamia*) has been admitted into works on British Fishes, evidence is deficient that it has been taken off our coasts. Grew . . . remarked that it is sometimes found on the Cornish coast; Low, on hearsay that it was found off the Orkneys, but no descriptions appear to be extant from a British specimen. I have therefore omitted it." My own impression is that Palmer's Shark was a Basking Shark (*Selache maxima*),

which grows to a huge size; and that Wake's example was a Blue Shark (*Carcharias glaucus*).]

THRESHER (*Alopias vulpes*).—This species, which has a tail nearly as long as its body, was first described by Dr. Caius, from a specimen stranded between Lowestoft and Pakefield, in February, 1570. The following list will cover most of the records:—One in Herring-nets off Lowestoft, September 28th, 1879; length of body, 6 ft. 6 in.; tail 6 ft. 4 in. One, Lowestoft, October 20th, 1881, 12 ft. long. Two small examples, Lowestoft, September, 1897. One, Lowestoft, November 7th, 1898; length 14 ft. 4 in. Mr. Dutt informs me that “An 11 ft. example, weighing $2\frac{1}{2}$ cwt., was caught by some Southwold fishermen while they were after Herrings not far from the shore; this was in October, 1906.”

ROUGH HOUND (*Scyllium canicula*).—Lesser Spotted Dogfish. Occasionally taken by offshore Suffolk trawlers, Lowestoft; Lowe (Nor. N. S.), on the authority of J. H. Gurney. Southwold (Wake).

NURSE HOUND (*Scyllium catulus*).—Greater Spotted Dogfish. One caught off Aldeburgh, August, 1909. A fisherman told me he had, a few years ago, taken six and seven score a day when long-lining off that town. Southwold (Wake).

PICKED DOG (*Acanthias vulgaris*).—“Picked” is undoubtedly a corruption of piked, so named from its spines. Comes into the local waters in shoals, following the Herrings. I observed examples of this species in August, 1909, at Southwold, and at Lowestoft. It attains a length of 4 ft. according to Dr. Day; the largest I have ever recorded was one from Lowestoft in July, 1909; length 3 ft. 3 in.; weight 9 lb.

GREENLAND SHARK (*Læmargus borealis*).—Recorded once in Norfolk, at Sherringham; once at Lowestoft; Mr. T. Southwell recorded the latter in ‘The Zoologist’ as taken at Kessingland, near Lowestoft, on February 28th, 1875; it was a male, 12 ft. 6 in. long.

MONK FISH (*Rhina squatina*).—Mr. T. Southwell saw one exhibited at Lowestoft, August 5th, 1874. Has been brought into that port on several occasions (Dutt).

TORPEDO RAY (*Torpedo nobiliana*).—An example of this fish is recorded for Lowestoft, December 1st, 1883, which was taken

in a trawl-net off that port. A freshly captured specimen, "barely dead," was brought me by a Lowestoft fish-vendor on February 9th, 1907. I understand that on February 18th, 1895, Mr. Howard Bunn received an example for preservation in the same town.

SKATE (*Raia batis*).—Common off the Eastern coast.

LONG-NOSED SKATE (*R. oxyrinchus*).—Said by Wake to have been taken off Southwold, which to me is curious, as I have never yet satisfactorily discovered it for East Norfolk.

BURTON SKATE (*R. marginata*).—I had a small example of this species brought me fresh from Lowestoft on May 9th, 1909. The under part was white, with the *black margin* (as figured in Couch, vol. i. p. 110) that has gained for it the name of Bordered Ray, now, however, satisfactorily described as the young of the present species. The upper surface was drab-coloured and as smooth as glass, with no spiny processes except one against each eye. It was roughly spined under the snout, and had three rows of spiny processes on the tail. I forwarded it to the late Mr. Southwell, who was delighted to receive it.

THORNBACK RAY (*R. clavata*).—Known in the trade, and locally, as "Roker." Great quantities brought from the North Sea to the fish-market by trawlers. Numerous all along the coasts; I saw examples landed by the Southwold and Lowestoft boats. A white variety taken off Lowestoft in October, 1905, 3 lb. in weight. Aldeburgh.

SPOTTED RAY (*R. maculata*).—Locally known as "Homer," or Homlyn Skate. Common all along the Eastern coast. Very small examples in boats at Lowestoft, August, 1909; the fishermen termed them "Maids."

STARRY RAY (*R. radiata*).—Of this formidably spined fish, an example the size of a dinner-plate was brought me from Lowestoft on February 20th, 1907. My first record was an example taken off Norfolk, May 14th, 1897. In each instance, the taxidermist assured me the skinning and preserving of them punished his fingers severely.

STING RAY (*Trygon pastinaca*).—Has on two or three occasions lately turned up on the Suffolk coast. One was caught by a lady fishing from Claremont Pier, Lowestoft, in the June of 1909 [date lost]. It weighed 35lb. Her basket contained, for

the afternoon's angling, a 1 lb. Sole, a large Dab, and an Eel, besides this monster—a varied catch! On September 3rd, 1909, one of the Aldeburgh trawlers brought in a Sting Ray weighing about 50 lb. It was promptly exhibited on the "Front" to visitors, at the charge of a penny, a board attached to a lamp-post announcing the capture as "The Terror of the Sea, caught at last!" Mr. Whistler, who saw it, assures me that previously an even larger example was captured. "Mr. Gurney mentions one weighing about 10 stone, which he saw taken off Kessingland, Suffolk, September, 1856, which had a double spine" (Nor. N. S.).

WHIP RAY (*Myliobatis aquila*).—Known also as the Eagle Ray. Mr T. E. Gunn records "the skeleton of one found dead on Lowestoft beach, June 19th, 1867," which was in the possession of Mr. Harper, chemist, Norwich.

SEA LAMPREY (*Petromyzon marinus*).—A strong local prejudice exists against this toothsome fish, which strays up the Waveney and other rivers, probably oftener than is known; solitary examples, probably sickly or damaged in some way, have several times, to my knowledge, been fished from the surface of the local waters. Mr. W. S. Everett informs me that, some thirty years ago, a man named Bessey took from his Eel-set on the Waveney, after one night's fishing, no less than 5 cwt. of Lampreys. He despatched them in boxes to London. "Two stuffed specimens at Geldeston, taken in the lock" (Dutt). "Has been caught at Ellingham lock" (Tilney).

RIVER LAMPREY (*P. fluviatilis*).—This species ascends our rivers in irregular but occasionally in great numbers for spawning purposes. An Eel-catcher is recorded to have taken a ton at one haul in his Eel-set, in 1806. When taken in any quantity they are sent away for bait, its toughness on a hook making it a favourite with fishermen. "Taken at Ellingham lock" (Tilney).

[LANCELET (*Branchiostoma lanceolatum*).—Dr. Day seems to doubt this "fish's" claim to a true species ('British Fishes'). He says: "This creature is introduced here, due to its being included in other works on British fishes. The structural resemblance between *Amphioxus* [this creature] and the Ascidi-ans was pointed out by Dr. Goodsir." Dr. Wake gives this

“ fish ” as occurring in Southwold waters ; it is a pity he does not quote authority or date. I myself am inclined to reject it.]

P.S.—A list of species in my Yarmouth Catalogue of Fishes* which might in all probability be discovered off Suffolk if carefully looked for :—

Plain Bonito.	2-Spotted Goby.	Rock Goby.
Opah.	Power Cod.	Sail Fluke.
Gattorugine.	Eckstrom's Topknot.	Long Rough Dab.
Müller's Topknot.	Lemon Sole.	Common Trout.
Pole.	Anchovy.	Ocean Pipefish.
Hammerhead.	Cuckoo Ray.	Planer's Lamprey.
Blackfish.	Ray's Bream.	

* Cf. 'Zoologist,' 1897, pp. 539-567, and 'Nature in Eastern Norfolk,' pp. 269-310 (1905).

FORMICA SANGUINEA, LTR., AT BEWDLEY, WITH
AN ACCOUNT OF A SLAVE-RAID, AND DESCRIPTION
OF TWO GYNANDROMORPHS, &c.

BY HORACE ST. JOHN K. DONISTHORPE, F.Z.S.

ON July 19th last I went to Bewdley Forest for a few days to study the nests of *Formica sanguinea*, a species which is rather common there. Indeed, it flourishes amazingly, having increased considerably since I was there last year. It is now spread all over the district, all along the railway banks, the roads through the Forest, and even in some of the fields. I found the ants very active, winged males and females in most of the nests (some of the former in one of the nests being very small specimens, "Micraners"), and some winged females running about outside. I captured two gynandromorphic specimens—one, half-male, half-worker, on July 20th; and the other, half-male, half-female, on July 21st. I give a description of these curious creatures later on.

On July 20th I was fortunate enough to witness a slave-raid. I found the ants belonging to a nest situated on a high embankment of the railway in a great state of excitement, all running about outside the nest, and very active in the hot sunshine, some winged females being also present outside. I then noticed that a lot of *sanguinea* workers kept arriving, carrying pupæ, whilst others were all hurrying off in the opposite direction. These I started to follow, and found they went along the embankment for a good many yards, and then descended the steep bank, crossed the railway-lines in a slanting direction, and mounted the bank on the opposite side. At the top I found them busily engaged in ravaging a nest of *Formica fusca*. Many workers, laden with pupæ, were streaming off in the direction of their home; I had met specimens carrying pupæ all the time I was tracking the outgoing ants. Others were attacking and killing solitary *fusca* workers. Several *fusca* workers were observed up the grass-stems, &c., holding pupæ, and endeavouring to escape from the slave-raiders. I watched

these proceedings for a considerable time, and accompanied some of the ants with pupæ back to their nest, quite a distance off, though they covered the ground very quickly. Several trains passed, but the ants did not appear to be disturbed, as when I went on to the lines after one had gone through, the ants continued to cross the railway as if nothing had happened. It was unfortunate that I did not witness the start of the expedition, only arriving after the proceedings were in full swing. I believe the only other individuals who have had the good fortune to witness a slave-raid in this country are the great Charles Darwin, F. Smith, and W. Farren-White.

I now give a description of the two gynandromorphs mentioned above. They both belong to Dalla Torre and Friese's Group I. Lateral Gynandromorphs ('Ber naturwiss med Ver. in Innsbruck,' xxiv. 1898, pp. 3-96):—

Formica sanguinea, Latr. (fig. 1).—Nearly complete lateral gynandromorph; male on right side, worker on left. Right antenna male, left worker. Right mandible, eye, lateral ocellus, and median ocellus male; left mandible, eye, and lateral ocellus worker. The head is black, with the exception of the left mandible, left half of clypeus, a small patch before left eye, and left cheek, which are red. Thorax and petiole, male on right, worker on left, the line of division not being quite straight, however, the black colour on the right side of mesonotum encroaching on the red colour of left side. Petiole divided sharply, black on right, red on left side. Gaster black, the right half with male pilosity and sculpture, left half worker. External male genitalia are present on the right side, the anal sternite being present only on that side. The red and black colour are sharply defined beneath, but the coxæ are all black and red, as in the male, and the legs on both sides are somewhat infuscate, the tarsi on the right side being longer. Winged, of course, only on right side; the veins and stigma are pale, and more like those of the female. L. 7 mm.

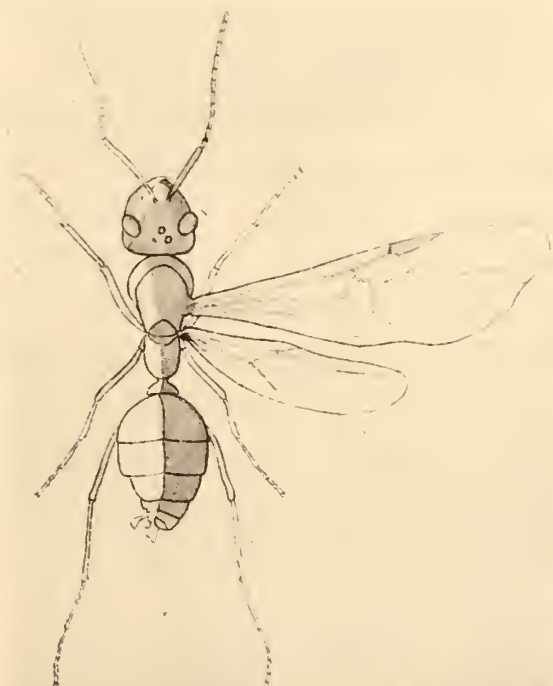
Formica sanguinea, Latr. (fig. 2).—Lateral gynandromorph; male on left side, female on right. Both antennæ female, head somewhat small, but female shape, left eye a little larger than right, ocelli female. Head black, with exception of clypeus and right mandible, which are red; greater part of thorax red and black, evenly divided laterally, only the top right corner of the

epinotum being red. A bit of the scutellum and post-scutellum on the left side, where the hind wing is joined, red. Petiole sharply divided, red on right side, black on left. Gaster black, the right side with female pilosity and sculpture, left side with that of male. Colour sharply defined underneath. Legs and coxæ

(2)



(1)



Hereward Dolman.

female on right side, male on left. External male genitalia are present on left-hand side. Fully winged on both sides, the stigma and veins being darker, as in the male. L. 9 mm.

Only two other specimens appear to have been found in Britain. These are a specimen of *Myrmica lævinodis* (B. Cooke, Nat. Yorks. viii. 1882, p. 30; F. Smith, Ent. Ann. 1874, p. 147, and Trans. Ent. Soc. Lond. 1874, Proceed. pt. iv.), and a specimen of *Stenammas westwoodi* (R. C. H. Perkins, E.M.M. 1891, p. 123). Prof. Wheeler has written a very complete paper on Gynandromorphous Ants (Bull. American Museum, Nat. Hist., xix. 1903, pp. 653-683).

The following Myrmecophiles were taken during my stay at Bewdley:—*Dinarda dentata*, not uncommon in some of the *sanguinea* nests, as well as many of its larvæ. A specimen of *Notothecta flavipes* running among the *sanguineas*, having no doubt flown from one of the *rufa* nests near, and another on the wing. The mite *Laelaps cunifer*, which occurs with so many species of ants, was abundant in the *sanguinea* nests. The interesting little fly, *Phora formicarum*, was captured hovering over and striking at ants in nests of *F. sanguinea*, *Lasius niger* and *L. flavus*. It hovers in a very steady and deliberate manner over an ant, getting gradually nearer and nearer. It was very amusing to observe an ant, when it had become aware of the presence of the fly, run as hard as it could for shelter, pursued by the fly. I found the fly would hover and strike at the ants even when the latter were on my hands. A single *Coccinella distincta* was found in a *rufa* nest. A female of the fine Bracon, *Euphorus bistigmaticus*, recently described by Mr. Morley (E.M.M. 1909, p. 212), was captured, hovering over a nest of *F. rufa*.

Before bringing these notes to a close, mention must be made of a nest of *Formica fusca* var. *rubescens*, Forel, Ann. Soc. Ent. Belgique, T. 48, p. 423 (1904). I discovered this nest last year at Bewdley. It was situated under a very large, heavy stone, and partly in a mound it had raised beside the stone. At the time I took it to be *Formica rufibarbis*. I had expected to find *Dinarda pygmæa* and *Atemeles paradoxus* with it, but this will account for their absence! No female could be found last year, and this year, though many winged males were present, not a single female could be found. This looks as if the males were the parthenogenetic offspring of the workers, from worker eggs. This is the first record of this variety of *F. fusca* in Britain, though Prof. Forel tells me it is common in Switzerland.

NOTES AND QUERIES.

AVES.

Wryneck in Yorkshire.—On June 8th, whilst walking through the park at Studley Royal, near Ripon, I heard the Wryneck (*Iijnx torquilla*) in full song. It is the first time that I have noticed this bird in Yorkshire during twenty years' residence in the county. — W. GYNGELL (Scarborough).

Notes on the Nesting of the Sparrow-Hawk (*Accipiter nisus*).—

May 23rd.—Nest built in a holly-tree, eleven feet from the ground, containing five eggs, this nest, as is very frequent, being near a ride.

June 15th.—7 p.m. Two young hatched.

17th.—7 p.m. Four young hatched. One addled egg. No trace of any remains of food in the nest. Probably the young are being fed with small portions only of the prey brought to the nest.

19th.—7 p.m. No remains of any food.

21st.—7 p.m. Feathers of a small Warbler in nest; probably Willow-Warbler. The young are evidently now tearing to pieces the "kills" brought to nest.

30th.—7 p.m. Feathers only in nest, apparently of young birds, and difficult to name with any certainty.

July 8th.—Remains of one Pheasant poult and one Jay.

9th.—Another Pheasant poult.

11th.—Remains of two Pheasant poults, one Blackbird, two Thrushes. As Pheasants are not very common near at hand, most likely regular visits are being paid to my neighbour's coops.

12th.—Remains of Jay, Redstart, and Warbler. Two of the young Hawks sitting on branches outside of nest.

14th.—Remains of Redstart. Four nestlings all in the nest.

16th.—Remains of two Pheasant poults. No young seen.

17th.—Remains of young Pheasant, Woodcock, Chaffinch, and Thrush, the latter having been eaten on the ground some few yards distant from tree containing nest. One young Hawk on the nest, another close by, and others not seen, the trees around being so thick it is difficult to locate them unless they chatter.

18th.—11 a.m. One young feeding on a Blackbird within the nest. One or more of the other nestlings heard near at hand. Re-

mains of hen Bullfinch, Robin, Warbler, and one other bird on the ground in the vicinity of the nesting-tree.

19th.—7 p.m. Remains of Blackbird and Thrush on the ground.

20th.—One only of the nestlings heard. Remains of a chicken (size of Partridge), Thrush, and Warbler. The remains are found within a area of fifty yards of the nest.

No trace of any additional "kills" after this date, and the young were neither seen nor heard again in this particular part of the forest. For a period of not less than twenty-seven days the young were in the nest, and eight days more before finally leaving their birthplace.

In addition to the seven Pheasants, one Chicken, one Woodcock, two Jays, five Thrushes, three Blackbirds, one Bullfinch, one Robin, two Redstarts, one Chaffinch, and several Warblers already mentioned, there would be a number of other "kills" of which no trace would be found. In the smaller birds under the size of a Thrush, the whole, as a rule, appears to be devoured; with Thrushes and such like birds the legs are not usually swallowed, and with the larger birds the legs, head, and more or less of the skeleton are left. Most of the feathers are removed from the "kills" before being brought to the nest.—
J. STEELE ELLIOTT (Dowles Manor, Salop).

Rough-legged Buzzard in Surrey.—A Rough-legged Buzzard (*Buteo lagopus*) was shot in Wonersh Park, near Guildford, on Nov. 24th, 1909. The bird is a very nice adult male, but not very old. It measures $22\frac{1}{2}$ in. long, and 53 in. tip to tip of wings. It is being preserved by Pratt & Sons, the well-known naturalists of Brighton.—
G. HERBERT EASTWOOD (Whipley Manor, Bramley, Surrey).

Little Bittern in Oxfordshire.—A Little Bittern (*Ardetta minuta*), with one wing shattered close up to the body, was picked up under the telegraph-wires at Somerton (in the Cherwell Valley), Oxon, on June 27th, 1909. I examined it three days later while it was still in the flesh. The bill was then brown and yellow; legs greenish yellow. It appears to be adult, and was afterwards carefully sexed and found to be a female. The ovary was to have been sent to me, but bad weather intervened, and it went bad before I could see it. It was said to contain rudimentary eggs of the size of sweet-pea seed, but whether this points to the bird having already deposited its eggs or not I cannot now say. I should have preserved the ovary in spirit, and submitted it to an authority had I been able to do so; but there is hardly any doubt that the bird would have laid by the end of June if it was going to lay at all, and had a mate. A set of four eggs in my collection, taken by a friend of mine in Spain, was found on

May 5th. There are plenty of suitable breeding places (weed- and rush-grown osier and withy beds) in the Cherwell Valley, in the neighbourhood of Somerton.—O. V. APLIN (Bloxham, Oxon).

Bittern in Warwickshire.—I do not think I have recorded that a very thin Bittern (*Botaurus stellaris*) was brought from Fenny Compton to a birdstuffer during rather severe weather, on Jan. 28th, 1909.—O. V. APLIN.

Brown-throated Quail in Oxfordshire.—A Quail was picked up under the telegraph-wires at Adderbury on May 6th, 1909, and brought to me while in the flesh. It had been heard calling in an adjoining clover-field since the 3rd of the month. In this example the chin and throat are dark brown, and the only sign of the black anchor-shaped mark found in *C. coturnix* is a small black spot at the bottom of the throat. It would thus appear to agree with the description of the hybrid birds between *C. coturnix* and the form known as *C. capensis* (found in South Africa and the islands surrounding the coast) described by Mr. Ogilvie Grant in his 'Handbook to the Game Birds,' vol. i. p. 181. It is a male, weighed $3\frac{1}{2}$ oz., and seemed fairly fat. I have had it preserved.—O. V. APLIN.

Some Migration Notes from Yarmouth.—Up to time of writing the annual autumnal migration has not provided local naturalists with many surprises. A Water-Rail was found dead in the heart of the town on Sept. 25th, having struck an overhead wire when flying, and two Land-Rails found themselves in trouble from a similar cause on the 13th and 16th respectively; in this case, however, neither were injured, and I saw them alive in two public-houses, where they were being exhibited as "foreynors," to the no small bewilderment of brains none too clear and unclouded. Their flight must have been less forceful, or they had undoubtedly shared the same fate as the Water-Rail. Redstarts swarmed the St. George's Park on Sept. 16th, and numbers were seen, with Wheatears, by a gentleman cycling on the road between Lowestoft and Yarmouth. The first Hooded Crow was shown me dead on Oct. 4th. This species has been scarcer locally, so far, than for a number of years past; I am inclined to think it does not now visit us so commonly as at one time. Larks, Linnets, Chaffinches, and other small birds were arriving all day, and late into the afternoon of Oct. 10th, after which date they came in only spasmodically, and, so far as I can gather, in no great numbers. Only on odd days have the various *Corvines* been observed trooping in. My nephew, who was stationed on board the 'Leman and Ower' Lightship in October, tells me that, compared

with last October, this has been a very poor migration, from a lightsman's standpoint. He lamented a paucity of "fog-horny" nights, *i.e.* the nights were most frequently clear, and the birds were not driven to such straits on migration as happens on damp, drizzly nights. There were Larks, Tree-Sparrows, and other small birds noticed passing, but the only birds "of any account" were a Kingfisher and a Moorhen. The latter struck a lamp on about the 8th, killing itself, and, my relative remarked, "was within an ace of bashing the lampman's face, the whisk of its wings being felt upon his face." This bird was immediately pounced upon, and afterwards "baked with a bit of salt pork." The fact of a Kingfisher coming aboard the vessel, which is eighteen miles from shore, is interesting. It has been remarked, I believe, that this bird had never, so far, been recorded from a light-vessel; of course naturalists can only conjecture it a possible migrant. It arrived the same night as the Moorhen. I afterwards visited the particular lightsman's house, where its carcase was to be seen. It had been drawn and filled in with salt and a bit of stuffing, and was of course an exceeding sorry example of amateur taxidermy. A goodly muster of Swans was reported to me by a Mr. Youngs, an amateur puntsman, as seen by him on Breydon. They were, he states, divided into three or four flocks, in all numbering upwards of a hundred individuals. This was on Nov. 11th. Youngs tells me he heard some of them "whooping"; while Mr. Sharman, an old Breydon puntsman, informed me one flock was almost certainly composed of Bewick's. One or two large bunches of Snow-Buntings have been seen, and two Lapland Buntings are reported as "obtained."—ARTHUR H. PATTERSON (Ibis House, Great Yarmouth).

Correction.—T. LENNARD (p. 233) should be T. SHEPPARD (Municipal Museum, Hull).

NOTICES OF NEW BOOKS.

The Place of Animals in Human Thought. By the Countess EVELYN MARTINENGO CESARESCO. T. Fisher Unwin.

THIS is a stimulating and learned book on a subject which engaged the minds of thinking men long before zoology was studied as a science; it approaches the subject on a mystical and psychological plane, and seeks to unravel the hidden qualities which unite man to the other animals rather than the

structural characters which differentiate him. In this respect there is some clue to the cryptic remark made by Cardinal Newman, and quoted by the authoress: "That we know less of animals than of angels." Shall we ever reach the position of ceasing to describe mankind alone as constituting "our fellow-creatures"?

In human history, full of "wars and rumours of war," it seems strange to find that there have always been sages and thinkers who have advocated the view that we should use animals as our helpers, but should refrain from taking life. It is quite a novelty to be referred on this point to Plutarch, and the Countess has done good service in extracting from "the formidable depths of the *Moralia*" sufficient to prove "that Plutarch traversed the whole field of speculation on animal intelligence." From the *Adi Granth*, or Sacred Book of the Sikhs, we find a quotation from Baba Nanak that reminds us of a subsequent well-known couplet in the 'Ancient Mariner':—

"He who towards every living thing is kind,
Ah! he, indeed, shall true religion find!"

In all the great faiths of humanity we find injunctions to the same effect, though often little followed by the faithful, and on this point the student may well agree with a quotation of the authoress: "He who knows but one religion knows none." Through these ancient fields and the mazes of folk-lore the Countess leads us with no uncertain step in a volume which is suggestive to the last degree. The subject, however, is after all somewhat of an academic one; we heartily grant the premise that all life is sacred, even when starting for a happy day's angling; as zoologists we gloat over the skins of slain birds and mammals which give us a knowledge of still more species, and enable us to further understand the intricacies of animal distribution. But we can at least rise to higher things in refusing to believe that other animals are automata, and we can study animal psychology apart from a too strongly pronounced anthropomorphic standpoint.

There is little to criticise. The "wolf of Agobio," on p. 257, is referred to on p. 258 as the "wolf of Gubbio"; while the story of the Saint of Assisi and the Cicada requires revision. The injunction of Francis, "Sing, my sister Cicada," and the

remark that, after receiving the permission, "she sang her song," is not only, as regards a sexual acquirement, against the teaching of entomology, but also contrary to the true though ungallant lines of the Rhodian bard who wrote :—

" Happy the Cicada lives,
Since they all have voiceless wives."

The Home-life of a Golden Eagle. Photographed and Described
by H. B. MACPHERSON. Witherby & Co.

MR. MACPHERSON has had an unique experience—in fact, the ornithological chance of a lifetime, and he has made the most of it. He has not only watched the home-life, but seen the young Eagle from the egg to its abandonment of the nest and its disappearance into the grand but inhospitable gorges of the Grampian range. In what to a Southron seems dreary exposure combined with laborious climbings the author has kept long vigils near the eyrie, and done bird-watching *par excellence* with the trusty camera, while thirty-two mounted plates show the principal incidents of the eleven weeks passed by the eaglet in the eyrie. There were two young, but one mysteriously disappeared, so that even this rare bird requires protection rather than molestation, for destructive as are its habits it is not free from danger.

In this booklet Mr. Macpherson tells his story with considerable skill, for it never lacks the highland environment; it details observations which are original, and it records work only to be accomplished by much hardihood. The plates fully illustrate the story of the eyrie with the hardy uprearing of the eaglet as in the old Scottish way. We have only one fault to find, and that more with the publisher than the author. Surely this booklet deserved better binding; an essentially paper cover for so good a piece of work throws an obligation on all who possess it and naturally wish to place it on the library shelf.

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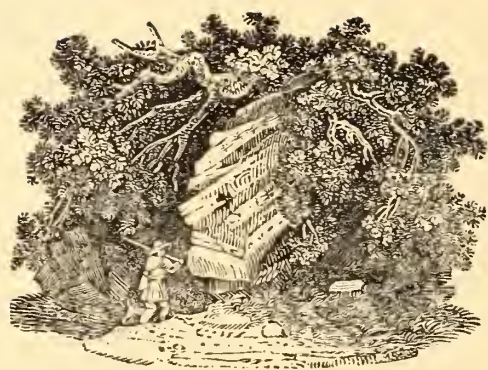
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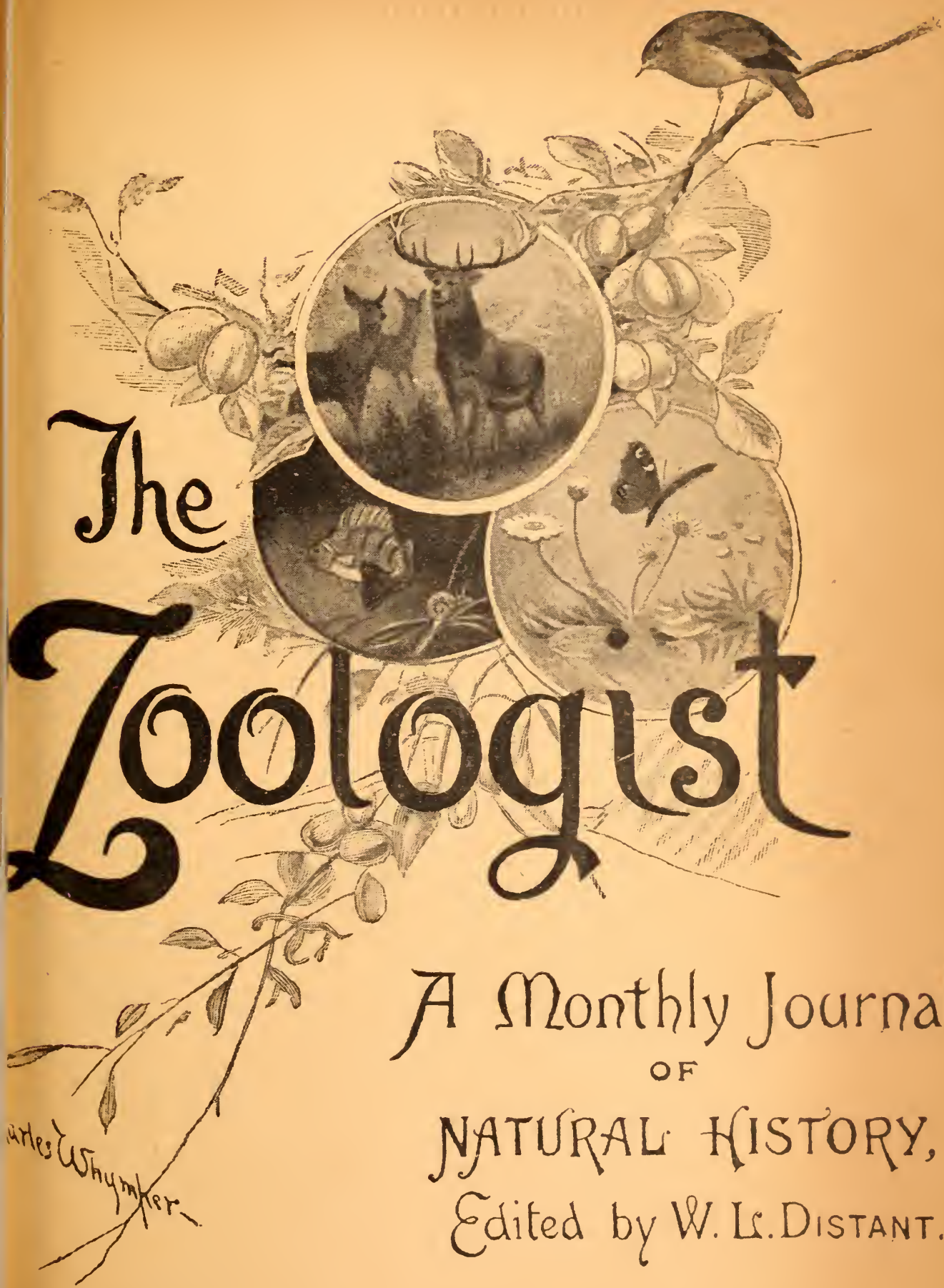
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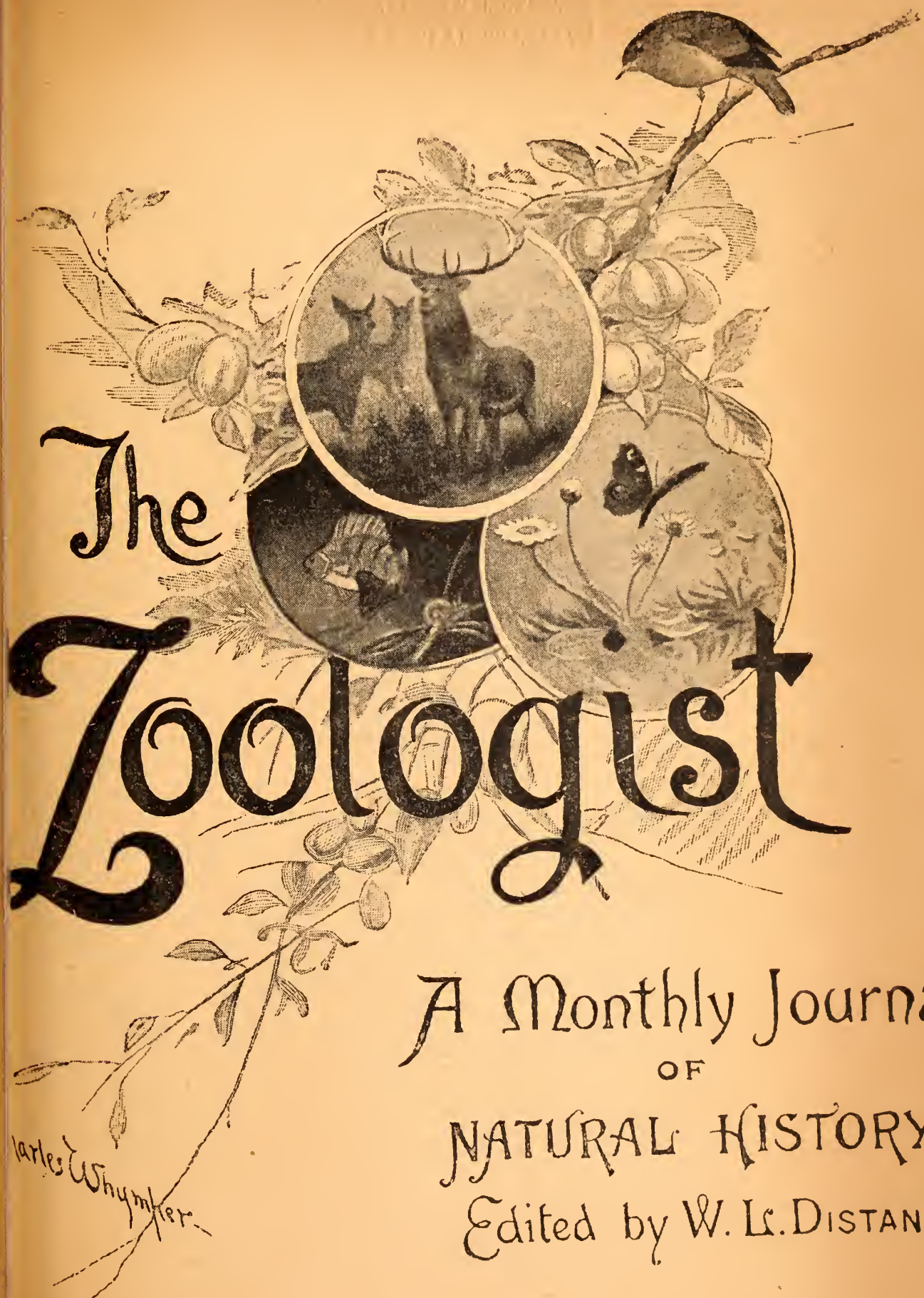
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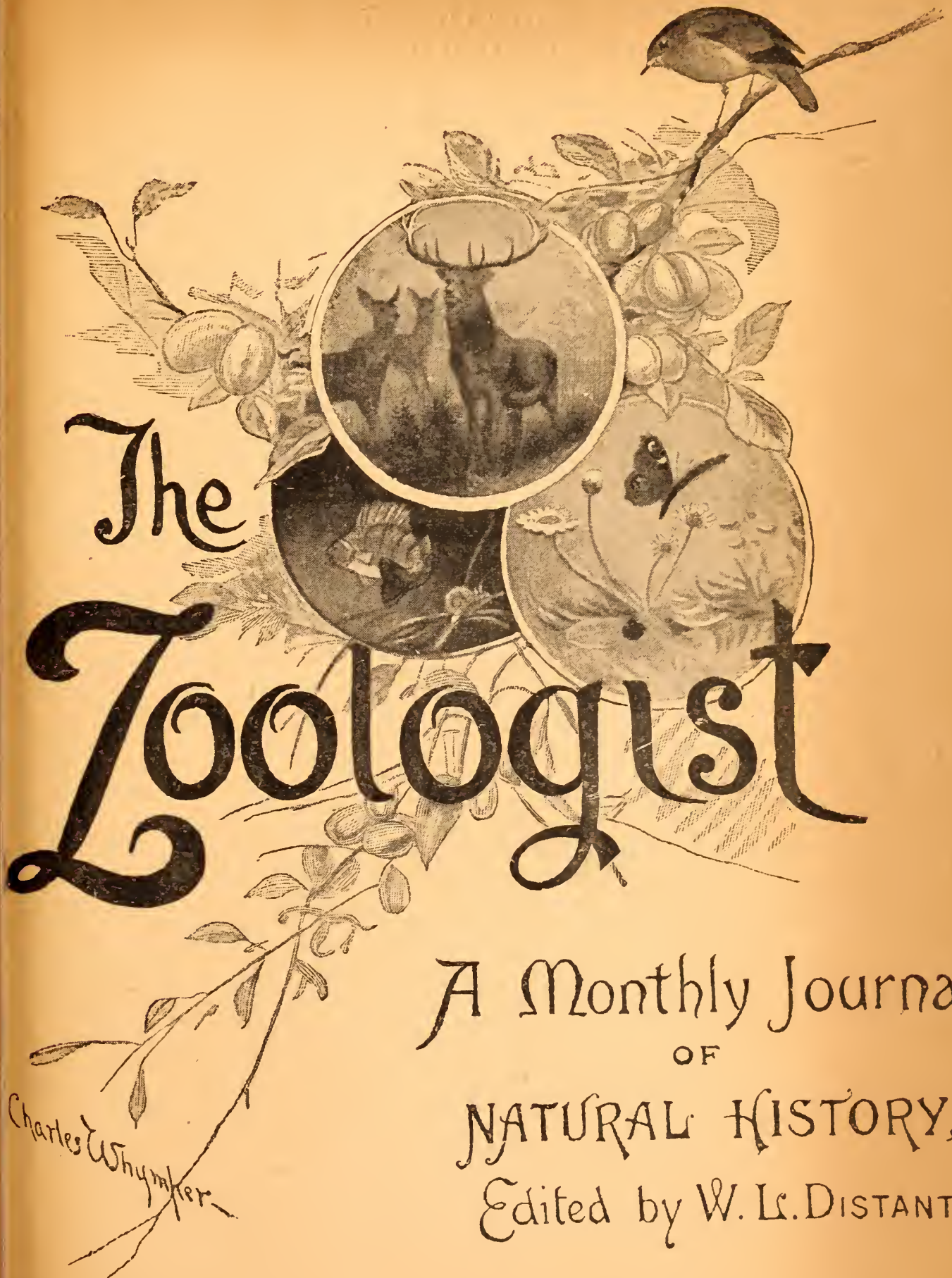
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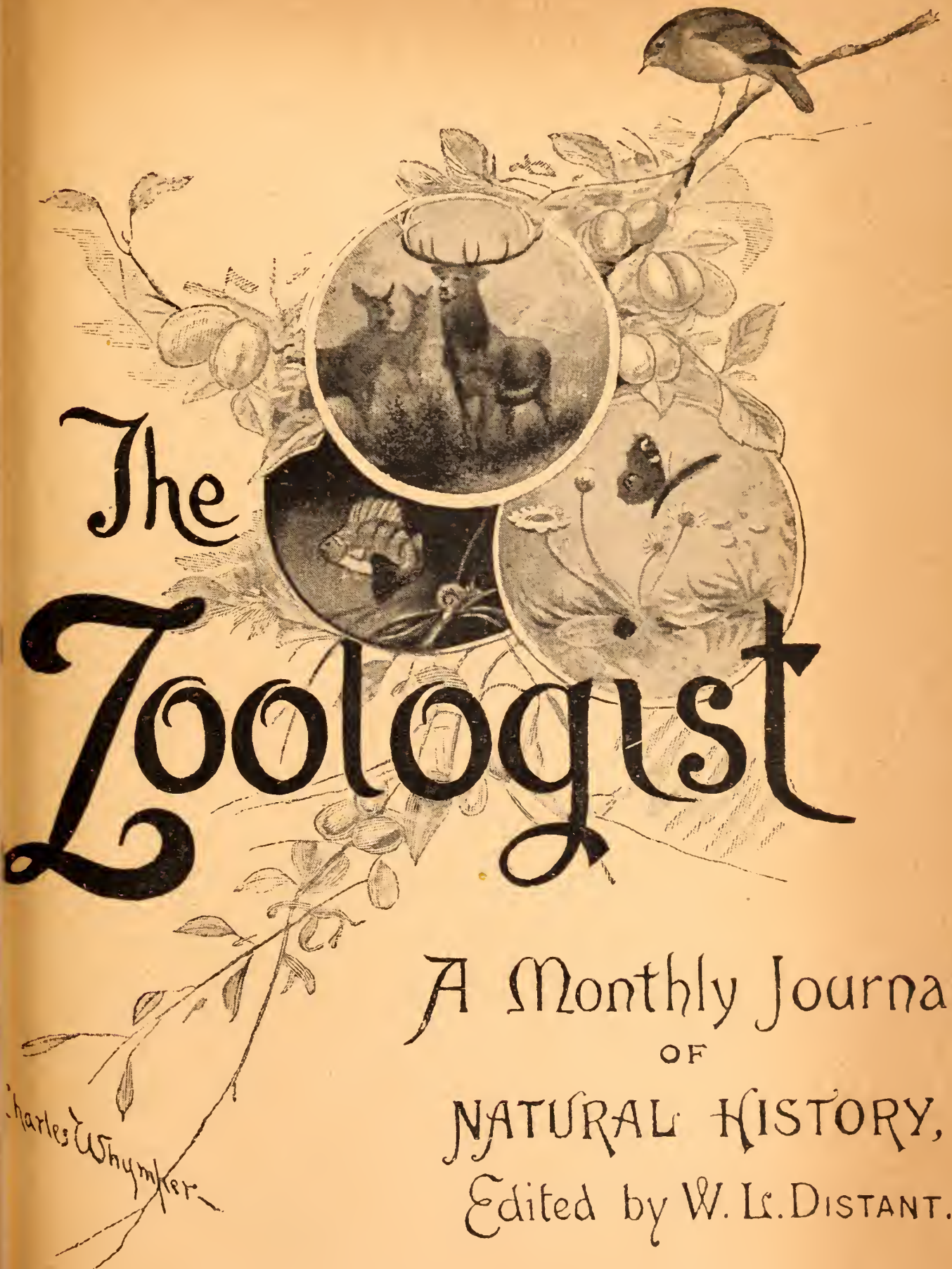
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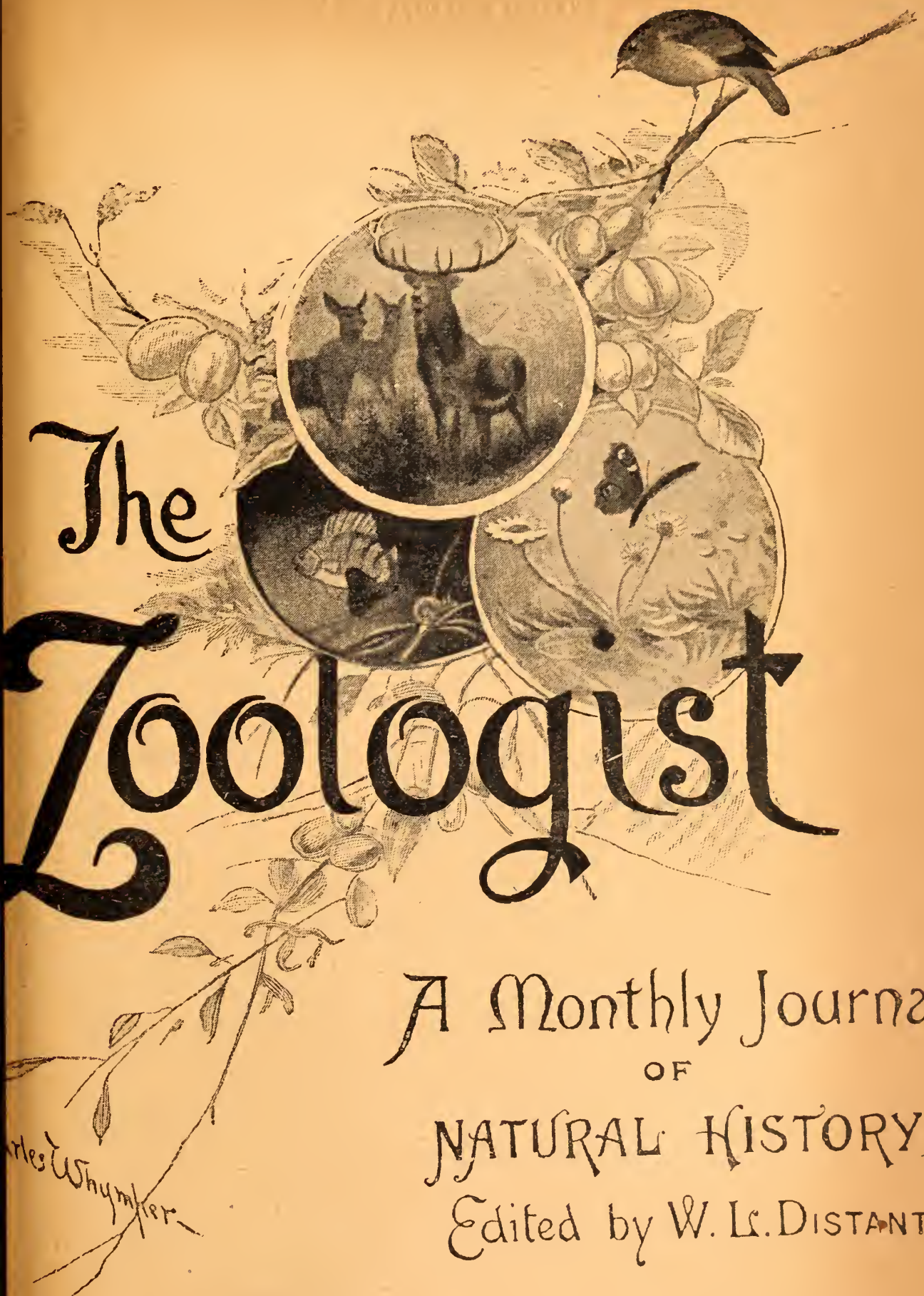
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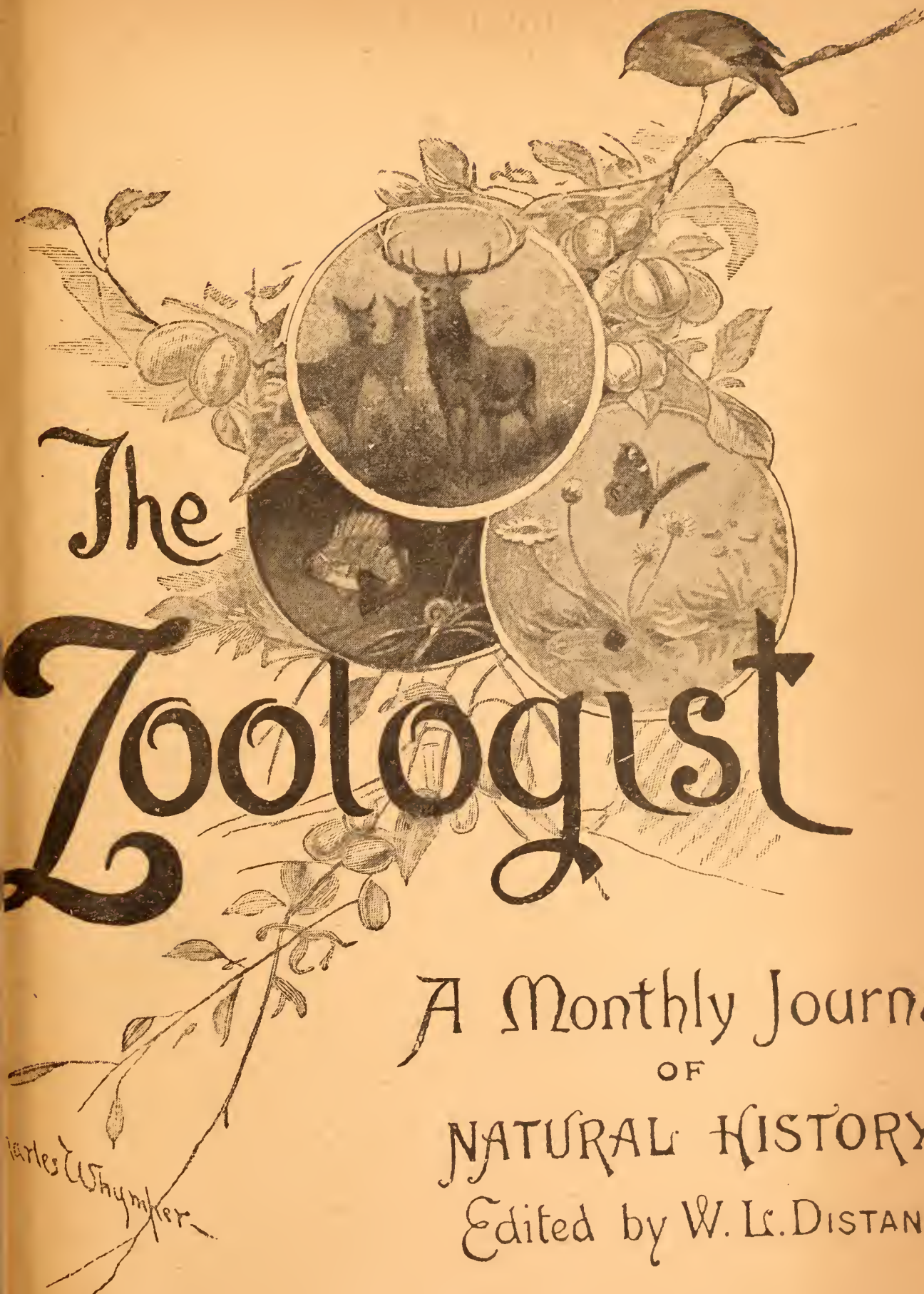
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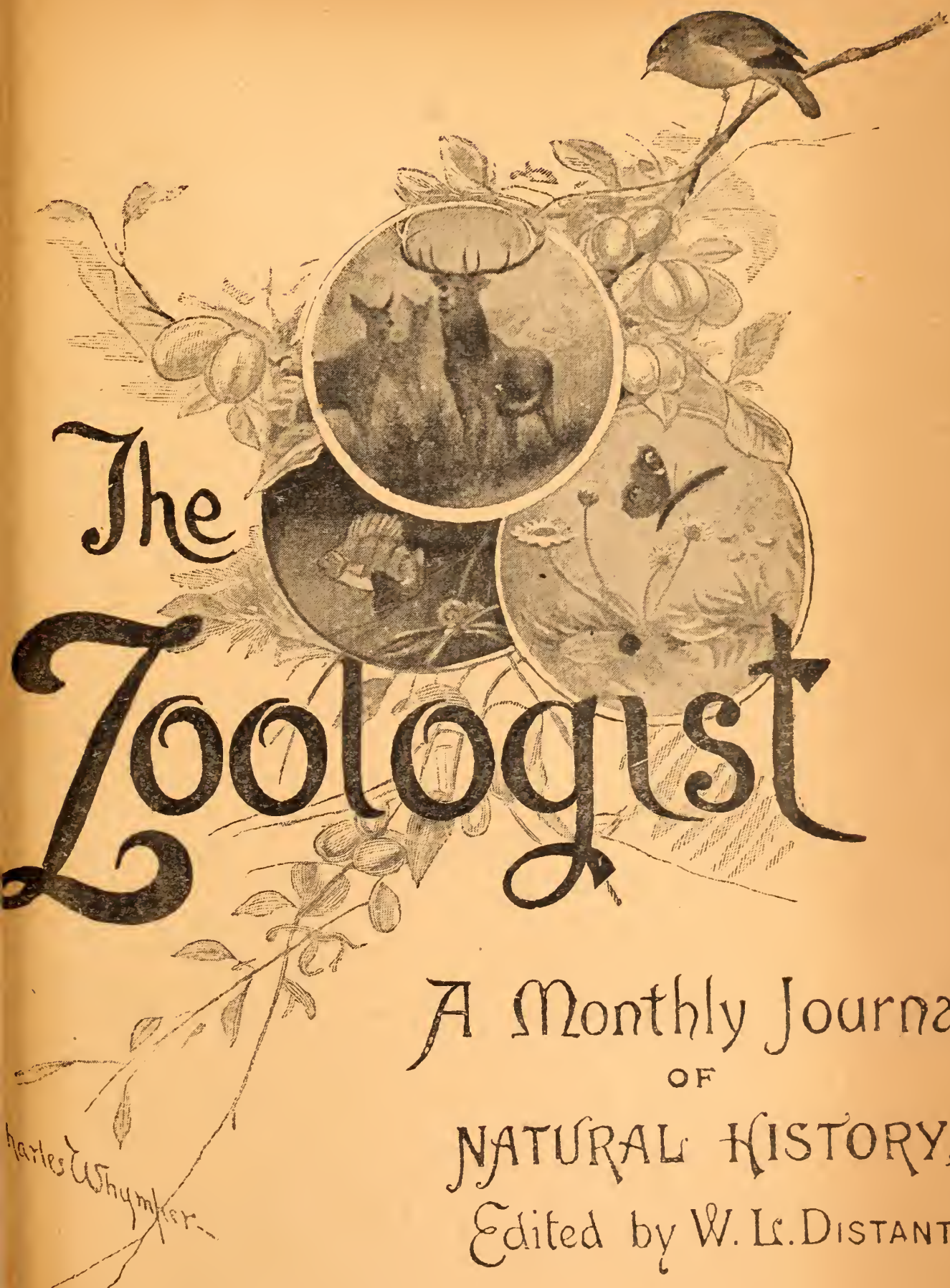
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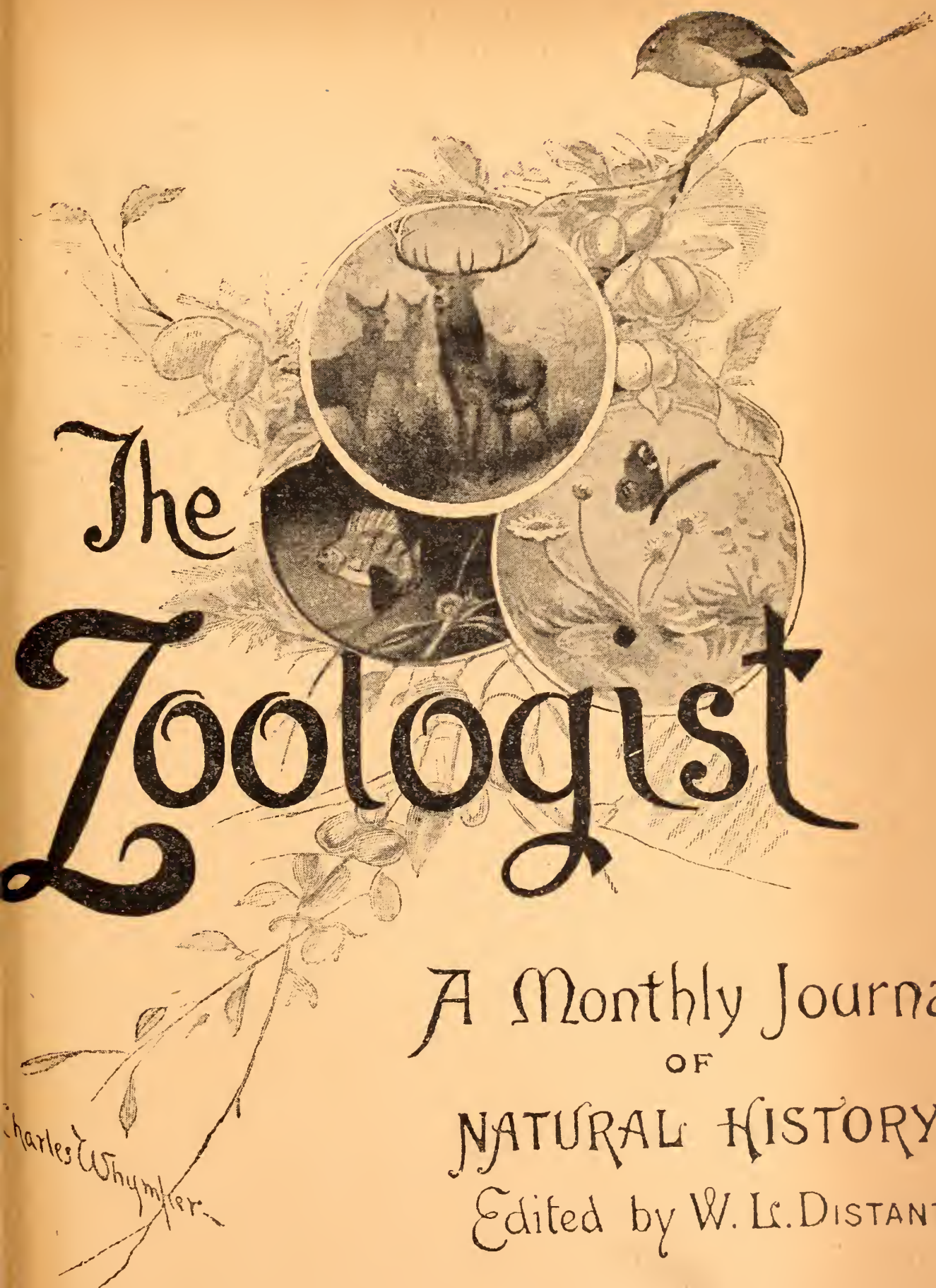
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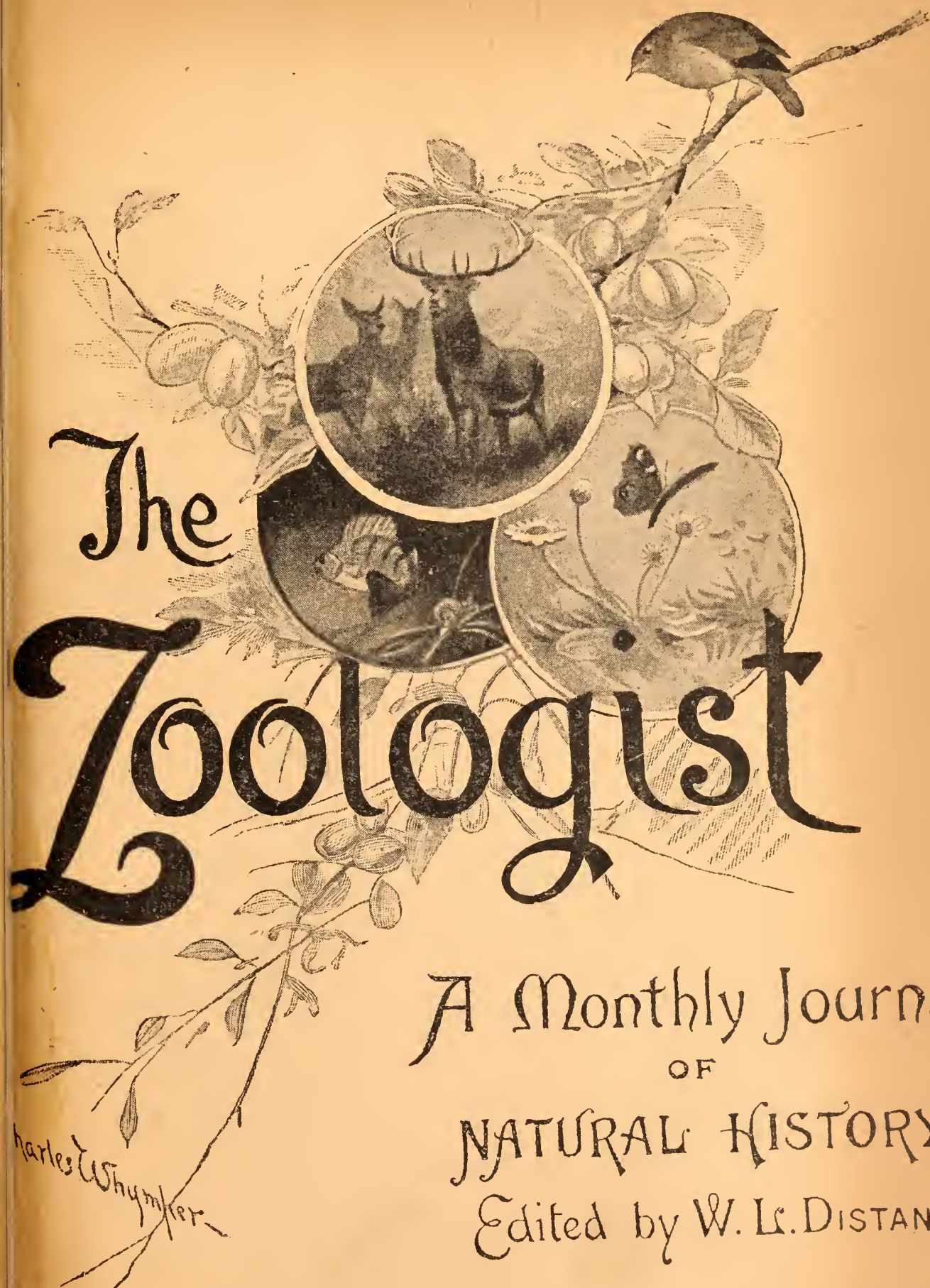
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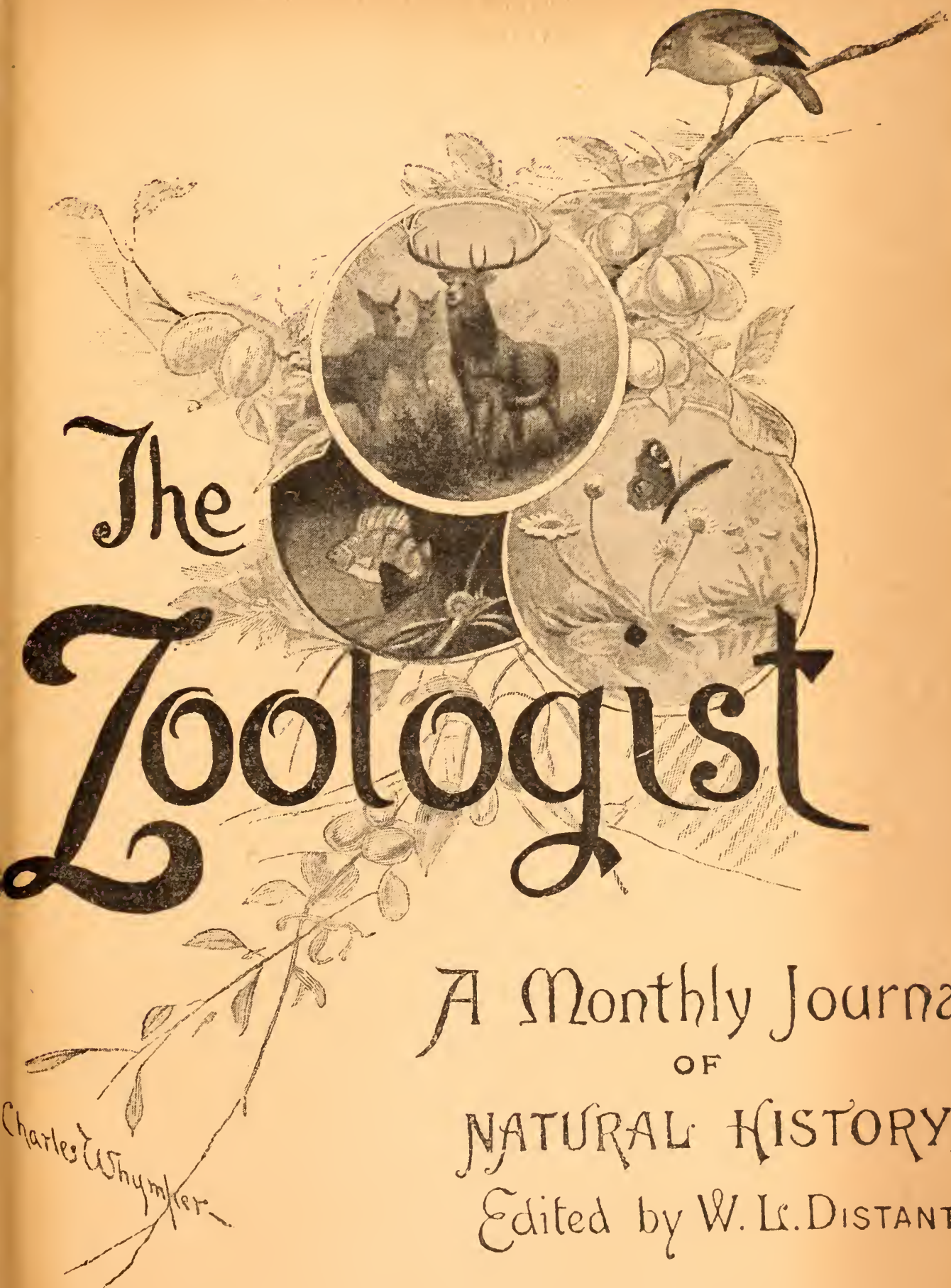
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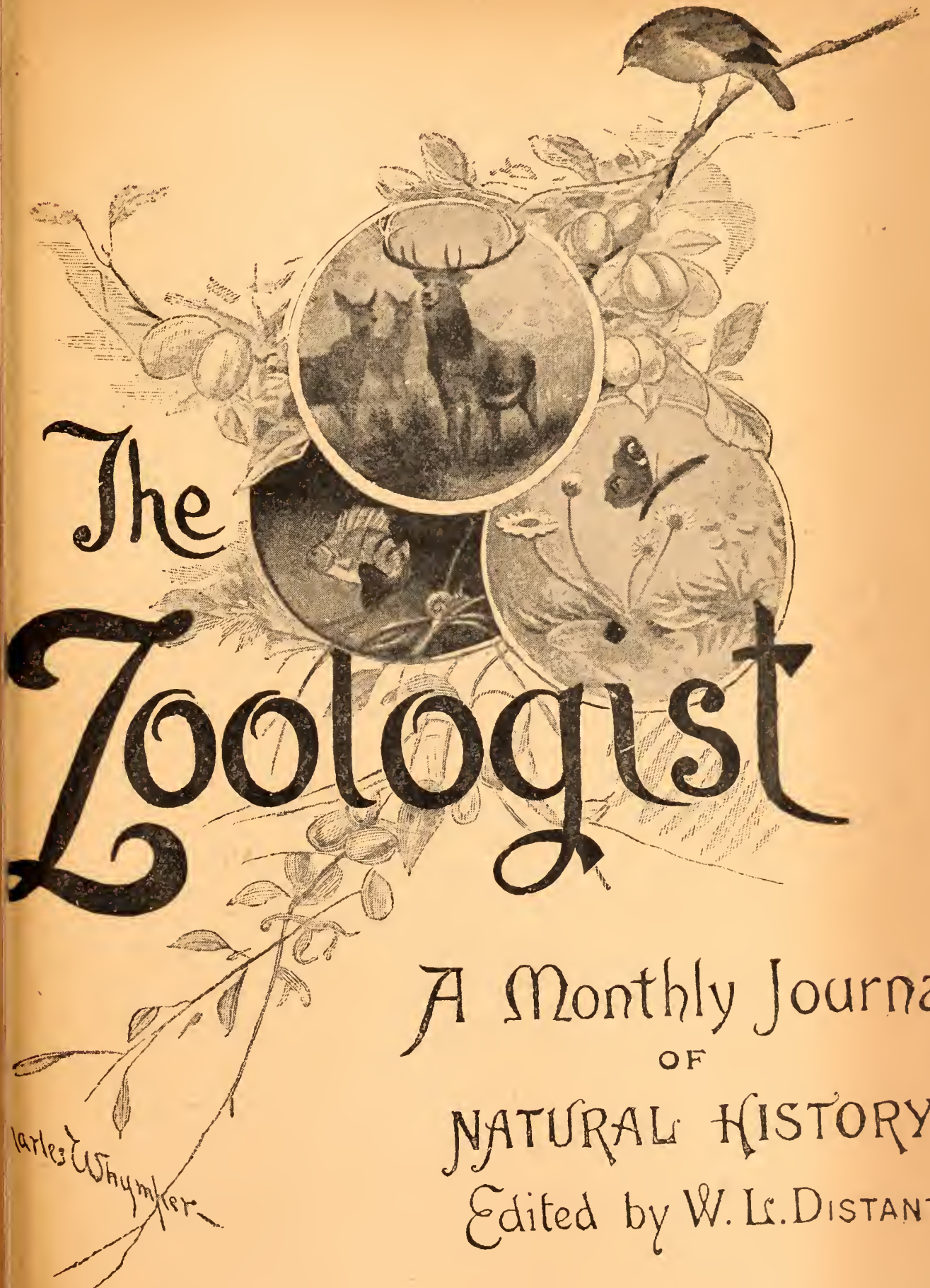
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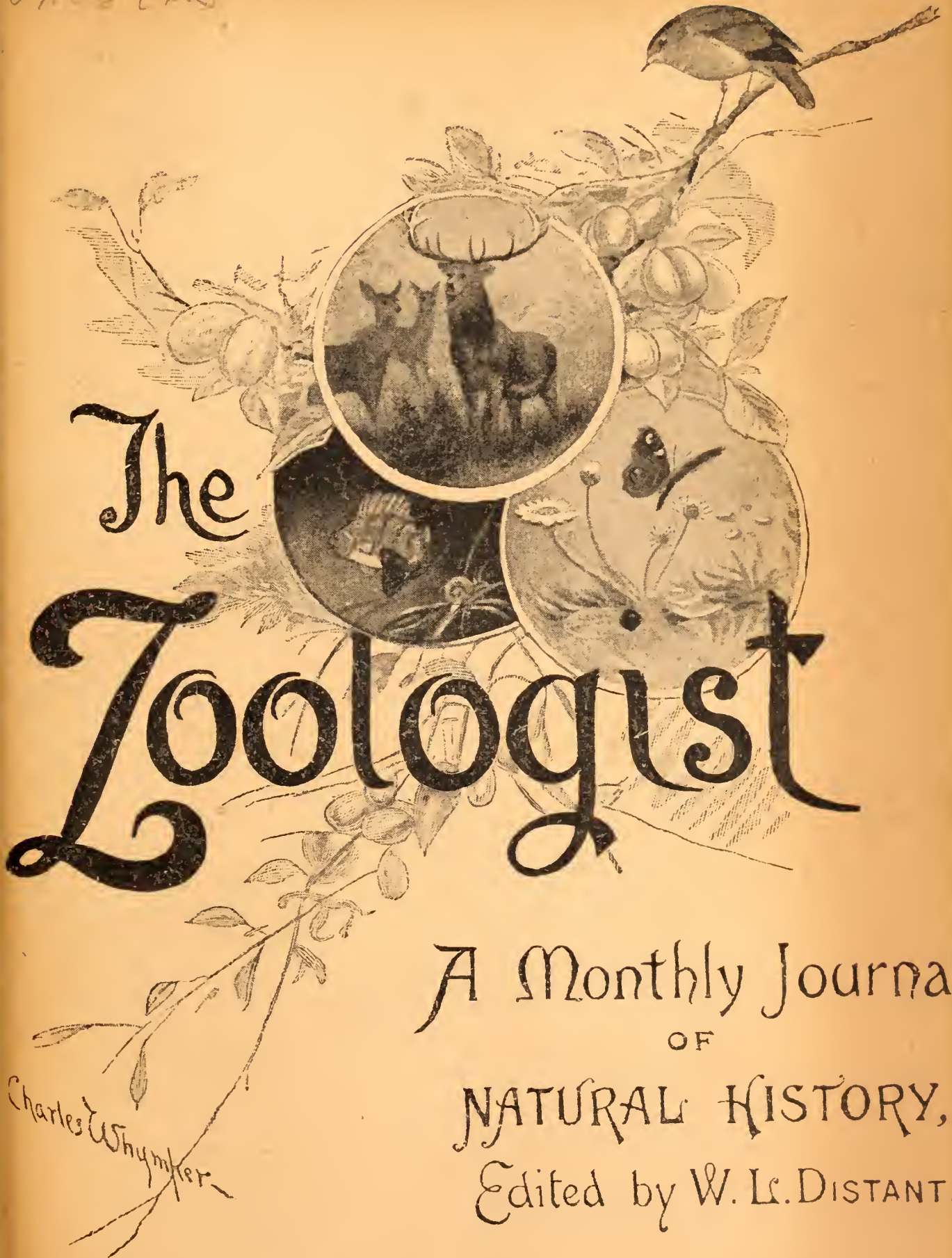
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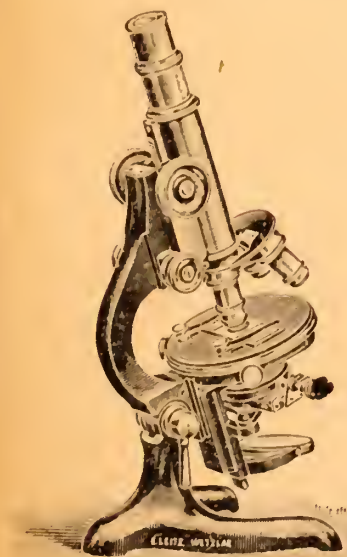
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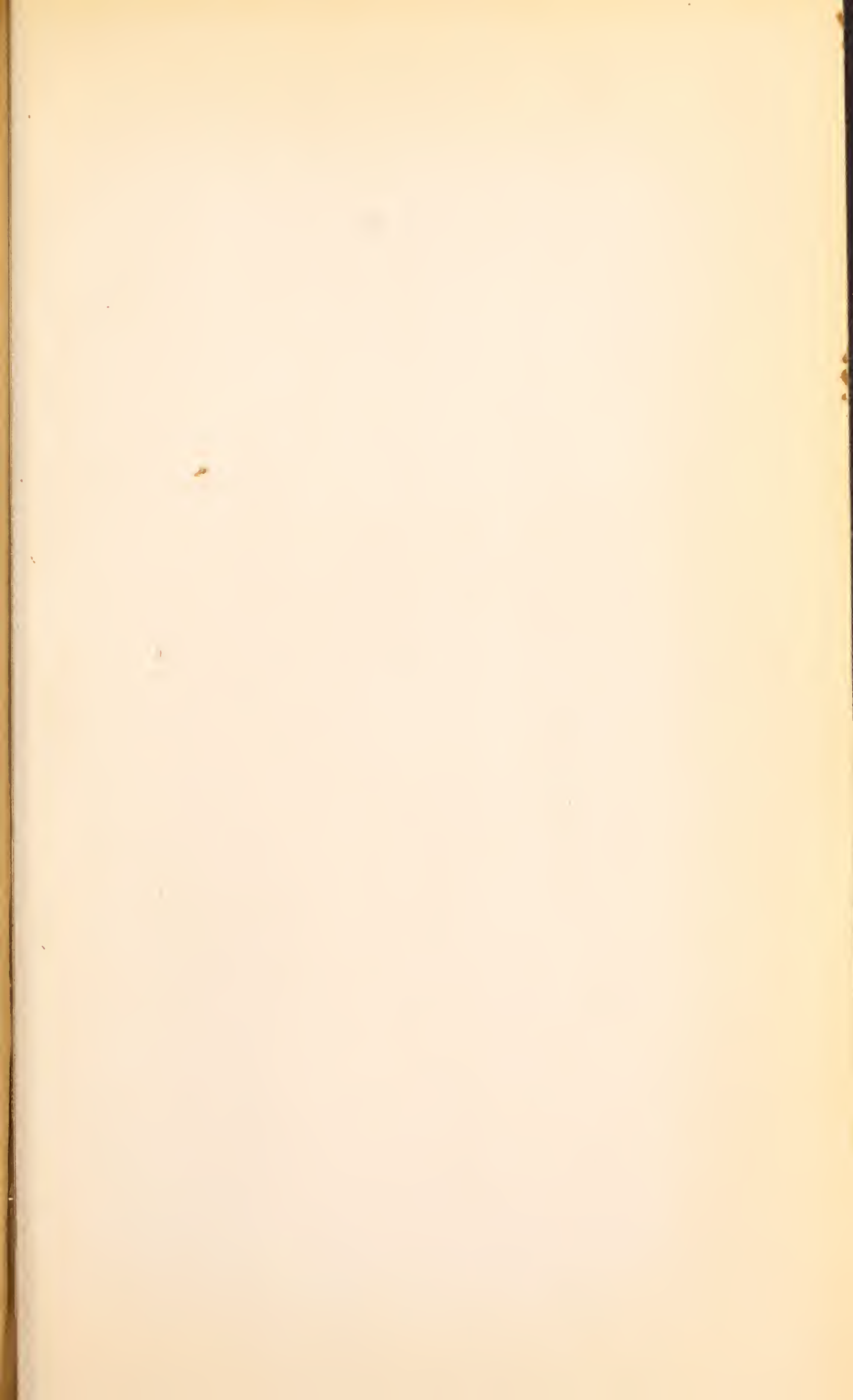
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