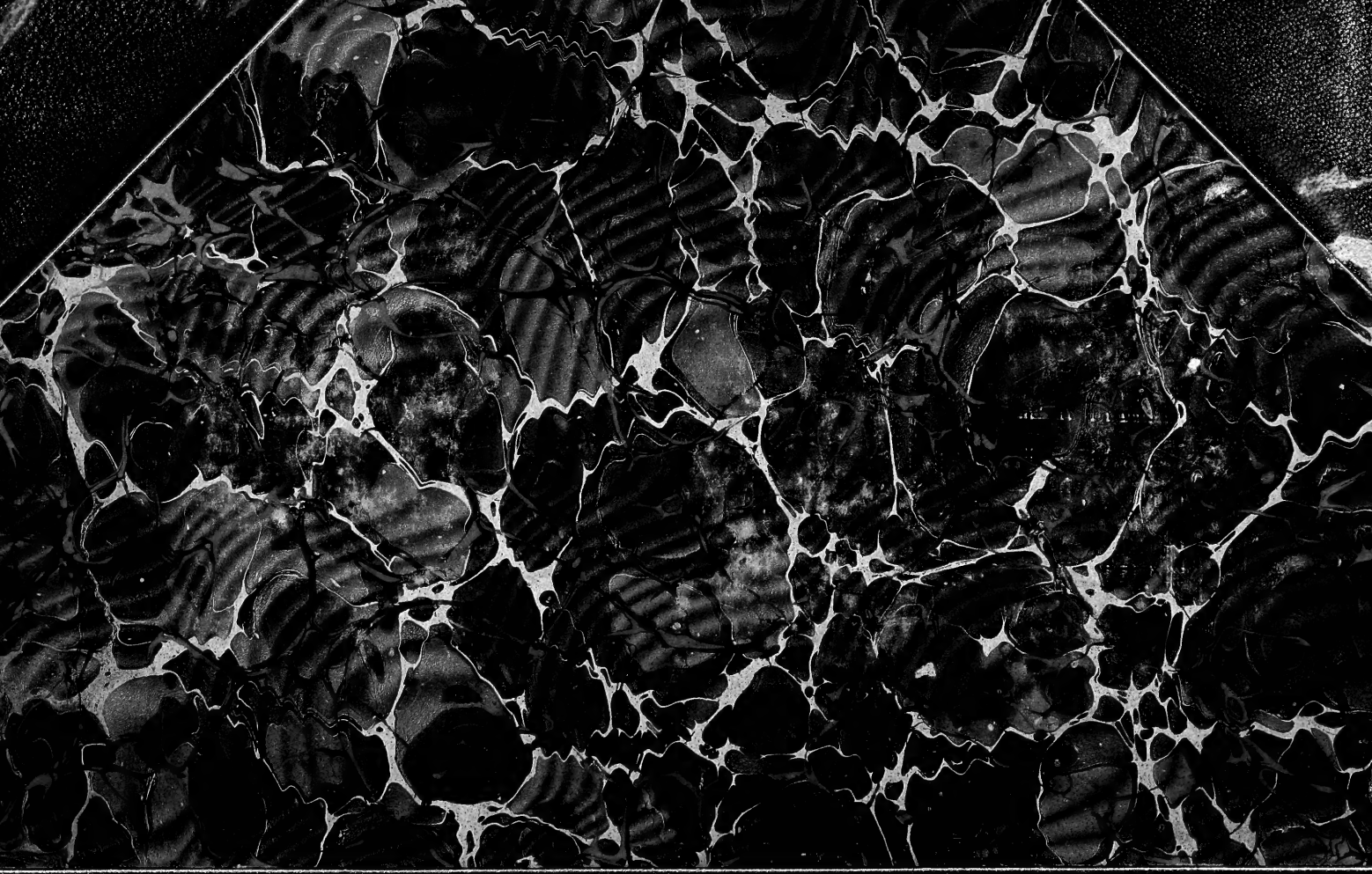

ANIMAL LIFE

AND THE WORLD OF NATURE

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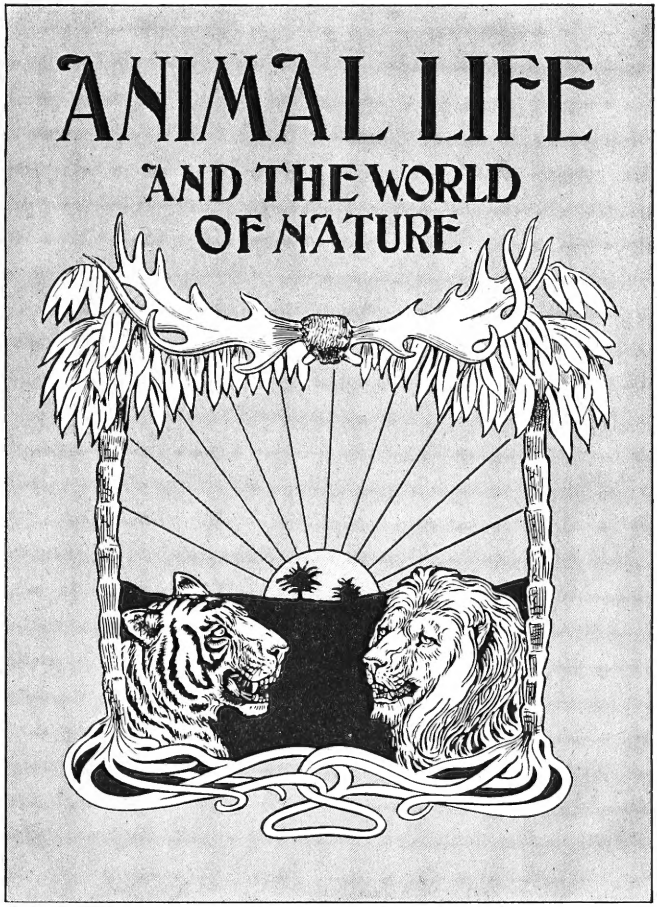

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ANIMAL LIFE

AND THE WORLD OF NATURE

A MAGAZINE OF NATURAL HISTORY

VOL. II.

JULY, 1903
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VOL. II.

COLOURED PLATES.

ILLUSTRATIONS IN THE TEXT.

Illustrations in the Text, Vol. II.

AUTHORS CONTRIBUTING TO THIS VOLUME.

SMALL WHITE BUTTERFLIES AND THEIR CATERPILLARS.

From an original painting by PROFESSOR F. EDWARD HULME.

THE BIRD LIFE OF THE BRECK DISTRICT.

Written and Illustrated with Photographs by Wm. Farren.

PART I.

THE so-called "Breck" district is a large expanse of sandy country in the north-west of Suffolk and south-west of Norfolk; it extends roughly on the south from Newmarket to Bury St. Edmunds, and on the north from Thetford to Brandon and Lakenheath, some twelve or fourteen miles each way; south and east it is bounded by the higher and more wooded parts of Suffolk, and in the north, crossing the Brandon River, it is gradually lost among the heath-land of Norfolk; while on the west it ends abruptly on the edge of the deep fens of north Cambridgeshire.

A barren, infertile land, composed for the most part of sandy, flint-covered hills, the sparse vegetation kept close cropped by innumerable rabbits, and scarcely more fertile valleys, where grow quantities of bladder-campion, viper's-bugloss, ragwort and poppies. Everywhere are long belts and clusters of Scotch fir, the blackness of which is only relieved by their own red stems, the light green of occasional beeches, and here and there the silver stem of a birch.

On the roadsides, where hedges occur at all, these also are of Scotch fir—locally called "Scotch fences"—at some parts cut and trained, dense and impenetrable; at others overgrown, twenty feet high, and nearly as thick at the tops, the lower parts gaunt, twisted stems, bare, and affording glimpses through of the country inside, sometimes of a field of rye—the only crop which flourishes at all on the sandy soil—sometimes of bare hills and scurrying rabbits, and sometimes of a veritable blaze of blue bugloss, white campion, yellow ragwort and red poppies.

An infertile land, hopeless of cultivation and thinly populated, no wonder that it should have become what it is—one of the richest game preserves in England. Not only in the "Breck" itself, but for miles on every side, the country is devoted to the preservation of game, excepting the western boundary which abuts on the Fens, and here the snipe and other wildfowl take the place of partridges and pheasants.

In agricultural districts the daily talk is of crops; in the Breck it is of partridges and pheasants—everyone appears to have an interest in the game, and understanding it, respects it accordingly. The hedgeless fields and heaths near the roads appear to be as inviolate as the most secluded parts; in the nesting season the birds sit as safely by the roadsides as they do in the fir belts (and what a wealth of nests is contained in

PHEASANT'S NEST WITH THIRTEEN EGGS.

those dark fir belts!), the partridges, most motherly of birds, utilising every feather in spreading themselves over their seventeen or eighteen eggs, deep down in the waving grass, the pheasants closely snuggled under the shelter of a friendly fir.

NEST OF FRENCH PARTRIDGE WITH TWENTY-ONE EGGS.

Naturalists may regret that the natural fauna of carnivorous mammals and birds of prey is all but exterminated by watchful keepers, whose one care is naturally the game they have to protect, but none will dispute the fact that all the large game preserves in England give a shelter to many interesting birds which are not detrimental to the game, and are therefore not only unmolested by the keepers, but share with the partridges and pheasants that seclusion which is necessary for their well being—almost for their very existence. Let any who doubt it have an opportunity of inspecting the plantations in an ordinary agricultural district, where gamekeepers are unknown; note the gaps in the hedges and trodden-down tracks in the vegetation leading to the empty boy-robbed birds' nests; compare this with the coverts of a well-"kept" game preserve, where every nest has eggs or young. The large game moors and heaths are the safe breeding ground of innumerable birds of the wader and plover family, as the Breck district is the sanctuary of the interesting wild birds which in this article the writer will endeavour to describe.

The presence in the fauna of several sea-coast forms, the nature of the soil, and its immediate proximity to the deep fens, has led many naturalists to regard the Breck as a remnant of an old coast line, the shore of an ancient bay which possibly covered the whole of the fens of North Cambridgeshire and Lincolnshire. There is a very natural disposition on the part of students of natural science to value most highly the evidence afforded by their own special branch; and although geologists will point out that no sea shells have been found in the Breck, entomologists, knowing how conservative

PARTRIDGE'S NEST WITH SEVENTEEN EGGS.

"Deep down in the waving grass."

"Closely snuggled under the shelter of a friendly fir."

insects are in adhering to a particular sort of locality, and finding several species of moths otherwise found only on the coast abounding in the Breck, some thirty miles or more from the nearest sea, feel justified in regarding them as the survivors of the littoral fauna of an ancient sea coast.

The geologists are undoubtedly right in stipulating for the presence of marine shells, but while this would be definite and convincing, the occurrence of these coast insects in a locality so far inland is one of the shreds of evidence afforded by the geographical distribution of living forms which assist in unravelling the history of the changes the earth's surface has undergone.

In a locality where the surface has so long remained undisturbed one would naturally expect to find some indication of pre-historic human inhabitants, and this frequently occurs in the form of flint arrow-heads picked up among the surface-flints of the hills; it must have been a vast workshop for the old stone-folk who dwelt there—a wealth of material and consequent waste of the result. The stone-folk have gone, but not their occupation, for there are still living at Brandon some of the old "flint-knappers" who, if they are not so now, were up to very recent times celebrated for the manufacture of gun-flints.

It is, however, with the birds which inhabit the Breck that this article has to deal, and there is at least one otherwise exclusively coast species which in the nesting season regularly visits the district; this is the ringed plover, or ringed dotterel, one of the commonest of our resident shore birds. It is quite possible that as the large flocks which have wintered on the more southern shores break up and move northward in the spring, pairs settling here and there along the Norfolk coast, while the majority pass across to Lincolnshire and the north, a certain number, following the line of coast as it turns into the Wash, continue westward till they lose the sea at King's Lynn, and crossing the twenty-five or thirty miles of Norfolk heaths, find the sandy solitudes of the Breck sufficiently like the sea shore to suit the requirements of their nesting operations, spread over the hills and sandy fields from Brandon to Mildenhall, and find themselves as much at home for the time as if they could hear the swishing of the tide as it creeps over the broad sands of the Wash thirty miles away. They leave in the early autumn with their young families, and it may be that the latter, with the controlling principle of the instinct of migration, returning again the following spring to the place where they were reared, have so established a regular visitation.

This theory is quite independent of the supposed littoral origin of the Breck; if we connect the occurrence of the ringed plover with that hypothesis, it is only by regarding the individuals who spend their breeding seasons there now as the descendants of the ringed plover which inhabited the Breck in the remote period when it was an actual sea shore. It is a contemplation fascinating in the extreme, in that it deals so intimately with the mysteries of hereditary habits—very pleasant to dream and theorise, especially so if standing on one of those sandy flint-flecked hills on a warm June day, watching the ringed plovers as they skim low over the ground, sometimes lost to sight as their white under-parts blend with the white flints; and listening to their shrill cries so reminiscent of the shore. One needs but to close one's eyes for a time and hear the soft wind soughing through the fir trees, sounding so like the murmuring of the sea and blending so naturally with the cries of the ringed plovers, that one almost expects on looking up to see tiny wavelets creeping over the rippling sand and a blue haze joining sea and sky in the distance.

Ringed plovers' nests are common on most of our coasts, and are mere hollows in the shingle and pebbles of the beach; the four pale stone-coloured eggs, speckled and streaked with brown and black chiefly at the large end, assimilate most remarkably with

NEST OF RINGED PLOVER.

they are known all through the district.

The class of birds which inhabit a country or district is largely dependent on the character of the country itself. The Breck is eminently suitable to the habits of ground-nesting birds; not such, however, as ducks and rails, which require swampy ground with long grass and herbage in which their somewhat conspicuous eggs may be hidden, but for such as the ringed plover and others, the remarkable resemblance of whose eggs to a stone-strewn soil gives them a better protection than concealment, the bare hills and fallows of the Breck forming an ideal nesting ground. Best known and most widely distributed of such birds is the Lapwing or Pee-wit. Its breeding grounds are spread all over the country, and its plaintive cry of their surroundings, and are practically invisible except to the practised eye.

On the Breck these birds seem to have acquired a special nesting habit. A hollow is made in the sandy soil and neatly lined with small stones carefully selected about the size of peas; the nests when untenanted are conspicuous enough, but with the addition of the eggs they are as invisible as those on the beach; this habit of lining their nests with stones has earned for them the local name of "Stone-hatch," by which

YOUNG RINGED PLOVERS.

RINGED PLOVER ON NEST.

"pee-wit!" may be heard in early spring on many a heath or other open space, such as commons, downs, fallow fields and meadows, the more bare and shelterless the better to ensure this ever watchful bird from being approached

LAPWING'S NEST.

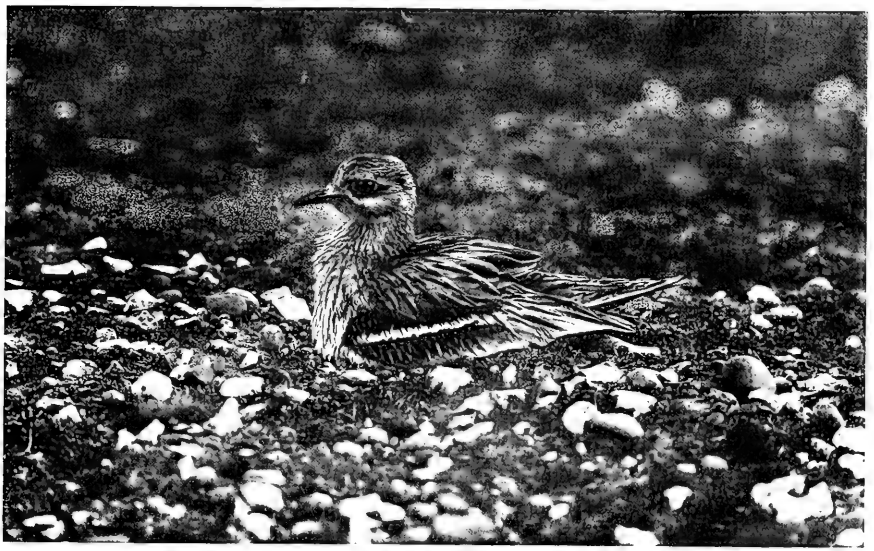
unawares. Their eggs are the "plovers' eggs" of poulterers' shops, and are familiar to all; but few seeing them as they are displayed for sale, often in hundreds, would realise how difficult they are to discover in their natural situations. In a locality so congenial to their watchful habits as the Breck, the presence of these birds in considerable numbers is a foregone conclusion.

EGGS OF THE STONE-CURLEW.

But of all the birds which inhabit the Breck none are so characteristic, so interesting and fascinating to the naturalist, and none fit in so well with the nature of the country, as the Thicknee or Stone-Curlew. It is the largest of all the plover family in Britain, and is often called the Great Plover and Norfolk Plover, the latter name originating in the district of which we are writing. Of the other two names mentioned above, "Thicknee" is derived from the thickening of the leg in immature birds, a peculiarity which, although unusually pronounced in this species, is common not only to all the plovers but the whole group of birds known as "waders," from the herons down to the smallest sandpipers. As regards fitness, there is but little to choose between the several trivial names of this bird; even advanced ornithologists hardly show a preference for any particular one. Although in the writer's opinion "Stone-Curlew" is not the most appropriate, yet as it is the name generally used in Norfolk and Suffolk, it will be adopted in this article when the bird is subsequently alluded to. The use of the name is, however, apt to be productive of some confusion unless the explanation is made that no near relationship exists between this bird and the real curlew; some approximation there is in build and general colouring of the two birds, but contrasted with the short plover-like bill of the stone-curlew, the characteristic long curved one of the curlew is so distinctive a feature as to make it unlikely that the name arose from appearance alone. It is more likely that it originated in one of the few breeding places of *Œdicnemus* near the shore, or some moorland where curlews were well

STONE-CURLEW'S NEST.

LAPWING.



STONE-CURLEW.

known, and that the similarity of their wild night cries caused the inhabitants to confuse the two birds, and then, recognising a distinction, to add the prefix "stone" to the former from their habit of nesting in stony places. Although belonging to the plover family the stone-curlew has no close affinities with any other British members of the group; it forms an interesting link between them and the bustards, which birds it much resembles in both appearance and habits. Apart from other species of its own genus *Œdicnemus* (which occur in remote parts of the world such as southern Asia, tropical America and Australia, but principally Africa), the stone-curlew is nearly allied to the coursers, which inhabit similar localities, notably the sandy plains of Africa.

The stone-curlew is migratory, arriving in this country early in April, at the end of which month its eggs may in some seasons be found, although as a rule it does not commence to lay before May is a week old. Its breeding grounds are the chalk downs, plains, and heaths in several of our southern counties, but nowhere in such abundance as on the Breck. Whilst most of the British plovers lay four eggs of the well-known pear-shaped form (which, arranged with the small ends together, occupy a far smaller space than their comparatively large size would lead one to expect), the stone-curlew lays but two; these are nearly oval in shape, stone-coloured, and streaked and blotched with different shades of brown and grey; they are deposited in a slight hollow scraped in the sandy soil, and there are generally loose flints strewn about the surface near the "nest" with which the eggs harmonise so perfectly as to be most difficult to detect.

The ringed plover, lapwing and stone-curlew all nesting as they do under similar conditions, it follows that their habits during incubation have much in common. The eggs are so well protected by their resemblance to their environment that at the approach of danger (by which it may be inferred man is implied) the eggs are safer left to themselves than if the parent bird remained on them, to be probably frightened into a sudden flight by a near approach of the intruder, which would afford a good clue to their whereabouts.

(*To be continued.*)

A ROYAL BIRD.

JULY is the month when the young Swans on the Thames are marked by the King's Swanherd, in conjunction with the Swanwardens and Markers of the Vintners' and Dyers' Companies. These two Companies and the King are the owners of Swans on the River Thames. For the purpose of marking the young birds every year the King's representative meets the wardens and herdsmen of the Companies, and they all start from Southwark Bridge on the Swan Voyage. The King's birds are marked with his initial, and those of the Dyers' and Vintners' Companies with one and two nicks respectively. In connection with the mark, or rather marks of the latter, it is interesting to note that the old tavern sign "The Swan with Two Necks" is a corruption of "The Swan with two Nicks." Swan laws still in force are numerous; among them may be mentioned one which provides that no persons other than the King's sons may possess the birds unless they hold land to the value of five marks; another is that any Swan found on any of the seas or rivers of England without an owner's mark becomes the property of the Crown.

Photo by W. P. Dando.

MOUNTAIN ZEBRA.

ZOO NOTES.

Described and Illustrated with Photographs

BY

W. P. Dando, F.Z.S.

Mountain Zebra—the scarcest of all the Zebras.

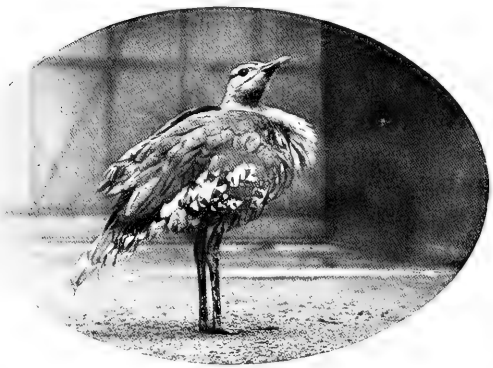
The Mountain Zebra (*Equus zebra*) is now exceedingly scarce, and it was with the greatest pride the Zoological Society looked upon their pair of these rare animals, for who can say when, if ever, we shall get another? The picture of the female specimen here reproduced was taken on the very day the poor animal caught the chill which caused her death. The type of this species is more asinine than equine, and the ass-like character is heightened by the barer tail, which is only furnished with long hairs towards the tip. The mountain zebra is of muscular build and very strong, yet beautifully symmetrical in form. In colour it is of a silvery white ground, and the black markings are fuller and very even as compared with the other members of the genus, and extend over the entire surface of the body except the stomach and inner part of the thighs; it will be observed that even the legs, right down to the hoof, are closely ribboned in black and white. These zebras run in small troops, and in South Africa are only found in the most rugged and inaccessible mountain ranges. The profile photograph is of the male, taken in the stable. The death of his mate is a great disappointment to those who hoped that the pair might breed this year.

MOUNTAIN ZEBRA.

BRUSH TURKEY.

The Brush Turkey.

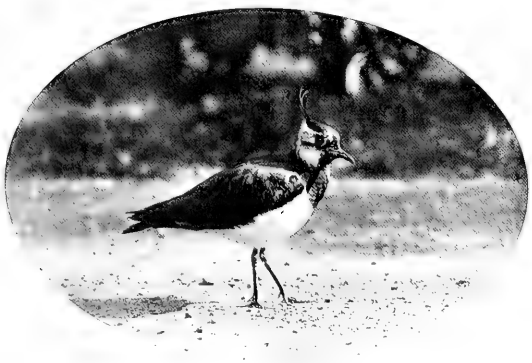
These birds do not sit upon the eggs, but, after a certain number have been laid by the hen, the cock collects them all in a suitable spot and covers them over with hay and decayed leaves, making a heap, in the centre of which are the eggs. He does all the work of this incubator, regulating the heat by uncovering the eggs should he discover, when he dives his head into the mound, that it is too great, and piling up more leaves should he find that it is not sufficient. It is very amusing to watch this process and to observe with what jealous care he looks after the work, driving the hens away should they approach too near to his charge.



DENHAM'S BUSTARD.

Bustard.

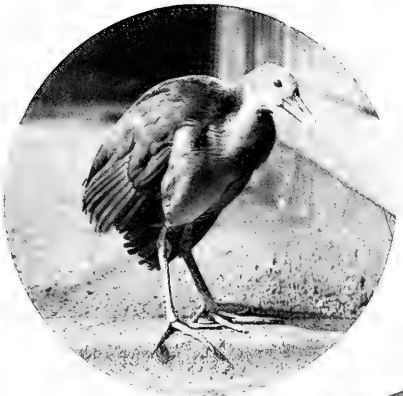
Great Bustards were formerly common in England, especially in Wiltshire and Norfolk; but being large (the male about four feet long and the female three), they were too conspicuous to escape persecution, and now are rarely seen.



LAPWING.

The Lapwing.

Mr. W. H. Hudson, writing of the Lapwing, describes the curious antics of these birds when one of them pays a formal visit to others of the same species: "The three form a procession, the stranger walking in front and his hosts following—all keeping step, and uttering resonant drumming notes. Presently the march stops, the stranger elevates his wings and stands motionless, while the other two, exactly abreast, halt behind him, drop their voices to a murmur, touch the ground with their bills, as though making obeisance, and in this posture remain for some time. Then the ceremony is over, and the



YPECAHA RAIL.

visitor retires to his own ground and mate, to receive another visitor in exactly the same way."

The Ypecaha Rail.

RAILS were at one time divided into two groups, Land-Rails and Water-Rails, but the simpler name is now generally applied to all birds which are included in the family *Rallidæ*. These birds also are very ceremonious in their habits, and the same writer, in his "Naturalist in La Plata" (Chap. XIX.), declares that "some of the rails join in festive dances that can only be likened to balls, the performers becoming excited almost to frenzy, and with loud cries and outstretched wings rushing from side to side for several minutes."

Burrowing Owls.

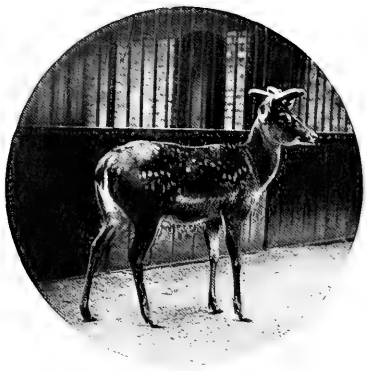
WHEN these pretty and active little owls (*Speotito cumularia*) were kept in the first cage of the Northern Aviary, with a plentiful supply of dry sand and shingle and a few drain-pipes laid in amongst it, some idea could be formed of the way they live in their native land, America. Wherever the species is found it dwells, at all events during the breeding season, in burrows formed in the earth either by its own labour or by that of some digging mammal. At the bottom of its burrow the eggs are deposited on a bed of moss, grass or dry roots, and here the young remain during the downy period of their existence, occasionally advancing to the entrance, but retreating immediately on the approach of any suspicious object. Now that the specimens have been removed to a small cage just large enough for them to turn round in, they are no longer attractive, and are passed by without being noticed. In their old quarters they drew quite a crowd.

BURROWING OWL.

Spoonbill.

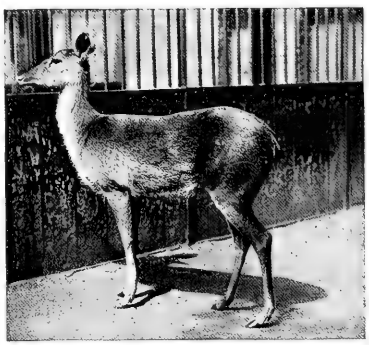
THE White Spoonbill (*Platelea leucorodia*) is found over the greater part of Europe and Asia and north of Africa, but is only a straggling visitor to England. It possesses no power of modulating its voice. The windpipe is bent on itself, like the figure 8, the coils applied to each other, and held in place by a thin membrane. This peculiarity does not exist in young birds. On the Danube spoonbills nest in company with egrets and other herons. And the

COMMON SPOONBILL.

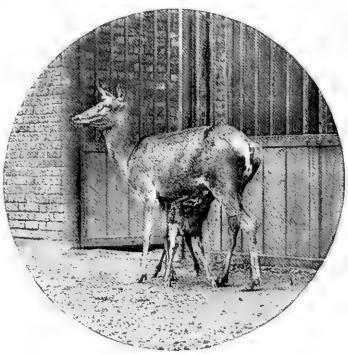


PANOLIAN DEER.

following interesting account of a visit to one of these breeding-places is given in Mr. Barkley's work, "Bulgaria Before the War." He found a colony on an island a few miles below Rustchuk, and he describes the scene as follows:—"Pushing our small boat into a narrow creek, we took off our shoes and stockings, and, turning up our trousers, picked our way through the tangled boughs in the direction of the sound, which evidently proceeded from the centre of the island, and I shall not easily forget the sight we beheld when we reached it. There, on the pressed-down boughs of the willows, only a few feet above the water, were hundreds of great flat nests of the various kinds of herons, spoonbills, egrets, bitterns, etc., all huddled together in one confused mass, and the entire colony reeking with the most indescribably filthy smell. It was rather late for eggs, as most of them were hatched off, but was just the time to observe the doings of the children of these sedate, quiet, peaceful-looking birds, and I must say that I have never yet beheld such a collection of little fiends, nor a more hideous set. Their bodies were of the smallest proportions, while every other part of them—their wings, legs, necks, and beaks—were of the longest. Most of them had no feathers, and all seemed possessed with one idea, and that was either to limb a small brother or swallow him whole, and all kept up either a shriek of fear or pain or a yell of rage. Floating on the top of the putrid water were masses of dead birds, some with legs torn off, others without heads or wings. Most of them were dead, but others were dragging their maimed carcases about in a ghastly manner. So intent were they on their fiendish pastime that they took little notice of us, and dragged and clawed themselves about after their weaker brethren at our very feet, whilst the old parent birds sat looking on from the topmost twigs as if fractricide were the proper moral pastime for the young. A big spoonbill would chase a small egret from bough to bough till at last he tired it out, and then, seizing it with one claw, would take hold of its leg or wing and tear it from the poor victim, or else, getting its head in its mouth, would try to swallow it whole, and gulp and gulp till so much of the poor little one was down its throat that it was itself choked, and would turn over on its back, kicking and struggling, to be in turn seized by a brother and torn limb from limb. All uttered some hideous



EAST PANOLIAN DEER.



RED DEER AND YOUNG.

scream, and all kept clambering and dragging themselves about from bough to bough, either hunting or being hunted, and from what we saw I am sure that nine-tenths of all hatched in that colony came to an untimely end before they could fly."

HISPID LIZARD.

Thamin Deer.

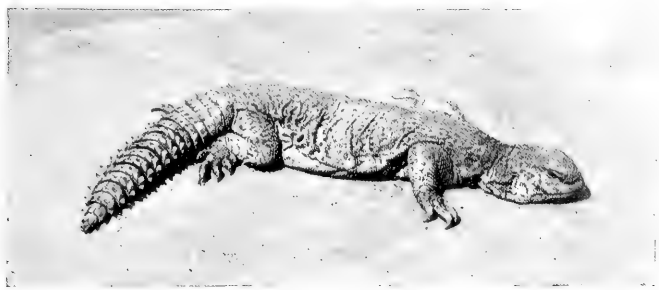
THE Deer illustrated on the preceding page are natives of the swamp-land of Burma, and have no near affinity to the red deer of Europe, which is shown in the third photograph.

Bristly Lizard.

ANOTHER African lizard, from the south, is the Bristly Lizard, belonging to the genus *Agama*. When this reptile first arrived at the Zoo it was very brilliant in colour, and the symmetry of its markings and the glistening of its shiny skin gave it more the appearance of a freshly-lacquered bronze than a living thing. Being quite harmless they can be handled with impunity, and when placed in a position they remain there perfectly still until, without any apparent cause, they spring away in a remarkably rapid manner, which gives one quite a start.

Spiny-tailed Lizards.

THERE are about seven species of Spiny-tailed Lizards—called by some "Thorny-tailed"—all of which inhabit the parched-up land of north Africa and south-west Asia, the species photographed being typical of the former continent. It will be noticed that the body is much depressed and there is no crest along the back; also that the head is extremely short and rounded in comparison with other *Agamidæ*. The coloration of these lizards is no doubt protective, resembling the sombre colour of the desert regions they frequent. Their diet is exclusively of a vegetable character, and their flesh is said to be excellent as a table delicacy; at all events the Arabs are very partial to it. In the small vivarium in which they are held captive they appear sluggish and slow in their movements, but outside, when exposed to a warm sun, they are very active and can run with great speed.



SPINY-TAILED MASTIGAN.

THE WOLFERIES.

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough, f.z.s., f.e.s., etc.

VII. THE WOLF.

IT seems rather strange, considering that the domesticated varieties of dogs are but the descendants of the wolves or jackals, that the pure type of ancestor, viz., the wolf or jackal, is not more often kept than it is; in fact, if the cubs of the wolf are taken soon after birth and looked after properly they are as tame and playful as puppies of the ordinary dog, and may, up to the time of being fully grown, be treated as harmless companions in the house.

Unrestricted liberty is not always desirable with these animals, for unless a watchful eye can be kept on them and their doings, it is possible that something—it is always the unexpected that happens—may occur to bring out their smouldering savage instincts with disastrous results, so that a kennelled run should be provided in order that the wolf may be in safe quarters when it is impossible to keep observation on it. Such runs are advertised every day in the various "fancy" papers, and no doubt a second-hand one could be got very cheaply by means of a short ad. in the advertisement pages of Animal Life, so that the score of expense, which is always a prime factor in these matters, need not be a deterrent. If possible the run should be placed over a bricked or cement foundation, as the place can be kept more easily clean than if there be only an earth one.

The feeding and all general details of management are just the same as for a dog of the same size. Good sound meat, both raw and cooked, stale bread, vegetables, etc., form the principal diet. Wolves, like dogs, are very capricious with regard to individual tastes, one perhaps preferring cabbage as a tit-bit, another a sweet apple, yet another a piece of sugar or a sweet, and so on.

The largest owner of wolves in this country is Mr. H. C. Brooke, of Welling, the well-known secretary of the Bulldog Society, to whom, together with Messrs. Harmsworth Bros., I am greatly indebted for permission to use the photographs which illustrate this article. The grey wolf in the photographs is a most affectionate

animal, although only so to Mr. Brooke. Owing to being annoyed in her younger days by street curs, she is rather a terror to strange dogs, and, with the Dingo also shown, has killed a sheep-dog in a couple of minutes; but to dogs who are properly introduced she is amity itself, and quickly makes friends with them. She has a companion, a bull-terrier, with whom she is very fond of playing. Wolves vary very much in disposition: some are very gentle and confiding even with strangers; others, on the contrary, are very treacherous. The wolf, when wild, does not bark, and some, even when tamed and kept with domesticated dogs, remain absolutely dumb; others, however, soon learn to bark. It is curious and at the same time worthy of attention that wolves, unlike dogs, never bark at nothing—there is always some reason for their bark. Those who have gone in for wolves are all agreed that the wolf is a very nervous animal and most suspicious of what it does not perfectly comprehend; it therefore follows that in training these animals the utmost patience is required, especially until they get accustomed to, and have perfect confidence in their owner or keeper. Wolves have an advantage over foxes and jackals in that they are less "snappy" and less odoriferous, and with careful attention to cleanliness can be kept quite or almost without smell—far sweeter, in fact, than many dogs are. Mr. Brooke has often, he tells me, taken one of his white females—the one on the lady's lap—for a ride in a train and cab, and even taken her with him into London restaurants.

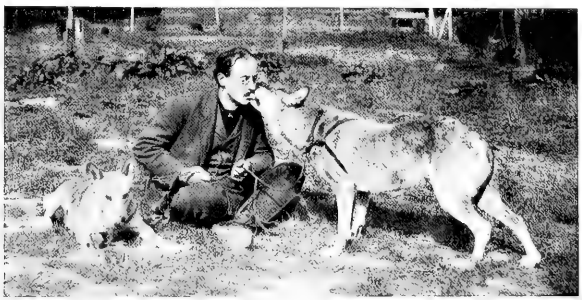
A PET WHITE WOLF.

There appears to be no reason why wolf-breeding should not become a profitable hobby when once the general public realise what delightful companionable pets they may be trained to become, as wolves in captivity pair with readiness and bring forth their young in due season. They breed regularly in all the Zoos and in the hands of the various travelling-menagerie keepers, *e.g.*, they breed at Sanger's place at Margate every year. If the male wolf is left with the female when the cubs have arrived he will take an active interest in bringing the young cubs up, and it has been noticed that when the cubs begin to run about, the male, after feeding, regurgitates a considerable portion of his half-digested food, which the cubs ravenously devour; it has been further noticed, and is a remarkable fact, that if for some reason at this period the male is removed, the female immediately commences to do likewise. Wolves not only breed *inter se*, but will cross also with suitable dogs and the dingo. Many of the habits of the wolves and jackals show themselves in the domestic dog, as, for instance, the turning round two or three times when about to lie down, this action, no doubt, being originally intended to form a hollow in the ground to make a resting place.

If it is required to train a wolf up to be a household pet, a bitch cub should be selected, preferably one just weaned, as being quieter and practically free from all smell. Teasing should be rigorously avoided and a sharp look-out kept on the animal's behaviour with children, as many otherwise docile wolves have an antipathy to children and are untrustworthy when in their company. Some years ago a very fine European wolf was presented to the Zoological Gardens; it was reared by hand, and was most tame and confiding. It lived in the house and followed its master just like a dog all about the country roads. But on one occasion it caught sight of a child running in the distance, and at once made after it in that loping, tireless gallop which is a characteristic of the wolf; fortunately it was overtaken before it came up with the child, otherwise there is little doubt it would have seriously injured the youngster. A young wolf cub can be bought for three or four pounds in May or June from almost any of the animal dealers and from some of the Zoos, such as the London or Rotterdam Gardens.

Smaller than the common wolf, and equally, if not more, suitable for a pet, particularly for ladies, is the coyote. Owing to its thicker and longer fur and more bushy tail, the coyote appears to be a much larger animal than it really is. The howl of this animal is different from that of the grey wolf. It is a matter of doubt among many scientists as to whether the common or grey wolf (*Canis lupus*) and the North American timber wolf (*Canis occidentalis*) are specifically distinct. Personally, as a pet I prefer the look of the North American animal. It is now generally accepted that the Esquimaux dog is but a reclaimed or domesticated wolf, in just the same way as the Hare Indian dog is presumed to be a domesticated descendant—through association with human beings—of the coyote (*Canis latrans*).

The white variety of wolf, as may be seen, is a very beautiful-looking creature, but unfortunately anything but common, and a good price would have to be paid by a would-be possessor for an example—say fifteen or twenty pounds, just about double the cost of an ordinary grey wolf when adult.



A PET GREY WOLF.

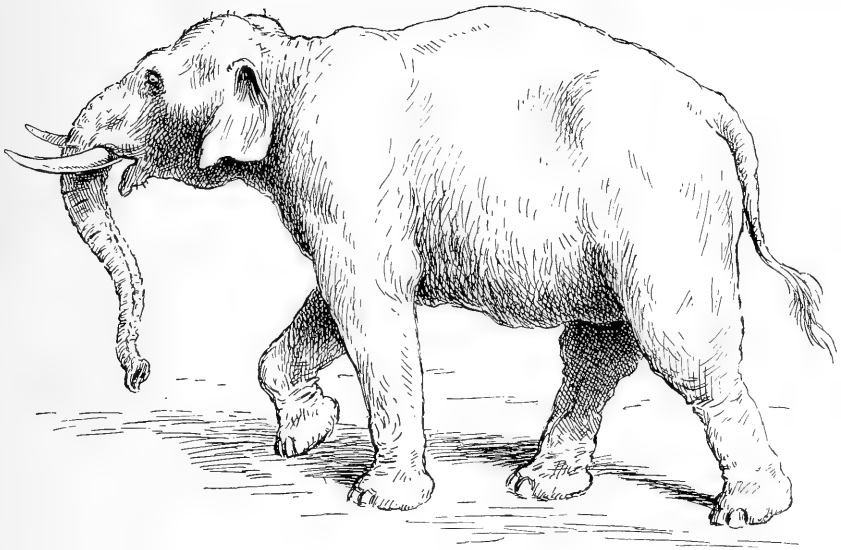


Fig. 1.

THE GAIT OF LAND ANIMALS.

By R. Lydekker.

THE existence in our language of such terms as "walk," "run," "trot," "canter," "gallop," "hop," etc., implies that characteristic differences in the gait or pace of mammals and other land animals have long been recognised. The application of several of these terms partakes, however, of that indefiniteness so noticeable in popular language generally. For example, while "hop," "trot," "canter," and "gallop" have each a definite and restricted meaning, the terms "walk" and "run" are applied much more indiscriminately. Thus we call the slower type of locomotion in the great majority of mammals a "walk," while the term "run" may be employed to designate the more rapid movements of these animals in all cases, save where they hop or leap. The faster motions of a horse or a deer are, however, properly denoted by the terms "trot," "canter," and "gallop"; and these words are not rightly applicable to the gait of bipeds. On the whole, it seems probable that the terms "walk" and "run" properly refer to the gait of man and such other bipeds as do not hop, but that they are also used in a wider or general sense for the locomotive movements of the great majority of mammals; and that they are always employed in this wider sense when no special name exists for the movements of any particular kind of animal. For instance, we may say in a general way that a horse walks or runs; but if we desire to be more definite, we say that it either walks, trots, canters, or gallops. On the other hand, in the case of a mouse (as with man), we can only say that it either walks or runs.

Although the aforesaid terms imply, as we have seen, the recognition of certain differences in the mode or rapidity of movements in certain animals, yet we have no terms to designate certain other differences in animal locomotion. There are no titles,

Fig. 2.

Fig. 3.

Fig. 4.

for instance, to indicate that the movements of a giraffe or a camel are very different from those of a horse. This is probably due to the fact that a very imperfect recognition of the nature of the ordinary movements of locomotion (including those of man himself) exists among most of us. Under these circumstances it has been thought that a brief and simple explanation of some of the leading types of such movements in land animals, and more especially mammals, would be acceptable to many of the readers of Animal Life.

It should be premised that, in addition to the differences due to whether animals are bipedal or quadrupedal, many of the peculiarities or disabilities in the movements of particular species depend upon the relative straightness or otherwise of their limbs. That is to say, the extent to which one segment of the limb is flexed upon the other, and the consequent difference in the size of the angles formed by the junction of such segments. The relative lengths of the fore and hind limbs also exercise an important influence on the movements of their owners; those animals which have the longest and most flexed limbs being, *primâ facie*, the swiftest runners and the longest and highest leapers.

The great majority of land quadrupeds move their limbs, when walking or running, in a diagonal order, so that their tracks form a series of ellipses placed end to end, the track of one complete movement forming a figure of eight. Man, in spite of his gait being bipedal, is really no exception to this rule, for in walking or running (Figs. 2 and 3) he swings his arms as well as moves his legs, and the left arm is swung when the right leg is advanced, and *vice versâ*. In other words, the synchronous movements of the limbs are diagonal; and the combined tracks of the hands in the air and of the feet on the ground would form the above-mentioned ellipses, or figures of eight. The part which the arms play in locomotion is perhaps better shown in skating; in running it is generally found preferable to bend the arms on the chest and dispense altogether with their swinging movement, the upper part of the body being at the same time inclined forwards. The alternating diagonal movements of our two pairs of limbs in walking are probably retained to a great extent as an aid in maintaining the balance; but, in any case, they may be regarded as an inheritance from our four-footed ancestors. Owing to the straightness of his legs, man is a comparatively poor jumper, although he acquires additional power by flexing his limbs (Fig. 4), and thus diminishing the size of the angles formed by the inclination of their component segments at the moment of taking the leap.

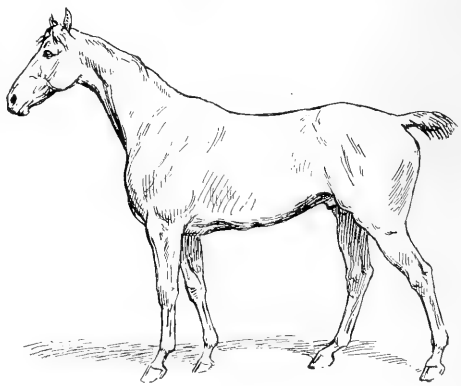


Fig 5.

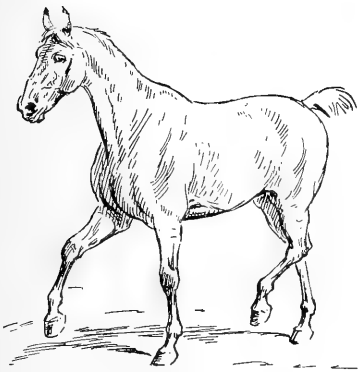


Fig. 6.

WALKING.

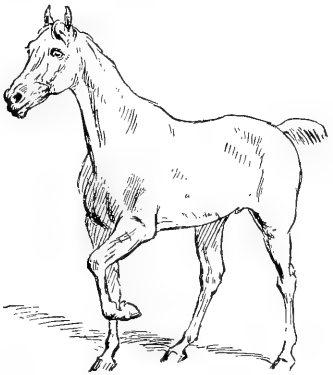


Fig. 7.

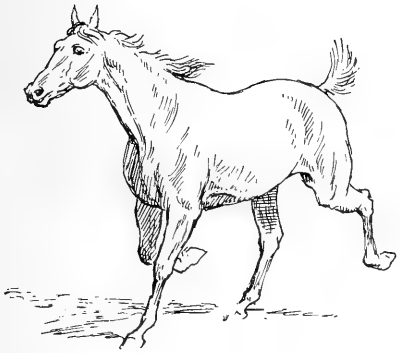


Fig. 8

TROTTING.

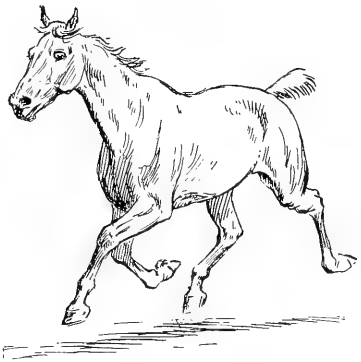
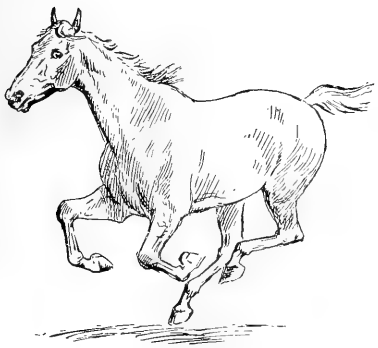
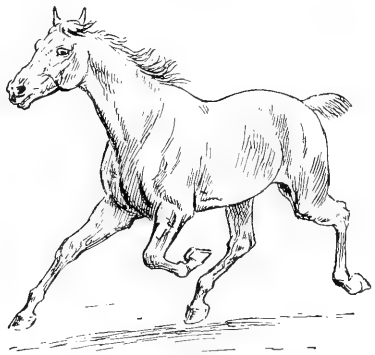


Fig. 9.



GALLOPING.
Fig. 10.



AMBLING.
Fig. 11.


Fig. 12.

In a horse, the bones of the upper segments of the limbs are set very obliquely to one another; and as those of the lower segments are much more elongated (both actually and proportionately) than in man, the running and leaping powers are greatly increased. Both in walking (Fig. 6) and in trotting (Fig. 7) the diagonal movement of the limbs occurs, although it is only in the latter mode of locomotion that one fore-limb moves synchronously with the hind-limb of the opposite side. Supposing a horse starts his walk by raising first the left fore-foot (and it is a remarkable fact that most domesticated horses, perhaps as the result of training, show a marked tendency to "lead with the left"), the next to be advanced will be the right or diagonal hind-foot; the latter being followed in turn by the right fore-foot, and this again by its diagonal, namely, the left hind-foot. In slow walking (Fig. 7) the horse has always three feet on the ground; but when moving at a more rapid walk (Fig. 6) there are short intervals during which two feet are off the ground simultaneously, although these intervals are so short that the fact cannot be detected by the naked eye.

Owing to the diagonal and alternate movements of the limbs in walking, a more or less nearly horizontal roll is communicated to the whole body of the horse. This roll is, however, still more conspicuous in smaller animals, such as dogs and cats, in which a continuous oblique wave of motion seems to traverse their bodies as they advance at a walk or a slow trot. Here it may be mentioned that all, or nearly all, domesticated dogs, when walking or trotting in a given direction, invariably hold the body more or less obliquely to the line of progress; this oblique position being most noticeable in the smaller short-tailed breeds, such as fox-terriers (Fig. 12), some of which advance in an almost crab-like fashion. On the other hand, when at speed, the larger dogs at any rate, such as foxhounds and greyhounds, apparently have the axis of the body coincident with the line of progress. All wild members of the group, such as foxes, jackals and wolves, always carry the body perfectly straight (Fig. 13); and it would be very interesting to know the reason why the domesticated breeds have departed from this practice. The idea that the oblique position of the body is connected with the curling of the tail, characteristic of so many domesticated breeds, naturally suggests itself; but even if this be true, it does not much assist matters, so far as a reason is concerned.

In trotting, when the legs move diagonally in pairs, the undulations induced in the body by the movement are mainly in a vertical, in place of a horizontal, plane. In trotting, each leg is moved somewhat oftener in a given length of time, the ratio being as six to five. The advantage gained in speed by moving the legs diagonally in pairs instead of consecutively is due to the fact that in trotting (Figs. 8 and 9) each foot is on the ground for a short interval and in the air for a long one; just the reverse of this state of things taking place in walking (Fig. 16).

From this diagonal motion of the limbs, it follows that when animals like horses, cattle, deer, pigs, dogs, etc., come to a standstill (Fig. 5) they often have the two feet of one side comparatively close together, while those of the opposite side are as far apart as possible. That is to say, the two feet of one side—the right, for instance—will be directly under the body; while those of the other side—the left, in this instance—will project beyond its two extremities. Such a position is impossible in the case of an animal which moves the two limbs of the same side simultaneously.

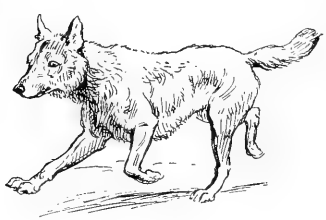


Fig. 13.

Omitting mention of the canter, the next important natural pace of the horse is the gallop, in regard to

the nature of which movement much misunderstanding long prevailed. We find, for example, the following passage in a book on "Animal Locomotion," published no longer ago than 1874:—

"The gallop has been erroneously believed to consist of a series of bounds or leaps, the two hind-legs being on the ground when the two fore-legs are in the air, and *vice versâ*, there being a period when all four are in the air. . . . A little reflection will show that this definition of the gallop cannot be the correct one. When a horse takes a ditch or a fence he gathers himself together, and by a vigorous effort (particularly of the hind-legs) throws himself into the air. This movement requires an immense exertion and is short-lived. It is not in the power of any horse to repeat these bounds for more than a few minutes; from which it follows that the gallop, which may be continued for considerable periods, must differ very materially from the leap."

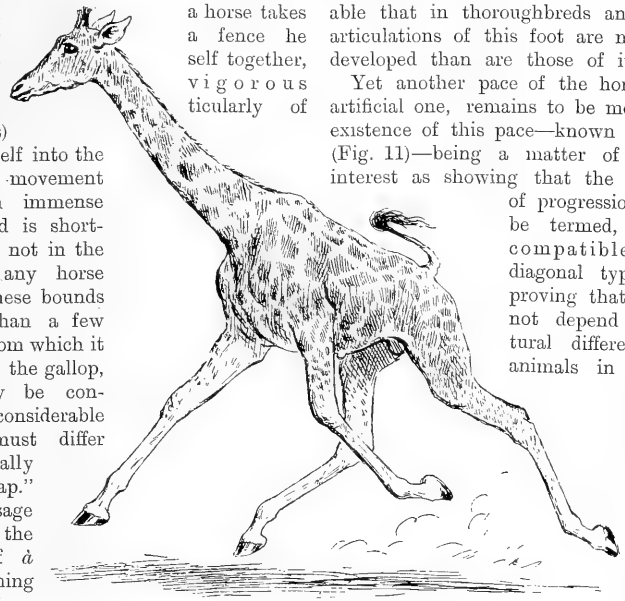


Fig. 14.

This passage illustrates the danger of *à priori* reasoning in such matters, for, as a matter of fact, the older observers were right and their successors and critics in the wrong, photography having shown that at intervals in the gallop all four feet of the horse are simultaneously in the air. This opens up a question in regard to the proper manner of depicting a galloping horse. When an instantaneous photograph is reproduced, all the four feet of the horse are often shown in the air; but this is not what we see. And, in our opinion, a galloping horse ought to be drawn in the old conventional style—that is to say, as it appears to the eye (Fig. 10). We use this conventional method in drawing the wheels of a carriage when travelling at speed, the spokes being depicted as a confused blur, although each would be shown perfectly distinct in an instantaneous photograph. If we use the conventional method in the case of revolving wheels, we should employ it in the case of a galloping horse. It has already been mentioned that most horses, when galloping or cantering, lead with the left fore-foot; and it is not a little remarkable that in thoroughbreds and Arabs the articulations of this foot are more strongly developed than are those of its fellow.

Yet another pace of the horse, albeit an artificial one, remains to be mentioned, the existence of this pace—known as the amble (Fig. 11)—being a matter of considerable interest as showing that the lateral mode of progression, as it may be termed, is perfectly compatible with the diagonal type, and thus proving that the two do not depend upon structural differences in the animals in which they normally occur. In the amble the two feet of one side are moved simultaneously for the first step, and are followed by those of the opposite side for the second. By the rapid succession of movements of this nature the sides of the body of an ambling horse are alternately thrust forwards, thereby producing a lateral swaying movement, far less graceful than the one which results from trotting, but much more easy to the rider.

Giraffes progress in the same manner when moving at their ordinary pace (Fig. 14), advancing first the two limbs of one side and then those of the other. Whether a swinging lateral motion of this kind is the

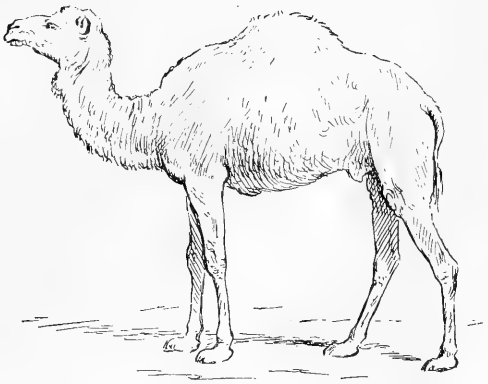


Fig. 15.

one best adapted to the giraffe's towering height, or whether it is a feature common to all the members of the group, cannot be determined until we are acquainted with the gait of the okapi. It is, however, noteworthy that the humerus, or upper bone of the fore-leg, of all members of the giraffe family differs somewhat in structure from that of other ruminants, thereby implying a difference in the muscles. And it is possible that these differences may be correlated with the ambling gait of the giraffe. In galloping, giraffes display an altogether peculiar movement, bringing the two hind-feet simultaneously in advance of the front pair—of course, on the outer side of the latter. Apparently the two front feet are moved together, as are also the two hind ones, in this very remarkable kind of gallop; but it is by no means easy to decide whether this is really the case merely by watching the animals.

Fig. 16.

Like giraffes, camels when walking and trotting move the two limbs of each side together (Fig. 15); if not unduly pressed, a good riding-camel will keep up its favourite jog-trot for eight or ten hours at a stretch, and will do this day after day, frequently covering from 80 to 90, or even 100, miles in 12 hours. With the nature of a camel's gallop I am unacquainted, but I believe that these animals cannot jump. On smooth and wet inclined roads they are quite helpless, owing to the cushion-like nature of the soles of their feet. The limbs of a camel differ somewhat in structure, both externally and internally, from those of the typical ruminants, the thigh being more free from the side of the body; it is therefore not to be wondered at that their movements are different from those of the majority of the latter.

Before leaving the subject of the gait of ruminants, it should be mentioned that many of the lighter-built species of this group, whose ordinary gait is of the diagonal type, frequently commence their progress by a series of bounds. This is specially noticeable in the case of the African springbok and the Indian blackbuck (Fig. 16), as well as in gazelles and some of the smaller kinds of deer, springbok repeating this movement from time to time throughout their progress. The little oriental chevrotains, or mouse-deer, run with a peculiar mincing gait on the tips of their toes (Fig. 17), much the same kind of movement being characteristic of the tropical American rodents known as agutis. Limits of space do not admit of allusion in detail to the important difference in the gait of mammals according as to whether they walk on their toes or on the soles of their feet—in other words, whether they are digitigrade or plantigrade. It must suffice to state that horses and dogs afford typical examples of the former mode of progression, and bears (Fig. 18) and badgers of the latter. All mammals made for great speed are digitigrade.

Fig. 17.

Neither can much be said with regard to the locomotion of the

smaller mammals. A few words must, however, be devoted to the hare and rabbit, which (and more especially the former) are characterised by the great relative length of the hind as compared with the fore-limbs. In consequence of this, these animals run much better uphill than downhill. When at speed, they apparently gallop, but when going slowly they often move their fore-limbs two or three times to one motion of the hind pair; consequently they may be said to walk with the former and hop with the latter (Fig. 19).

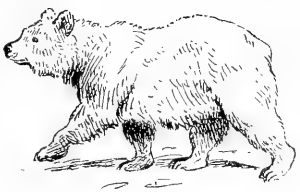


Fig. 18.

From all the more typical hoofed mammals the elephant differs very markedly in the structure of its limbs, the component bones of which are set vertically one above the other without the slightest angulation. Consequently these animals are totally unable to jump, their progress being stopped by a six or seven-foot ditch which cannot be taken in their stride. As regards the gait of elephants, I may quote from Mr. G. P. Sanderson, formerly superintendent of keddas in India, who writes that "the only pace of the elephant is the walk, capable of being increased to a fast shuffle of about fifteen miles an hour for very short distances. It can neither trot, canter, or gallop. It does not move with the legs on the same side together, but nearly so" (Fig. 1).

Fig. 19.

A certain number of mammals have forsaken the ordinary mode of quadrupedal progression, and have taken to hop on their hind-legs, which for this purpose have been greatly elongated at the expense of the front pair. Among such mammals are the kangaroos (Fig. 20), wallabies, rat-kangaroos, and jerboa-rats (*Conilurus*) of Australia; the jerboas of the Old World, the jumping mice of North America and Eastern Siberia, the American kangaroo-rats, and the jumping hare and elephant-shrews of Africa. The majority of these animals have evidently acquired their leaping powers quite independently of one another; and it is not a little remarkable that, with the exception of man and a few monkeys and lemurs which habitually assume the upright posture, no mammal in which the hind-limbs are alone used in progression has taken to walking or running, hopping being the invariable mode of advance. Neither has any mammal in which all four feet are habitually used taken to hopping.

On the other hand, in birds there are a large number of species—mostly, by the way, of small bodily size—which hop (Fig. 21); while there are many others, notably the game-birds and the ostriches and their allies (Fig. 22), which run. There is also a lizard—the frilled lizard of Australia—which habitually assumes the erect posture, and walks and runs with great speed on its hind-limbs alone (Fig. 23). Doubtless some of the great extinct dinosaurian reptiles (such as our own iguanodon) which were bipedal likewise walked and ran, for it is practically certain that they did not hop. In any case we have here again an instance where the upright posture has been independently acquired in two distinct groups, for no naturalist to whose opinion we should care to assign any weight would dream of suggesting that frilled lizards are the direct descendants of iguanodons. So far as I am aware there are no lizards that hop on their hind-legs in kangaroo fashion.

Fig. 20.

As ostriches and frilled lizards exhibit a type of progression unknown among

Fig. 24.

mammals, save in the case of man and a few of his nearer relatives, so frogs display yet another type which has no representative in the entire mammalian class. That is to say, they are the only habitually quadrupedal vertebrates which hop, the hopping being, from the nature of the case, effected solely by means of the long hind-limbs. Frogs can, however, also crawl, although this gait is more typically developed in their cousins the toads (Fig. 24), some of which progress by first advancing one of the fore-limbs, and then, so to speak, pulling the body forwards from this point of vantage.

Fig. 21.

Fig. 23.

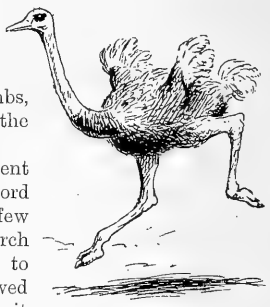


Fig 22.

In regard to the marching of soldiers, recent army regulations are thoroughly in accord with the teachings of nature. Till a few years ago troops were always made to march in a stiff and constrained position, with the arms held close to the body. Except on special occasions they are now allowed to march as they please, with the arms swinging. This is as it should be, for there can be no doubt that the slouching gait of the shepherd is more natural and can be kept up longer than the old-fashioned style of marching.

PHOTOGRAPHIC COMPETITION.

The following Prizes are offered to readers of Animal Life:

A SILVER MEDAL, TWO BRONZE MEDALS, and various Volumes of Illustrated Books on Natural History.

The Silver Medal will be awarded to the reader who sends in the best set of three Photographs of Animal Life in one of the Classes undermentioned, and a Bronze Medal will be awarded to each of the two readers who sends in the best set of three Photographs in the other two Classes.

CONSOLATION PRIZES will be awarded to Competitors receiving Honourable Mention.

Class A. Animals in Captivity.
„ B. Wild Animals in their Native Haunts.
„ C. Domesticated Animals.

The Editor hopes next month to publish the names of those gentlemen who have consented to act as judges (hors concours) in this Competition.

GENERAL RULES.

Every set of photographs must reach the office of Animal Life, 34, Paternoster Row, London, E.C., **between October 12th and 31st, 1903.**

Each envelope or packet must be marked "Competition" on the outside, and each set of photographs must be enclosed in a separate envelope and marked Class A, B, or C, as the case may be.

Each photograph must be mounted, and pasted on the back must be one of the Coupons which will be found among the advertisements in the August, September, and October numbers of Animal Life, marked 1, 2, and 3.

There is no limit to the size which the photographs may be, but only silver prints are eligible for this Competition.

The Competition is open to amateurs and professionals.

Each competitor may send in for competition as many sets of prints as he wishes, each set to be accompanied by the necessary set of Coupons.

Additional prizes will be given where the Competition warrants them, and the judges reserve the right of withdrawing any of the prizes should the merits of the work in any class seem unworthy of a prize.

The decision of the judges on all points will be final.

The Proprietors of Animal Life shall have the right of publishing the winning photographs and those awarded honourable mention.

No Photographs can be returned.

SOME RECENT NATURE BOOKS.

THE illustration on this page is taken from "The Great Mountains and Forests of South America," by Mr. Paul Fountain, who will be remembered as the author of "The Great Deserts and Forests of North America,"* a book which made up for the want of an index by a preface from the pen of Mr. W. H. Hudson. In his South American volume the latter is wanting but the former is given, and to books of this sort an index is indispensable. Mr. Fountain does not claim to be a scientific naturalist, but his book is not the worse for that; he does not add greatly to our knowledge of animal life, but what he does tell us on that subject is told in so attractive a form and with such a freshness of style that make his books a pleasure not only to read, but also to refer to again and again. The following extract relating to a trip up a tributary of the Purus is typical of many:—

"Animal life of the higher forms was exceedingly scarce in this gloomy place; but the monkeys often came down the vines like a lot of sailors from aloft. Nowhere have I seen monkeys so tame or expose themselves so fearlessly. They are among the most cautious of the forest animals as a rule, and keep themselves carefully hidden among the leaves; but here they came down to within thirty or forty feet of me, looking like satyrs in the dim light. They kept up an incessant chatter, and continually leaped backwards and up and down the rope-like trailers; yet curiosity seemed the sole cause of their activity, and they made no hostile gestures. Their proximity was the source of some danger to me as they attracted the caymans, which seemed to be particularly ravenous. I was obliged to shoot many of these reptiles to prevent an attack on the canoe, until my ammunition ran short. At the report of the gun, which

* Both these books are published by Messrs. Longman.

"The monkeys came down the vines like a lot of sailors from aloft."

WATER-RAT
From a photograph in White's "Selborne" by Messrs. Kearton.

boomed very loud in this confined space, the monkeys disappeared into the black recesses aloft in an instant, but they soon came down again and followed me for miles. They were of both sexes and all sizes, and most of the females carried young ones on their backs or shoulders; but sometimes these monkeys and other spider-monkeys carry the young on the breast, with the legs and arms clasped round the body. I mention this circumstance because it has been disputed. As is often the case, what one traveller sees and notes another does not."

From the same firm, Messrs. Longman, we have also received three volumes of "Chatty Object Lessons in Nature Knowledge," and three volumes of "Chatty Readings in Elementary Science."

Another book from which we take an illustration is a neat edition of Gilbert White's classic published by Messrs. Cassell & Co., and illustrated entirely from the photographs of the Brothers Kearton, one of whom also supplies several useful notes and an introduction. The book is remarkably well produced, and has a very dainty appearance. The following are Gilbert White's remarks on the animal here illustrated:—

"I suspect much there may be two species of water-rats. Ray says, and Linnæus after him, that the water-rat is web-footed behind. Now I have discovered a rat on the banks of our little stream that is not web-footed, and yet is an excellent swimmer and diver; it answers exactly to the *Mus amphibius* of Linnæus (see *Syst. Nat.*), which he says '*natat in fossis et urinatur.*' I should be glad to procure one 'plantis palmatis.' Linnæus seems to be in a puzzle about his *Mus amphibius*, and to doubt whether it differs from his *Mus terrestris*; which if it be, as he allows, the '*Mus agrestis capite grande brachyuros*' of Ray, is widely different from the water-rat both in size, make, and manner of life."

Concerning the water-rat being web-footed behind, Mr. Kearton remarks in a footnote: "This was a mistake into which Ray and Linnæus were led by Willughby. There is only one species of water-rat or vole (*microtus amphibius*) in this country, and by a strange coincidence the specimen figured in our illustration is lifting the left fore-foot as if to show the correctness of our author in regard to his being non-web-footed."

We have also to notice a volume by Mr. C. V. A. Peel, F.Z.S.—an industriously-compiled book on "The Zoological Gardens of Europe" (published by F. E. Robinson & Co.). Mr. Peel, with his camera, visited all the principal menageries on the Continent, and has put together a very readable account of what he saw therein. Necessarily there is a good deal of sameness now and then, and the book is not, perhaps, one of any supreme importance; but those who have the time and money might do a good deal worse than take the book as a kind of naturalist's "Baedeker," and follow out the author's route. If this is impossible, a ten days' holiday in Northern Europe would provide a tour (somewhat hurried, it is true) of as many excellent Zoos—say Paris (Jardin des Plantes and Jardin d'Acclimatation), Cologne,

Berlin, Hamburg (Zoologischer Garten and Hagenbeck's Park), Amsterdam, The Hague, Rotterdam, and Antwerp.

Mr. Finn, like Mr. Peel, is another of our contributors, and we gladly notice a small book of his published by Messrs. Thacker in India, entitled "The Birds of Calcutta." This consists of 24 articles reprinted from "The Asian." All these are popularly written, and contain sufficient scientific data to please the zoologist without annoying the naturalist. We should like to see these interesting articles in a more pretentious and permanent form than a small paper-covered pamphlet; perhaps some day Mr. Finn will see his way to write a bigger book on the birds of India, with illustrations. Apropos of a recent anecdote in this magazine on the crow's intelligence we may quote the following from the first chapter in Mr. Finn's book, as it bears out our own story: "With a dog," he writes, "they will go so far, I am told, as to tell off one of the fraternity to pull his tail when he is engaged with a bone, so that when the aggrieved canine turns round to snap, those in front can make off with his dinner. And this I can readily believe, as I have seen exactly the same trick played or attempted on a kite more than once; the crows in the last cases I have observed seemed undoubtedly to be pairs, which accounts for their working together so well. No doubt the female does the tail-pulling, while the male takes the post of danger in front; in one instance I made sure of this from the forbearing behaviour of the crow which had snatched the bone of contention, which he was able to do before any tail-pulling had taken place."

We have kept to the last, three books of Mr. Walter S. Long for mention, on the principle of last but not least, or, rather, last and best. In our opinion Mr. Long as a true naturalist is second only to Mr. Ernest Seton (Thompson), another American who needs no introduction to lovers of animals and animal life. Mr. Long is a real student of nature; he loves to watch animals in their native haunts, to become one of them, and to make his readers share the pleasure he himself gets out of them. No one who wishes to form a zoological library can afford to omit Mr. Long's books from its shelves; the three we refer to are "School of the Woods," "Beasts of the Field," and "Fowls of the Air," all published by Messrs. Ginn & Co. The two latter are handsome editions of chapters reprinted and embellished with additional illustrations from "Secrets of the Woods," "Ways of Wood Folk," and "Wilderness Ways." The former is entirely new matter.

"At a turn in the path not ten yards ahead stood a huge bear."

The reduced illustration here given as a specimen of those in that book relates to an encounter with a bear which the author experienced one day on his return

from salmon fishing. Let him tell the story in his own words: "It was late afternoon, and I was hurrying along the path, giving chief heed to my feet in the ticklish walking, with the cliff above and the river below, when a loud '*Hoowuff!*' brought me up with a shock. There at a turn in the path not ten yards ahead stood a huge bear, calling unmistakably halt, and blocking me in as completely as if the mountain had toppled over before me. There was no time to think, the shock and scare were too great. I just gasped '*Hoowuff!*' instinctively, as the bear had shot it out of his deep lungs a moment before, and stood stock still as he was doing. He was startled as well as I; that was the only thing I was sure about.

"I suppose that in each of our heads at first there was just one thought—'I'm in a fix; how shall I get out.' . . . Something, a mate, perhaps, must be calling him up-river; else he would have whirled and vanished at the first alarm. . . . I met his eyes squarely with mine and held them, which was perhaps the most sensible thing I could have done, though it was all unconscious on my part. In the brief moment that followed I did a lot of thinking. There was no escape up or down; I must go on or turn back. If I jumped forward with a yell, as I had done before under different circumstances, would he not rush at me savagely, as all wild creatures do when cornered? No, the time for that had passed with the first instant of our meeting. The bluff would now be too apparent; it must be done without hesitation or not at all. If I turned back he would follow me to the end of the ledge, growing bolder as he came on. . . . All the while I looked at him steadily until his eyes began to lose their intentness. . . . Suddenly his eyes wavered from mine; he swung his head to look down and up, and I knew that I had won the first move—and the path also if I could keep my nerve.

"I advanced a step or two very quietly, still looking at him steadily. There was a suggestion of white teeth under his wrinkled chops; but he turned his head to look back over the way he had come, and presently he disappeared. It was only for a moment; then his eyes were poked cautiously by the corner of the rock. He was peeking to see if I were still there. . . . He was uneasy now; a low, whining growl came floating up the path. Then I sat down on a rock, squarely in the path, and for the first time some faint suggestion of the humour of the situation gave me a bit of consolation. I began to talk to him, not humourously, but as if he were a Scotchman, and open to an argument. 'You're in a fix, Moween, a terrible fix,' I kept saying to him softly. . . . 'You have put me in a fix, too. Why don't you climb that spruce and get out of the way?'

"I have noticed that all wild animals grow uneasy at the sound of the human voice. . . . I have a theory also that all animals, wild and domestic, understand more of our mental attitude than we give them credit for. . . . Near him a spruce tree sprang out of the rocks and reached upward to a ledge far above. Slowly he raised himself against this. . . . Then an electric shock seemed to hoist him out of the trail. He shot up the tree in a succession of nervous, jerky jumps . . . till he reached the level of the ledge above and sprang out upon it, where he stopped and looked down to see what I would do next. And there he stayed, his great head hanging over the edge of the rock and looking at me intently till I rose and went quietly down the trail. . . . At the point where I had stood when his deep '*Hoowuff!*' first startled me I left a big salmon. . . . Next morning it was gone, and so it may be that Moween, on his next journey, found another and a pleasanter surprise awaiting him at the turn of the trail."

In conclusion we may mention that Mr. Long's publishers produce many excellent nature-study books, and that those who are interested in such should see a copy of their catalogue.

SOME CURIOUSLY-COLOURED BATS.

From an original painting by HARINGTON BIRD.

THE BIRD LIFE OF THE BRECK DISTRICT.

Written and Illustrated with Photographs by Wm. Farren.

PART II.

ENTER a field where lapwings are nesting, and you will probably be attracted by the somewhat ostentatious flight of several birds as they flap away—they are the males, and they will have given the alarm to the sitting females; the latter you will hardly notice as they go silently away close over the ground until well away from their nests. The ringed plover, and especially the stone-curlew, are still more cautious, and run for a considerable distance before taking flight. It is the same when returning; neither species will fly straight to the nest, but alighting some distance off will run towards it, occasionally stopping to glance suspiciously around or make pretence of looking for food, and passing the nest perhaps several times, before, apparently feeling satisfied that they are unobserved, crouching low down, they run rapidly to the eggs, which they inspect carefully, sometimes turning them about with their bills as though lovingly caressing them, and often giving utterance the while to low crooning sounds. Should the lapwing have young all caution is thrown aside; flying to and fro over—sometimes very near—the head of the intruder, screaming their familiar cry of "pee-wit!" while the music of their wing-beats through the air adds considerably to the din, they try their utmost to lure him away from where the young ones—downy balls of dark grey and white fluff—are skulking close to the ground. Should these young ones, and also those of the ringed plover, realise that they are detected, they will run with incredible swiftness, when it is not easy to keep them in sight; then suddenly sink flat on the ground again, where they remain as before until frightened into another run. In contrast to the noisy manifestations of the lapwing, the stone-curlew is quieter even than before the eggs are hatched, and it needs a very sharp eye to detect it as it runs, crouched low down, often for one or two hundred yards, and disappearing over some slight eminence before taking wing; the young, which are covered with a curious close, greyish stone-coloured down, with longitudinal dorsal stripes, are meanwhile stretched out flat on the ground as motionless as the stones they so much resemble.

Although the characteristic attitude of this bird when skulking has been more noticed in the young, it is none the less practised by adults. Like many other birds, they show less fear of one on horseback or driving than on foot, often allowing a very

STONE-CURLEWS A DAY OLD.

STONE-CURLEWS A WEEK OLD.

STONE-CURLEWS FULLY FLEDGED.

NIGHTJAR ON NEST.

near approach; even then their protective coloration, as with extended neck they lie flat on the ground, no doubt more often than not causes them to escape observation. It is a striking example of attitude combining with colour and markings to secure immunity from detection; the only conspicuous feature is the large yellow eye, which is, however, as rigidly still as the rest of the bird, as may be seen in the photograph of the two fully-fledged young (page 31). They remain near where they were hatched for several weeks, attended and fed by the parent birds; it is said that they eat the black and yellow caterpillars of the cinnabar moth, which appear to be exempt from the attack of most insect-eating birds; if so they find abundance of food near at hand, for these caterpillars swarm on the ragwort all over the district. But the stone-curlew is chiefly a night-feeding bird, and its weird cries may be then heard as it wends its way to the rich feeding grounds in the damp valleys of the rivers Lark and Ouse.

Not less interesting than these birds, but of an entirely different character, is the Nightjar. There are probably few places where it is to be found in such numbers as in this part of Norfolk and Suffolk; every fir belt will have its two or three pairs, every solitary tree on the heaths may shade the home of one, every healed-up cavity in the hillsides where gravel has been dug may be tenanted, or it may be found on an absolutely level part of the Breck away from trees or bushes of any kind. No semblance of a nest is made, not even a hollow; the eggs, two in number, are laid on the bare ground; they are protectively coloured, but on quite a different plan to those of the birds before mentioned. They are marked with large irregular lilac and brown blotches on a milk-white ground, the size and irregularity of the markings having the peculiar effect of breaking the outline of the eggs and so causing them to assimilate with their usual surroundings. The latter are generally dead sticks and leaves under trees, and, especially in this district, fir cones and fir needles on the outside of the belts. But the nightjar's real protection is its own wonderful resemblance to these surroundings; consequently it does not leave its eggs at the first approach of an intruder, but sits close and motionless, depending on its protective coloration to escape observation, leaving the eggs only as a last resort if the near proximity of its disturber makes it dangerous to remain, when it will go off with soft, noiseless flight. If it has young it will pretend to be injured and flap in an apparently helpless manner along the ground, endeavouring to attract attention from its young to itself. The newly-hatched young are covered with a hairy down, pale ochreous brown in colour; along either side of the front part of the head, in continued lines with the edges of the short bill and extending to above the eyes, the down is recurved, and is succeeded by similarly-curved feathers. These curved feathers are inconspicuous in adults owing to those of normal form along the middle of the head overlapping them; but before these central feathers grow in immature birds the curved ones are most conspicuous, as may be seen in the photograph of the young birds reproduced on page 33. At least, *it may be seen* when the *birds themselves* are discovered, for it must be admitted that this photograph is somewhat of a puzzle picture, but not by any means more so than was the actual subject in nature.

After being once disturbed the young will be moved a few feet or yards from the original spot.

The nightjar hunts and feeds at dusk, flitting with ghostly flight to and fro along the fir belts, catching moths and other night-flying insects; its enormous mouth, fringed with stiff bristles, constituting a most effective entomological net.

Nightjars have a curious habit of bringing their wings together with a sharp clap, and often when flying give utterance to a plaintive mewing cry; the familiar churring note, heard only after dusk, is uttered when at rest in the characteristic

NEWLY-HATCHED YOUNG OF NIGHTJAR.

TWO YOUNG NIGHTJARS: WHERE ARE THEY?

attitude *along*, not *across*, the branch of a tree. Like its smaller relative, the swift, the nightjar allows May to be well advanced, when there is a plentiful supply of insect food, before it ventures to our shores, leaving again before the end of September.

But of the Breck birds, the ringed plovers are the first to leave; they have generally all gone back to the shore by the end of August. The stone-curlews stay on until the end of October or even later, occasional specimens having been recorded in December and even, but more rarely, in January. It is stated that in Cornwall and Devonshire a few sometimes remain resident all the year; in October they gather in large flocks, when fifty or more may be seen together, and it would appear from the detailed observations of Mr. Edmund Selous (recorded in the pages of the "Zoologist") that they then hold some sort of concerted dance, such as some members of the plover family are known to do. It is at this season, too, that their wild cries are most heard; but as a rule, even when large numbers are together, they do not all call at once, but take up the cries one after the other.

Although in the nesting season the different birds will often, when disturbed in the day, fill the air with much screaming and whistling, it is at night that they are most impressive; and the memory of one June night still remains clear and distinct. The day had been bright and hot, the parched sandy soil and shining flints reflecting and accentuating the heat of the sun's rays; the faint echoes of very distant thunder, although hardly discernible, brought at intervals fitful crowings from the cock pheasants in the covert; the air was heavy with the fragrance of the firs, wafted over the barren fields by the hot breeze. But coolness comes with the evening, the few scattered fleecy clouds, hardly noticeable during the day, gather together and follow the setting sun to the western horizon, where they hang like a purple grey curtain over a sea of fire and gold; a partridge is chucking to her chicks on the other side of the "Scotch fence," and a solitary ringed plover, bringing thoughts of the sea shore, whistles shrilly as it flies by—low over the ground—the curtain of cloud gradually lowers, shutting out the last glimpses of fading gold—imperceptibly dusk is falling—a sudden "clap, clap," followed by a shrill mewing cry, and the brushing of soft wings through the air; the nightjar is abroad—doubling and turning as it follows the moths among the dark fir trunks; it vanishes from sight as suddenly as it came, and the next instant its rolling, churring cry breaks forth in ghostly cadence from the tree on which it has settled. It is rudely broken upon by the loud whistling cry of a stone-curlew, followed quickly by others as the birds wend their way overhead to their feeding grounds in the valleys. No other sounds are heeded now, for as the cries of the curlew are heard far above all its neighbours of the shore, so does its namesake, the stone-curlew, dominate with its weird melody all other sounds of the Breck.

EGGS OF THE NIGHTJAR.

CLOUDED TIGER.

ZOO NOTES.

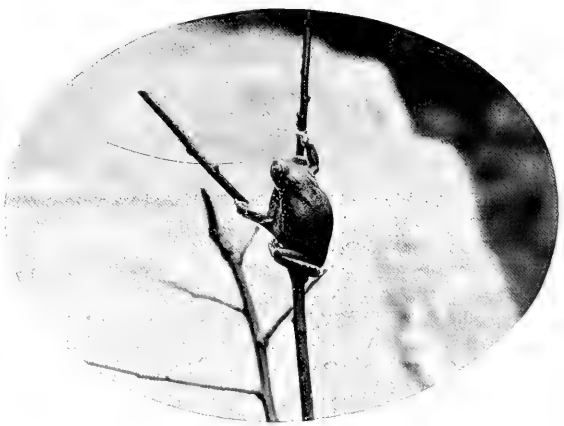
Written and Illustrated with Photographs by W. P. Dando, F.Z.S.

Clouded Tiger.

This beautiful specimen of the *Felis nebulosa* is very docile. She has been at the Zoo since 1899. The darkness of the cage and limited space make it exceedingly difficult to get a good portrait of her, and I believe this is the first time she has been successfully photographed. About the habits of this animal very little is known beyond the fact that it passes nearly the whole of its time in trees, sleeping on the branches, and that its food consists chiefly of birds and small mammals.

Graceful Tree-Frog.

It is notable that members of two separate families of frogs and of two distinct families of snakes should have taken to arboreal life. The chief characteristics of the Tree-Frogs are that their toes are quite free from webs and that their extremities expand into rounded tips, enabling the animals to climb with sure though slow progression. The tree-frog illustrated is really a very pretty little frog, of a beautiful green colour, brilliant and shining with the lustre of polished malachite.



TREE-FROG.

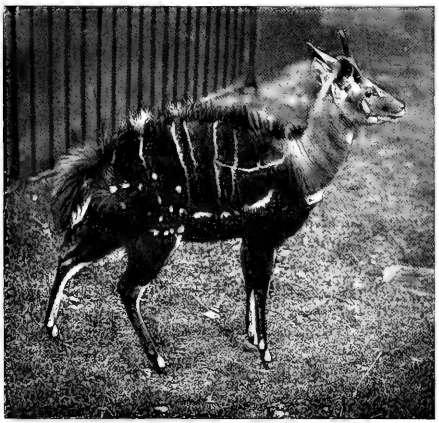
Egyptian and Arabian Gazelle.

THE Egyptian and Arabian gazelles are typical specimens of their species. The latter was for several months catalogued as Thomson's Gazelle, of which no specimen has been exhibited in the menagerie.

ARABIAN GAZELLE.

The Nilgiri Wild Goat.

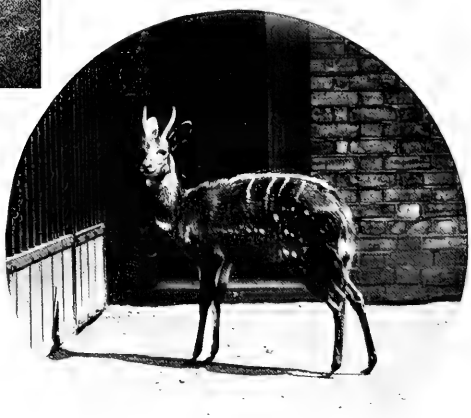
A VERY interesting species of goat, quite new to the Zoo, is illustrated in the photograph of the Nilgiri Tahr (*Hemitragus hylocrius*) from Southern India. Mr. Sclater gave the following description of this goat in the "Proceedings of the Zoological Society, 1886": "The so-called Ibex of the Nilgherries, Anamallays, and other adjoining ranges of Southern India is an outlying species, apparently allied to the *Hemitragus jemlaicus*, the Tahr which inhabits suitable regions along the whole range of the Himalaya from Kashmir to Bhutan." These two species differ from the true goats in the short, thick and much compressed horns, the anterior border of which is keeled, and the moist naked muffle. There are no glands in the fore-feet. The horns of the Nilgiri animal differ markedly from those of the Himalayan Tahr, being much more rounded-off in the front external angle.



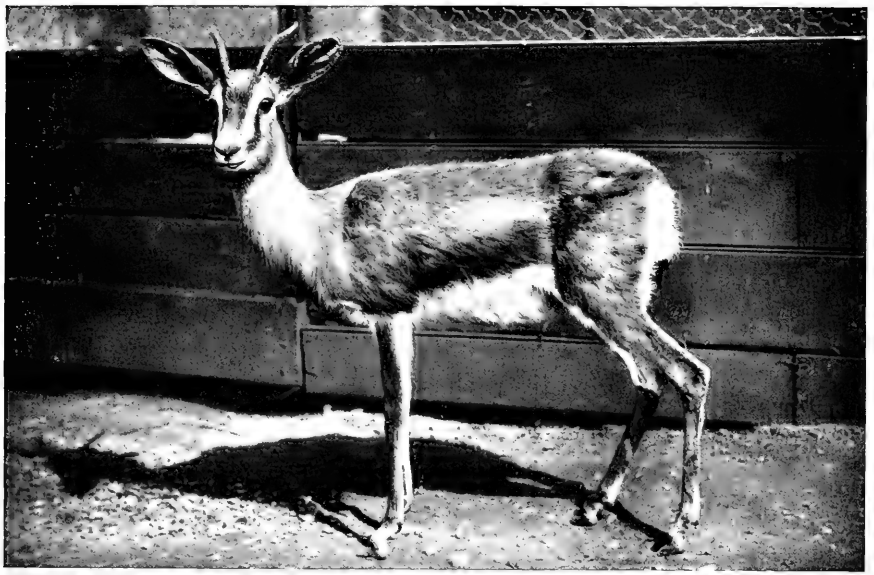
HARNESSED ANTELOPE.

Bosch-bok and Harnessed Antelope of South Africa.

WE figure two interesting examples of the genus *Tragelaphus* known as *T. scriptus* and *sylvaticus*, and popularly as the Harnessed Antelope (on account of the harnessed markings) and the Bosch-bok,



BOSCH BOK.



EGYPTIAN GAZELLE.

BLES-BOK.

NILGIRI TAHR.

HIMALAYAN TAHR.

a name taken from the Dutch: *bosch*, wood or forest, and *bok*, goat. It will be observed that there is a great similarity in the markings of these closely-allied antelopes.

Bles-Bok.

A VERY scarce species which has not been seen at the Zoo for over twelve years, and then for only a very short period, is the Bles-bok (*Damaliscus albifrons*). The present specimen is exceptionally savage and dangerous, and was removed from the case in which it arrived from South Africa with the utmost difficulty, and great caution had to be exercised by the keepers in getting clear of the animal. The way he charges with his sharp horns the partitions of his enclosure at the sight of the camera seems enough to break them, and is really alarming.

European Beaver.

WHAT an interesting study it would be, if space were only possible at the Zoo, to allow a small colony of Beavers (*Castor fiber*) to be kept. The engineering schemes by which these creatures dam a stream by nibbling a tree trunk round, not horizontally, but so as to slope or dip it in the direction in which they intend it to fall, is almost incredible, and it is recorded that so perfectly do these creatures do their work, that tracts of forest have been submerged and destroyed by the action of beaver-dams. The hind-feet are webbed, and one of the five toes has a double nail. The tail, which is used as a paddle, is flattened horizontally and covered with scales. Remains of the common beaver have been met with, among other localities, in this country in peat beds in Cambridgeshire and Essex.

THE BEAVER.

A seldom-seen inhabitant of the Zoo.

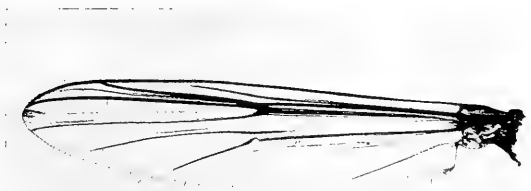
MIDGES? GNATS? OR MOSQUITOES?

Written and illustrated by T. A. Gerald Strickland, f.e.s.

"HOW these midges *do* bite!" If you are a polite person, you answer, "Yes, don't they?" but, as a matter of fact, with one exception, *i.e.*, the genus *Ceratopogon*, midges do *not* bite and are absolutely harmless. It is the female (usually) gnat or mosquito, for the names apply to the same insect, that so beautifully pierces our skin with her stylets and sucks our blood. In the warm evenings of late spring and early summer clouds of male midges rise and fall and play in the still air, amusing themselves with *innocent* terpsichorean movements; and as, to the casual observer, the little creatures are somewhat like gnats, we abuse them and call them bloodsuckers! It is worth while to catch one, and also a gnat proper, and compare the two with the aid of a pocket lens. Of course, there are internal differences in the two insects, but the external are striking enough.

In the first place, it will be found that the midge's proboscis is extremely short and generally minute, whilst that of the gnat or mosquito, which forms a case for the

MOSQUITO (*Culex sp.*).



WING OF MIDGE (*Chironomus plumosus*) × 14.

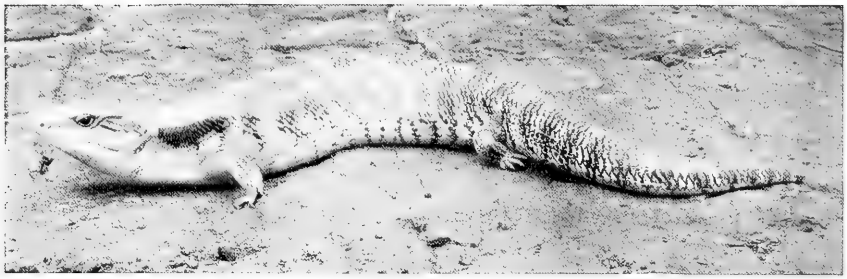
WING OF GNAT OR MOSQUITO (*Culex sp.*) × 16.

piercing-instruments, is notably long and strong; secondly, the wings of the midge are quite clear, or, in some species, evenly coated with fine hairs that cover the membrane as well as the veins. Now, in the gnat, scales or flattened hairs will be observed, even with the naked eye, clustering thickly on the nervures and fringing the edges of the wing, but the membranes are quite free and transparent. Another point to be noted is that in the *Culicidæ* (gnats or mosquitoes) the costal vein runs *completely* round the wing, whilst in the *Chironomidæ* (midges) it finishes abruptly at the tip.

Mosquitoes are comparatively scarce in England, there being only seventeen species, but the midges are plentiful indeed, one genus alone (*Chironomus*) numbering, it is said, two hundred species. One genus of mosquito (*Anopheles*) has, so to speak, hummed very loudly lately, indeed has become notorious as the host and transmitter of the malaria parasite; so it is only fair to the lightsome, flightsome midge that their respective families should be strongly differentiated — even in the minds of the general public.

NOTICE.

The Editor begs to draw attention to the notice on page 24 of Animal Life, No. XIII., which contains full particulars of the Photographic Prize Competition open to all readers (amateur and professional) of this magazine. The Prizes offered are a Silver Medal, Two Bronze Medals, and various consolation prizes of Natural History Books. The Competition closes on October 31st, 1903. The Editor is pleased to announce that the following gentlemen have kindly consented to act as judges (*hors concours*): R. Lydekker, Esq., J. W. Swan, Esq., R.A., W. P. Dando, Esq., F.Z.S., and the Editor of "Photography."



BLUE-TONGUED LIZARD.

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough, f.z.s., f.e.s., etc.

VIII. LIZARDS.

Of lizards there are many that form interesting pets, both from a financial point of view and from a naturalist's point of view. Lizards can be purchased from sixpence each upwards to practically as much as one would care to give. Like snakes they are easily tended, require but little more attention, and are an equal source of attraction to visitors.

The case described in the article on Snakes, Vol. I, pp. 312 and 313, is equally suitable for lizards, and will hold half-a-dozen ordinary-sized ones very comfortably without overcrowding. The choice of species made by the would-be owner is usually a financial determination, and therefore in this article I will confine myself to the less expensive kinds and their cost.

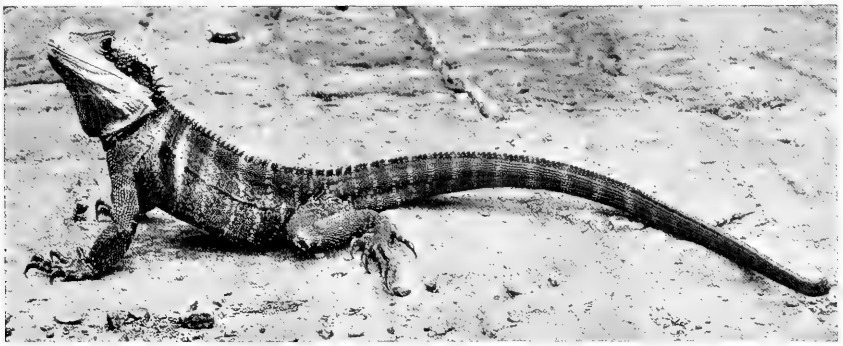
The Bearded Lizard costs from 15s. each; Skinks from 5s. to 10s. (except the Giant Cyclodus, which costs about £2); Glass-Snakes, 5s. to 10s.; Derbian Zonure, about 15s. to 25s.; the Green Lizard, 1s. to 2s. 6d.; Eyed Lizards, 2s. 6d. to 7s. 6d.; Geckos, 2s. 6d. to 15s.

The Bearded Lizard, during the winter months and at such other times as the weather is chilly, should have its case placed in a warm room. Snails, slugs, small pieces of meat and bits of fruit form its staple diet. Another interesting lizard of the same family (Agamidæ) is the Variable Lizard, a very handsome reptile which derives its name from the power it possesses of changing its colour, being in this respect more truly chameleon-like than the chameleon itself. The changes are most marked when the reptile is basking in the sun, when the head is yellowish, tinged with red, the body red, and the remaining parts black. The food for the variable lizard may be cockroaches, beetles of various kinds (with the exception of the Devil's Coach-horse and the Bombardier, both of which are unsuitable as articles of diet), tiny lettuces and a little ripe fruit. These lizards are arboreal, and a growing plant of some kind should be provided for them to climb up and disport themselves.

The Skinks require an extra supply of mould and sand in which they may burrow; six inches will not be too great a depth, as, when in a state of freedom, they have been known to bury themselves several feet down in the ground. Some species of skinks are addicted to cannibalism, and therefore it is not expedient to put other lizards in the same case with them, as, if smaller than the skinks, they will soon disappear. Flies are a very favourite diet of these creatures, and a few should be caught whenever possible and turned into the case for the skinks to feed on; other food may be

cockroaches, mealworms and gentles. In the summer months the gentles will keep up the necessary supply of flies without troubling the owner of the reptiles unduly. Two of the prettiest of the skinks are the Ocellated Sand-Skink and the Greenish Sand-Skink, the names of both being sufficiently descriptive of them.

The Glass-Snakes, although called snakes, and bearing externally at a first glance no trace of limbs, are nevertheless true lizards. They have all the appearance, although larger in size, of the common slow-worm. All the species are carnivorous, the larger kinds feeding on reptiles and other vertebrates, and the smaller varieties on worms, slugs, insects and spiders. Should any of my readers become possessed of a large specimen, they will find mice and voles not unacceptable. The glass-snake in freedom is a fierce and active reptile, showing no hesitation, if need be, in attacking and killing even the viper. Some specimens will feed on hard-boiled eggs, but worms are an unfailing attraction, and so are small frogs—not large ones, as the glass-snake, unlike the true snakes, has fixed jaws. In colour this reptile is reddish-brown, and in length about thirty inches. The American species is not so commonly imported to this country, and is a prettier reptile than the European kind. Glass-snakes are best kept by themselves, since they sometimes eat up their companions in captivity.



LE SEUER'S WATER LIZARD.

For the Zonures artificial heat is a necessity, as the temperature must not fall below 70 degrees, so that a well-warmed greenhouse forms as good a place as any in which the case or vivarium containing this reptile may be placed. Cockroaches, tiny frogs and raw meat may form the diet. The rough and spinous appearance of the zonures renders them more attractive to the ordinary observer than the smooth-skinned lizard.

The Green Lizard is one of the most popular lizards kept in captivity, this being due to its beautiful green colour and to the trifling cost it entails for the purchase—half-a-crown being a maximum price. This lizard very quickly becomes tame, and in many instances will take food from the fingers of its owner. The diet of the green lizard consists of insects—either flies, mealworms, cockroaches, earwigs, or gentles—and also slugs and worms. The Eyed Lizard is another beautiful species, marked, as its name implies, with blackish or blue ocelli. It is a more expensive reptile than the preceding species, but is just as easily tamed. When first imported they are very often wild and refuse to feed, and sometimes get quite thin and weak; but after a short time they usually pick up, and soon regain all their former beauty. Those readers who may object to reptiles on the ground that they usually are only eaters

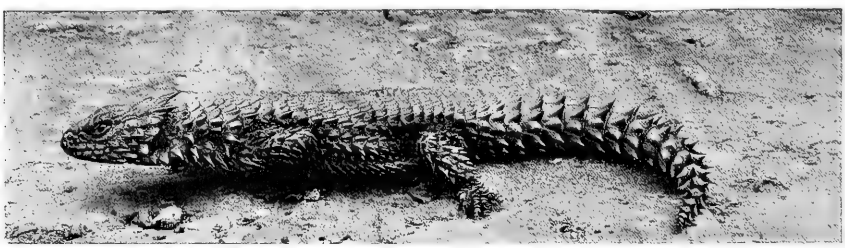
of live food may safely keep the eyed lizard and the green lizard without their susceptibilities being offended, as these species will take dead mice quite readily, ripe grapes and strawberries, and raw meat. Both these lizards will occasionally deposit eggs in captivity; although these are usually infertile, they are sometimes fertile, so it is advisable to try artificial incubation, and if possible hatch young.

The lizards that all people are interested in are the Geckos, of which there are altogether about three hundred species. To see these lizards climbing up the glazed sides or front of a plate-glass vivarium is a source of wonderment to all beholders who are not acquainted with the peculiar powers of the Geckonidæ in this direction.

One curious trait of the gecko is its power of uttering an audible cry or call, from which it derives its name, the word "geck-o" being a fairly correct phonetic rendering of the sound made by some species. The under-surfaces of the toes are provided with suckers similar in some instances to those of the sucker-fish, and in others to those on the feet of the common fly; however, some geckos—not many—are unprovided with these means to "upside-down" locomotion on ceilings and glass, and, instead, have developed claws similar to those on the feet of other kinds of lizards. Geckos are usually small—five or six inches in length; others may be a foot in length. They are very quick in all their movements, which are rather jerky in appearance; but in spite of this peculiar jerky style of movement they cover ground very rapidly, and if one escapes from the case it is no easy matter for the owner to recapture it. Mealworms, gentles, flies, spiders, earwigs and cockroaches are readily taken. Geckos are no trouble whatever; and if their case be kept in a well-warmed room in a nice sunny spot they will always be in good health and lively spirits.

Very beautiful little lizards of the Iguanidæ family are the Anoles; they cost, in this country, from five shillings to a sovereign apiece, but, from their beautiful and delightful little ways, are well worth the money. Being arboreal in their habits, it is necessary to provide plant life of some kind for them to climb about in. All lizards require plenty of sunshine; but anoles must have as much as possible, or else they soon get dull and mopish. They are strictly insectivorous in diet, and want as many flies as it is possible to provide them with; when flies are out of season, cockroaches and mealworms may be substituted.

The case for lizards should have a piece of virgin cork in it, under which they can crawl; it should, however, not be too large, and preferably well arched, so that, if necessary, the underside can be inspected without disturbing it. All lizards drink, and therefore a small pan of water should be provided.



DERBIAN ZONURE

SOME CURIOUSLY-COLOURED BATS.

By R. Lydekker.

BATS when on the wing in the twilight form conspicuous objects when seen from below, and it is evident that their coloration is in nowise intended to render them invisible from this aspect. Had it been so, they would have had the under-surface of the body and wings light-coloured, although it may be doubtful whether even this would have very greatly helped matters. When seen from above, their dark colour not improbably renders them difficult to detect against the ground over which they are flying; and this may be one of the reasons why bats form such a small proportion of the prey of owls, although their swiftness of flight is probably another. That the number of bats killed by owls is comparatively insignificant is demonstrated by a table of the analysis of the cast "pellets" of the latter given in Professor Newton's edition of "Yarrell's Birds." In that instance the pellets of three species of owls were examined, with the result that in the case of two out of the three no remains of bats were discovered, while in the case of the third species—the barn-owl—evidence was obtained of the destruction of only 16 bats, against 237 mice, 693 voles, and 1,590 shrews. Whether the barn-owl is the only species of its tribe that preys on bats, and if so, for what reason, does not appear to be ascertained; but it seems evident from the foregoing statement that ordinary bats have little to fear from enemies while on the wing, and consequently have no need of protective coloration. In the gloom of caverns, hollow trees, and roofs and towers, where they pass the daylight hours (and indeed their whole time in the winter of the temperate zone), their sombre coloration must doubtless assist to render them inconspicuous. Even in such situations, however, it is more than doubtful whether such adventitious protection is of any advantage to them, for it does not appear that they are habitually preyed upon by mammals which, like weasels and rats, could easily gain access to their roosting-places. Possibly this presumed immunity from attack may be due to the unpleasant smell of bats, which may render their flesh distasteful to the smaller beasts of prey.

Be this as it may, it seems evident that the great majority of bats are not specially coloured for purposes of protection. Most rules have, however, their exceptions, and this is the case with regard to the coloration of bats. It is perhaps not unreasonable to suppose that the natives of India and Ceylon have recognised the remarkable resemblance existing between the coloration of the Painted, or Plantain, Bat (*Cerivoula picta*) and its inanimate surroundings. At any rate, the Cingalese have named it *Kehel-voulha; kehel*, or *kehl*, being the vernacular name for plantain, and *voulha* (probably a derivative from the same root as the Latin *volare*, to fly) signifying a bat. It is from the native designation that the generic name, *Cerivoula*, of this group of bats is derived. With the single exception of the plantain-bat, the members of the Oriental genus *Cerivoula* present nothing specially noticeable in their colouring. Indeed they are all very nearly related to the genus which includes the European Bechstein's Bat (*Myotis bechsteini*), one of the points of difference being the direction of the front teeth.

The plantain-bat, on the other hand, as shown in the uppermost figure of the coloured plate, is coloured in a most striking and peculiar manner. The whole of the fur on the upper part of the body and head is bright orange, while those portions of the wing-membrane which are adjacent to the bones by which it is

supported, as well as the margin, are also of the same brilliant hue, as is likewise the whole of the membrane connecting the hind-legs. With the exception of a few spots and flecks of orange, the rest of the wing-membranes are deep black; on the lower surface of the body the fur is somewhat lighter in colour than that of the back. When disturbed and made to take flight in the daytime, this bat looks like a large brilliantly-coloured butterfly or moth.

Obviously there must be some special reason why this particular species should differ so remarkably in colour from all its relatives, and this reason is not far to seek. Those who have seen it in its native haunts tell us that during the daytime this bat conceals itself in a folded leaf of the plantain. Now the ripe fruit of the plantain—and in Ceylon and Southern India the fruits are ripe throughout the year—is practically identical in colour with the bat; and possibly decaying leaves may take on the same yellow and black-flecked coloration, although I cannot now remember whether this is really the case. Anyway, the resemblance of the colouring of the bat to that of a ripe plantain is a sufficient explanation why this species differs so remarkably in hue from all its kindred. It is, moreover, a striking demonstration of the fact that marked peculiarities in the coloration of a particular species or genus are very frequently of a protective nature. How this bat acquired its distinctive livery is a question I will leave my readers to discuss, for I am told that my own views on such matters are somewhat old-fashioned and out of date.

But the plantain-bat is by no means the only species displaying this abnormal type of coloration, two members of the allied genus *Myotis* being also orange and black. The first of these is Hodgson's Bat (*M. formosus*), ranging from India to China, and the second Welwitsch's Bat (*M. welwitschi*) of Angola and probably other districts on the west coast of Africa. In the latter the general tint of the fur is reddish above and straw-coloured below. The wing-membranes are orange and black, but the arrangement of the two colours differs somewhat from that obtaining in the plantain-bat. The black portions, for instance, are triangular in form, and occupy the spaces between the second and third and third and fourth fingers, as well as an area included between the fourth finger and a line drawn between the wrist and the ankle. The rest of the wings is orange with black spots and dots, as is also the membrane between the legs with the exception of its margin, which is black. Hodgson's bat, in which the fur is yellower, has the wings coloured in almost exactly the same way, but the black spots are wanting from the orange areas, and the dark spaces are flecked and spotted with orange. Moreover, orange extends along the margins of the fingers (of which the bones are of the same hue), and the ears and the whole of the membrane connecting the hind-limbs are likewise orange.

With the habits of Hodgson's bat we are fortunately well acquainted, owing to observations made many years ago by an English naturalist in Formosa. It appears that these bats are in the habit of hanging suspended during the daytime from the branches of the evergreen longan-tree, a species of *Nephelium*. As the leaves of that tree decay they turn orange and black, such decaying leaves being found at all seasons. The fruit is also of a reddish-yellow colour when ripe; and we are told that it is almost impossible to detect the bats from the dead leaves or ripe fruit among which they hang. Probably the coloration of Welwitsch's bat harmonises in precisely the same manner with the fruit or decaying foliage of one of the trees of its native country.

The remarkable thing in all this is, of course, that three distinct species of bats, none of them very closely allied, and one generically distinct from the other two, should have acquired an almost identical type of protective coloration, each apparently quite independently of the others. If all the members of a single genus had been thus modified, the marvel would have been very much less, since they might all be descended from a common ancestor possessing the distinctive colouring.

In all the species hitherto mentioned there has been no difficulty in assigning a reason for their departure from the normal type of coloration. We come now to certain other forms in regard to some of which there is at present no clue to account for their peculiar colouring. The first of these is the White-Winged Bat (*Scotophilus albofuscus*) of the Gambia, a member of an Old World genus of the typical bats (*Vespertilionidæ*), most of the other representatives of which present no peculiarity in colour. This species is remarkable from the circumstance that the greater portion of the wing-membranes are pure white. It is, however, only those portions of these membranes which are concealed when the bat is in repose that are white, all the parts lying internally of a line connecting the elbow with the knee being dark-coloured like the fur of the body and head, the general hue of which is deep amber-brown. Consequently, when the bat is at rest there is nothing specially noticeable in its colouring, and it is only when in flight that the white wings are shown; the white, it should be mentioned, being common to both their upper and lower surfaces. The contrast between the dark body and white wings is most striking when the limbs are extended, although when in repose there is nothing specially noticeable in the colouring of this bat. Whatever may be the purpose of the white wings, it is evident that this purpose comes into play only when the creature is in flight. That there is some special object in this very peculiar colouring may be taken for granted, more especially as certain other West African bats belonging to different genera display the same peculiarity. The attention of naturalists and collectors who may be travelling in the Gambia and other parts of West Africa should be especially directed to the importance of solving this curious problem. One of the species last referred to is the Silvery Bat (*Chalinolobus argentatus*) of the Cameroons, in which the general colour of the fur is dark silvery-grey, while the skin of the face and ears is pearly white, and that of the wing and leg membranes dusky translucent white traversed by dark network and lines. Other species are *Nyctinomus pumilus* and *N. whiteleyi*.

Very remarkable is the colouring of a Himalayan representative of a genus already mentioned, namely, the Harlequin Bat (*Scotophilus ornatus*). In this species (which is shown flying in the centre of the plate) the general colour of the fur of the back is brownish yellow, verging on orange-brown marked with white spots. On the crown of the head is a small elongated patch of pure white; a narrow white stripe runs down the middle line of the back, and there are two white spots behind each shoulder just above the origin of the wing-membrane. On the under-surface a white chevron extends from the abdomen to terminate in front of each shoulder; while a second white band forms a collar, commencing below each ear and running forwards to the chin. The rest of the lower-parts are brown. Such a remarkable coloration must certainly have a meaning, and it is noteworthy that specimens of this bat, said to have been obtained close to the snows in the Sikhim Himalaya, were named by the late Mr. Brian Hodgson *Nycticejus* (= *Scotophilus*) *nivicolus*. On the other hand, Dr. Jerdon states that this bat is found in warm low valleys near Darjiling, one of his specimens being reported to have been taken in a plantain leaf. Moreover, Dr. Blanford observes that some of Hodgson's specimens from the interior of the hills, although obtained near high mountains, were from the deep valleys at low elevations above the sea.

Although the name *nivicola* (as it should properly be) is suggestive that this bat owes its white markings to its inhabiting districts where the leaves are flecked with snow during some portion of the season when it is abroad, yet this interpretation cannot be sustained in face of the statements cited above. Moreover, it would be unlikely that bats could live at elevations where the snow lasted during most of the summer. Some other explanation has therefore to be sought; but this can only be found out by careful observation of the habits of this bat in its native haunts.

Another abnormal type of coloration is presented by the White Bats of Central and South America. In the common *Diclidurus albus* the hair of the body is dark-coloured for the greater part of its length, but the tips are yellowish or creamy-white, as are also the wing-membranes. The first example of this species known to science was taken in Brazil while resting in the leaf of a cocoanut palm; and this suggests that the peculiar colouring of these bats (one of which is shown in a hanging posture on the right side of the coloured plate) is to harmonise with the silvery under-side of the leaves of cocoanut palms.

In all the foregoing instances of abnormal coloration in bats, the colours are those of the hair and skin. One remarkable species, the African False Vampire (*Megaderma frons*), shown flying on the left side of the lower part of the plate, is, however, in at least one portion of its range, in the habit of dyeing its hair, and thus producing a brilliant orange tint in place of the natural brown. This hair-dyeing process is brought about by means of a gland on the rump—very similar in position to the oil-gland of a bird—by which is secreted a sticky orange-coloured powder. Apparently, as I am informed by an observer in the Sudan by whom this remarkable fact was first made known, the powder is ejected immediately before the bat takes to flight, and from its glutinous nature sticks to the wings and the hair of the lower part of the back; the latter being dyed more or less permanently yellow. When on the wing in the daytime, this bat, like the Indian plantain bat, is said to resemble a huge butterfly or moth.

This large bat has a very extensive distribution in tropical Africa, ranging from the coast of Guinea to Zanzibar, Abyssinia, and the eastern Sudan. In 1878 the late Dr. Dobson stated that the only information then available with regard to its habits was contained in a note by the explorer Speke. According to this, these bats were met with in considerable numbers at Meninga, where they rose singly from the ground, to alight sometimes in bushes, but on other occasions again in the grass. "This appears to indicate," adds Dr. Dobson, "that *Megaderma frons* hunts for its prey by day as well as by night; and the large size of the eyes in this as well as in the other species of the genus leads us to consider this very probable. Mr. Blyth has shown that *M. lyra* [the Indian representative of the genus] feeds on grasshoppers and small bats (and probably on other small animals); and the individuals of *M. frons* observed by Captain Speke may have been engaged in hunting for grasshoppers and small mammals among the long grass."

Can it be that some of the creatures on which this bat preys mistake it for a butterfly, and thus make no effort to hide themselves when it appears in sight?

In conclusion, I may state that one of the objects of this article is to draw attention to some of the many interesting problems connected with the habits of animals and the adaptation of particular species to their environment that still await solution at the hands of naturalists. Without in any way underrating the importance of describing species (although I may think that in some instances these are nowadays somewhat unnecessarily multiplied), it cannot be too strongly inculcated that the observation of the life-history of animals in the field should form an essential part of the duty of every collector. Without such knowledge the dried skins are, in a sense, almost as valueless as a field-gun without the breech-block.

A TEAM OF WORKING SLEDGE-DOGS

MORE ARCTIC DOGS*—AND OTHERS.

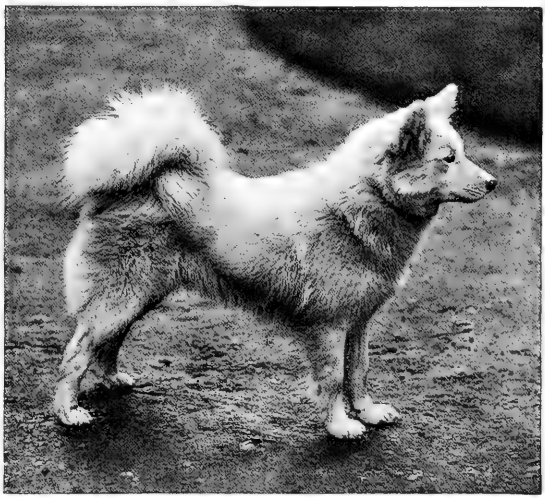
A Team of Working Sledge-Dogs.

THE accompanying picture, lent us by Mr. H. C. Brooke, of Welling, whose collection of foreign dogs has for years been the finest in the country, represents a team of working Sledge-Dogs, with the sledge, tent, and other paraphernalia actually used by their owner when prospecting in Alaska. The first dog in the team is an Esquimaux of sorts; but it is alleged, and his appearance bears it out, that he has one-quarter wolf blood in his veins. The second and third are very fair specimens of the Esquimaux dog, though not as high-class as the dog "Arctic King," whose portrait we reproduced a couple of months back. The dog next to the sledge is an animal by no means noticeable for beauty or purity of blood, but regarded as a working dog he is, according to his owner, worth the rest of the team. He is a dog of some hundred pounds weight, heavy and powerful, with drop ears and docked tail, and is a specimen of the manufactured variety known as the Hudson's Bay Husky (a mixture originally of mastiff, boarhound, wolf and Esquimaux), which is found to be more enduring and more tractable than the Esquimaux dog, whose wildness and ferocity in times of want, as well as his pugnacity and thieving propensities, are sometimes rather hardly felt. Both Esquimaux dogs and Huskies are used to draw the mail-sledges which now weekly leave Dawson City to carry the mails to the various parts of the Yukon District and even as far away as Cape Nome, a distance of nearly one thousand five hundred miles. This mail service is maintained by the Governments of both Canada and the United States. The average daily distance covered by these official teams is about forty miles; but of course, in the case of private teams such as that in our illustration, the distance depends upon the capacity of the dogs and the caprice and necessity of the owner. The photograph from which our illustration is taken was taken in England, and the background is artificial, the sledge running on a specially-prepared track; but the dogs are genuine Alaskan workers, and the sledge the one which had been used in the Yukon territory.

* See ANIMAL LIFE, Vol. I., pp. 107 and 192.

The Samoyede Sledge-Dog.

What the Esquimaux dog (portraits of which breed were recently given in Animal Life) is to the Esquimaux of Arctic America and Greenland, so is the Samoyede dog to the nomadic tribes inhabiting the western portion of Siberia and north-east of Russia. These two, with the Norwegian dog, commonly called Elkhound in this country, are the most important forms of the Arctic dog. The Samoyede is rather smaller than the Esquimaux, and more domestic-looking; in character also he is less wild than the Esquimaux, just as the Samoyede tribes are more civilized than the Greenlanders and Alaskan Indians. This makes him more suitable as a pet than the American dog, but also, in my opinion (writes Mr. Brooke, who sends us the photograph), renders him less distinctive in appearance as a breed: for there is no disguising the fact that he is apt to look like a large Pomeranian dog; in fact, when a great German cynologist and judge was in this country last summer, at the Botanic Gardens Dog Show, he remarked that the majority of the Samoyedes exhibited would, if running about a German town, be taken for large Pomeranians. Another point which domestication in this country is altering is the eye. All Arctic dogs have a more or less keen and wild expression, which is typical and goes far to make up the correct *tout ensemble;* but many of the specimens bred in this country have a soft, gentle, butter-won't-melt-in-my-mouth expression which, whilst it may be pretty and attractive to ladies, is by no means correct. The Samoyede dog is found of all colours, but that preferred in this country is white. This is the dog now usually made use of in Polar expeditions, partly owing to its being more tractable than the Esquimaux. It will be remembered that some years back a large number of these dogs which had been employed in the Jackson-Harmsworth expedition were brought to this country and exhibited at the Crystal Palace Dog Show, with tent and sledge complete. They attracted much attention. Of these dogs Her Majesty the Queen still possesses one, "Jacko" by name, who has won several prizes. The best Samoyede ever seen in this country was a dog presented some five years back to a President of the Kennel Club on the occasion of his visit to Russia. This beautiful dog was far ahead of any others ever exhibited, but what ultimately became of it I do not know. The accompanying illustration shows very much what the true Siberian sledge-dog is like. The colour, however, may be black, brown, red, yellow, or black and white. As in the case of the Esquimaux dog, there is no doubt that wolf blood is sometimes introduced, either accidentally or on purpose, into this breed: and it is worthy of notice that whereas the ears of the Esquimaux dog should be rather small, closely set and carried forwards, in this respect resembling those of the Arctic wolf, the ears of the



Photograph by T. Fall.

"PERLENE."
A pure white Samoyede.

The dog in the left-hand photograph is "Gatto," one of the pack used in the Duke of Abruzzi's Polar Expedition, which penetrated farther north than Nansen.

The right-hand picture represents Mrs. Kilburn-Scott's Samoyede sledge-dog "Nansen," 21 ins. high at the shoulders. He is a prize-winner, and wonderfully intelligent.

Samoyede, like those of the Russian or Siberian wolf, are larger, set wider apart, and more sideways.

Our portraits represent Mrs. Kilburn-Scott's "Perlene," who is descended from dogs which took part in the Jackson-Harmsworth expedition, and is the winner of many prizes; also the same lady's "Nansen" and one of the Duke of Abruzzi's.

The Lhasa Terriers.

ONLY a few years back a very pretty breed of little dog made its first appearance at our dog shows, being introduced by the Hon. Mrs. McLaren Morrison. Since then, after having been called "Tibet" terrier, "Bhutea" terrier, and "Bhutan" terrier, the breed has attained at last to the dignity of a separate classification in the Stud Book under

"PERLENE."

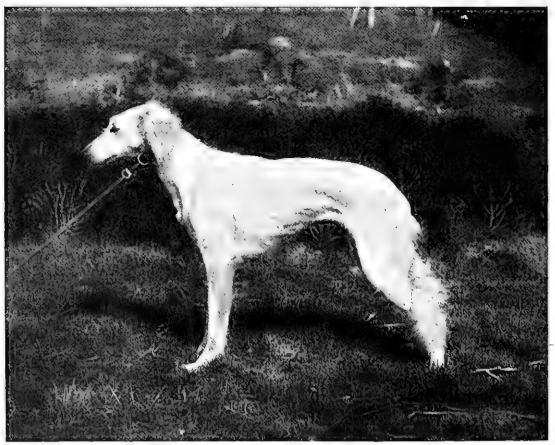
Another photograph of Mrs. Kilburn-Scott's pure white Samoyede.

TWO LHASA TERRIERS.

the heading of "Lhasa Terriers," though doubtless the first name of "Tibet" terrier was more suitable, the present nomenclature being much as if, say, the fox terrier were called the "London" terrier. Our photograph represents two winning specimens of this variety from Mrs. McLaren Morrison's kennels.

THE dog in the accompanying illustration is one of the pair belonging to Mr. H. C. Brooke, of Welling, referred to in our recent notes on the Persian greyhound (see pages 286 and 287 of Vol. I.). Owing to the shyness of the bitch it has as yet not been possible to obtain a photograph of her, which is to be regretted, for whilst a little smaller and less noble in appearance than the dog, she is possibly more perfect in points, and in shape and make is a treat for a lover of a greyhound to gaze upon. The most usual colour for the Persian greyhound is fawn, but red, black-and-tan, pied, and white specimens also occur. This pair, which were taken from a tribe of Kirghiz Tartars, are pale cream-coloured. They are, unfortunately, not sufficiently domesticated to make it safe to put their hunting capabilities to the test, but if their owner is fortunate enough to obtain a litter of pups from this, undoubtedly the only pair in England, he intends bringing up one or two with greyhounds in order to test them against an average English coursing hound.

Kirghiz Greyhound.



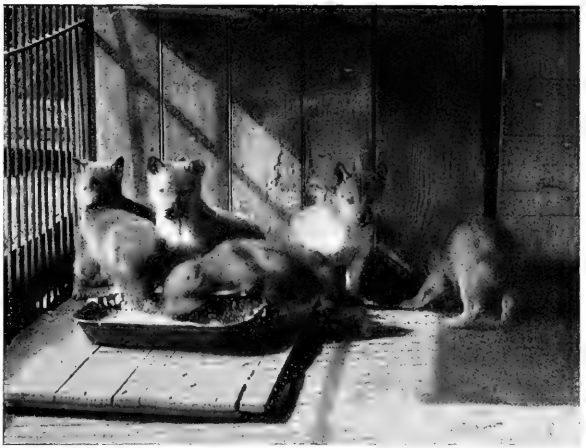
Copyright Photograph, Hutchinson & Co.

KIRGHIZ GREYHOUND.

THE litter of cubs portrayed on the following page were bred by Mr. H. C. Brooke and were sired by the prize-winning Dingo "Chelsworth Myall" (whose portrait was given on page 160 of Vol. I.), the mother being a European wolf, particulars and a portrait of which will also be found on page 224 of the same volume. These hybrids, in shape and make, follow the dam; in colour they are different, some being grey, with the characteristic markings of the wolf, whilst others show the ruddy colour of their

Hybrid Cubs.

Australian sire. This is not the first litter of these hybrids Mr. Brooke has bred: one of a previous litter he presented to Mr. Walter Rothschild, to whom the animal became extremely attached, following him about in his rides, only occasionally leaving him to kill a chicken or two. It was desired to mate the wolf with the white wolf whose portrait was also given on page 224, but she obstinately refused all his advances until her time seemed passed, when she was again placed with her old kennel-mate, to whom she is devotedly attached, and the litter portrayed was the result. The dingo is an excellent father. As each cub was born he would help to dry and clean it; as they began to toddle about he would superintend their personal cleanliness; and when the time came for them to be weaned he would bring up his food for them in the manner familiar to all breeders in the females of the domestic dog. How different this from the domestic dog, who either strongly objects to or at least ignores his helpless offspring. We are sorry to learn that these cubs are now all dead, with the exception of the large light-coloured one sitting up at the back, which is now the property of Mr. A. J. Sewell, the eminent canine specialist.



Copyright Photograph, Hutchinson & Co.
WOLF-DINGO HYBRID CUBS.

The Smooth Chow.

Whereas the ordinary rough-haired Chow-chow is now quite common in this country, and is frequently to be seen in the streets of London, the smooth variety is still scarce, and the majority of the specimens seen, so Mr. H. C. Brooke tells us, are of rather inferior quality. "Lun-Tai," however, the property of Miss Casella, is a most high-class specimen, as may be imagined from the fact that he was picked out on purpose for his present owner by a mandarin at Hong-Kong from a crowd of over a hundred chows brought in for him to select from.

"LUN-TAI," A SMOOTH CHOW.

ANIMAL ANECDOTES.

Ants stop a train.

When travelling up an incline about 180 miles from Albany, between Wagin and Beverley, the wheels of the engine belonging to a through train from Perth failed to grip the line. The train was brought to a standstill, and then it was found that the metals for hundreds of yards were covered by millions upon millions of black ants. The tiny insects were evidently treking, and took advantage of the smooth passage offered by the rails. The wheels of the engine crushed the ants and thus greased the rails, so that no purchase could be obtained.

The Results of Intemperance.

Mr. W. S. Walsh says that monkeys are known to be very fond of beer, and in Africa the natives make use of this evil trait to capture their poor relations. The monkeys there are extremely fond of a beer brewed by the natives, who place quantities of it within easy reach and wait until their victims are thoroughly befuddled. In this state they are unable to recognise the difference between negro and ape. When the negro takes the hand of one of them to lead him off, a second monkey takes the hand of the first, a third that of the second, and so on. A single negro may sometimes be seen carrying off a string of staggering monkeys.

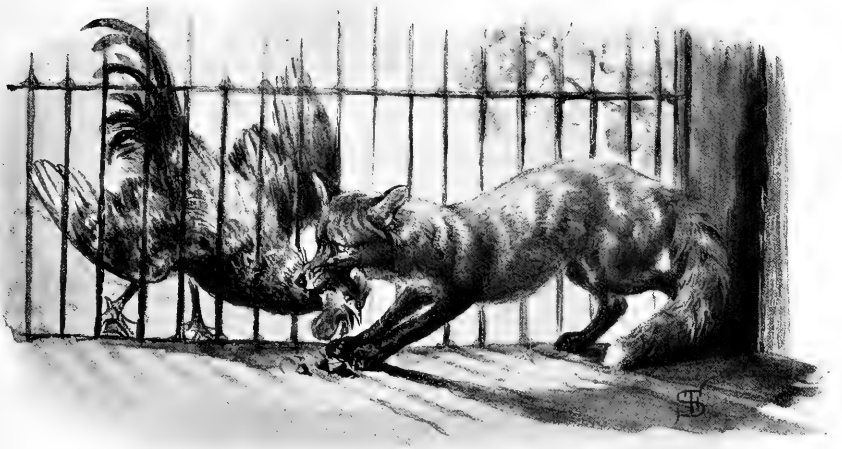
A Mole's Tit-bit.

The mole, which is perhaps the most voracious of all animals, usually feeds on insects and earth-worms. But it will devour other animals, including rats and, sometimes, birds. The last-named it catches in a very ingenious, if cruel, manner. Buried in a mole-hill, it moves its muzzle very slightly just below the surface of the soil. The bird, thinking a worm is stirring, immediately darts down to seize it, but is itself seized by the mole, dragged below the surface, and devoured.

It's usual Menu.

The voracity of the mole is such that it is calculated that one of these animals will, independently of its other food, devour 20,000 earthworms in the course of a year. If kept without food for a day, moles die of hunger. The strength of the muzzle and forepaws of the mole is evident from the extraordinary rapidity with which it burrows its way through the earth.

"The fox laid down, apparently to sleep."



"Some unsuspecting fowl put its head inside, and was quickly dispatched by the crafty fox."

The Device of the Fox.

A FOX which was kept as a pet in a cage devised the following plan by which to augment his breakfast table. Close by the bars of his den several chickens enjoyed a greater freedom than he was allowed. Reynard, more probably from motives of greed than of jealousy, determined to reduce the fowls in number. Accordingly he placed a morsel of his own meat near the bars of the cage, and well within reach of the chickens. He then laid down, apparently to sleep, and awaited developments, with the result that some unsuspecting fowl, scenting a tit-bit, put its head inside and was quickly dispatched by the crafty fox.

A Faithful Mate.

IT is very uncommon for herons to get into mid-ocean, but it is recorded that two of these birds flew into the rigging of a British steamship when she was half-way across the Atlantic. One of them broke its wing by striking against a yardarm. It fell to the deck, was picked up by an officer of the ship, and placed in an improvised cage. Its mate steadfastly hovered over the ship until finally the door of the cage was opened. Instantly the second heron flew from the rigging and entered the cage, where it remained, a willing prisoner, with the disabled bird.

A Curious Dish.

MILLIONS of butterflies are eaten every year by the Australian aborigines. The insects congregate in vast quantities on the rocks of the Bugong Mountains, and the natives secure them by kindling fires of damp wood and thus suffocating them. Then they are gathered in baskets, baked, sifted to remove the wings, and finally pressed into cakes.

A Little Too Clever.

A CERTAIN farmer possessed a donkey which had a great fondness for apples. Turning it out one day to graze in an orchard, he first tied the halter to its fore-feet in order to prevent it lifting its head to the fruit on the trees. The donkey, however, managed to get at the fruit by backing at the trees and kicking furiously at their trunks till some apples were shaken down. But at last, in kicking a twisted trunk, it wedged one of its hoofs so firmly into a fork of the tree that it was unable to drag it out, and had to stand on its fore-feet, with its hind-legs in the air, until its master cut it loose.

NOTES AND COMMENTS.

A Bulky Passenger.

From Mr. Stephen Cribb, of Southsea, comes the photograph reproduced on this page of an elephant in the act of landing after a long sea voyage. The animal is the property of the Duke of Connaught, to whom it was presented by a native prince during his Royal Highness's visit to the Delhi Durbar. It was brought over in H.M.S. Renown, and no sooner was it landed at Southampton than it was transferred to another boat *en route* for Dublin, where it is sure to find true Irish hospitality.

Arctic Animals.

Mr. H. C. Brooke writes: "I was much interested in the account of the Arctic White Wolves. I should be glad if your contributor would state whether he considers them a distinct variety of the common Arctic Wolf, or merely a colour sport.

"All the white wolves (European variety) I have seen have been smaller than the common wolf, and I take them to be a colour variety merely, probably in many cases inbred. The one now at the Zoo belonging to Mr. Rothschild is the biggest white wolf I ever saw. He was from common grey parents, and was the only white cub in the litter. He was bred by Biddell Bros., the showmen. The other white wolves I have seen and owned have been much smaller, and mostly menagerie bred, consequently inbred. Many of these have been bred by Purchase Bros., also showmen.

"It is interesting to note how the Esquimaux dog resembles the Arctic wolf in his smaller and more erect ears; you will see the European wolf's ears are much larger and more sideways set. The best Esquimaux dogs also exhibit the sloping back so marked in the Arctic wolf, though not to such a degree.

"There is a very fine pair of Arctic wolves (greys) now at the Zoo, tame as dogs. They have had cubs, of which I was most anxious to secure one, but they have all gone nearly paralysed in the hind-quarters.

"I have at last some Esquimaux pups out of the bitch whose photograph you gave—absolutely the last chance of breeding any in this country as things are at present, she being the only bitch in the country, and the dogs being eleven and fourteen years old respectively. I am more than pleased. My old Tibet dog is dead; he was about fourteen years old."

We hope to insert Mr. Madsen's reply in our next or an early number.

SHIPPING AN ELEPHANT.

A SPARROWS' NEST IN A LONDON BOARD SCHOOL'S PLAYGROUND.

The London Sparrow.

THERE is surely no limit to the boldness of the London Sparrow. The accompanying photograph shows the nest of a pair that built in the playground of a London Board School. They chose for their home the space behind a cork-covered bracket hanging on the wall against the caretaker's house, and, to make their ingress and egress easier, pecked away the wood. Photograph No. 1 shows the bracket in position, and photograph No. 2 the nest with its clutch of five eggs. Considering the noise and turmoil made by hundreds of youngsters playing around it a great part of the day, it is surprising that the birds chose such a place. Mr. G. C. Grover, of Wandsworth, is the photographer.

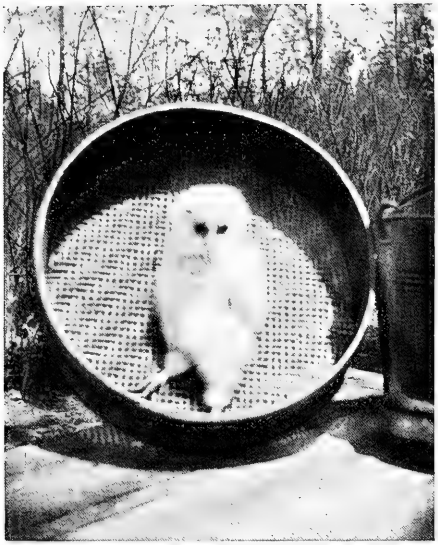
Can Birds Count?

A WELL-AUTHENTICATED incident is reported from Forfarshire which seems to prove that birds are capable of counting. We quote from the "Westminster Gazette": "Two nests of the common green plover were discovered in a meadow, about a yard apart. Each nest contained four eggs; and the inquiring mind of the finder led him to alter the arrangement, so that in one nest eight eggs were placed, while the other was empty. Then he retired to a strategic position whence subsequent events could be watched. In a few minutes the plovers returned, and expressed their feelings in unmistakable language at this uncalled-for interference with their property. Great was the twittering and fluttering that went on around the nests, but after a time the birds calmed down, and the observer emerged from his retreat to inspect developments. Each nest was found to contain four eggs as before. It would be interesting to know whether the mother recognised her own eggs or merely removed four haphazard."

Owls as Pets.

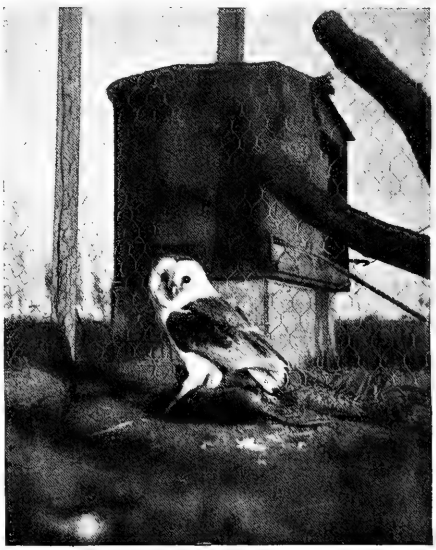
"WHAT a pity they ever grow big!" This is the exclamation of many a lover of animals when watching the gambols of some fluffy little kitten or puppy, and the remark is

INTERIOR VIEW, SHOWING EGGS.



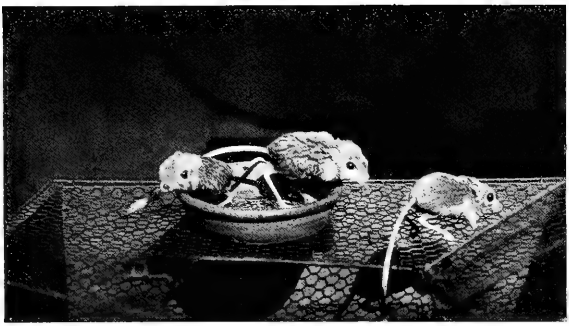
YOUNG BARN-OWL, AGED ONE MONTH.

equally applicable to owls. Young owls are very queer-looking birds, the white powder-puff of the nursery being the object nearest resembling them, especially as they remain quite motionless for long periods of time. When disturbed they turn their uncanny-looking heads from side to side and completely round, bobbing up and down and emitting a hissing noise which would put a boiling tea-kettle quite into the shade. The bird, of which two portraits are given, is one of a pair which were taken when about a month old from an old pigeon loft where their ancestors had been established for many years. "The knowing country folk of the district prophesied that we should never rear them (writes C. W. M., their owner), but up to the present they have been splendidly healthy, having passed through successive moultings without mishap most successfully, and it was extremely interesting to watch them at the critical period of their lives when they evolved from powder-puffs into awkward-looking hobbledehoys, and then into lovely-plumaged full-sized barn owls. Strangely enough, from the first days of their arrival one has always shown a much more docile disposition than the other; the tamer of the two will actually take food from our hands if at all hungry, but the other only comes to feed when quite satisfied that we have gone to a safe distance, and it will on no account face the camera. They are kept in a specially-constructed large square of wire netting, in which stands their cage. I have frequently felt tempted to let them fly quite loose at night, feeling sure they would return to their cage at daylight, but living as we do very near a game preserve, I am afraid some ubiquitous keeper would consider them suitable targets for his much too ready gun. They are fed as nearly in accordance with nature as possible, rats and mice being often available, but when these cannot be obtained raw meat cut small is given them. Owls, like cats, always begin at the head when eating a rat, tearing away the flesh and leaving the skin; mice are bolted whole, whilst birds are always plucked with great dexterity before they are swallowed. After digestion the bones, etc., of their carnivorous diet which are not required for nourishment are expelled from their mouths in pellets



THE SAME OWL TWO YEARS OLD.

of the size and shape of large hard nuts. It is a comical sight, which I have often watched, to see an owl discharge a pellet. Possessing a notoriously grave visage, the solemnity of aspect on these occasions is most ludicrous; standing quite still, the head is bent forward, the cruel-looking beak opens, the eyes are for an instant closed, then suddenly the pellet is ejected and the bird resumes its normal condition."



EGYPTIAN JERBOAS.

Jerboas.

In Animal Life for last December the first of Mr. Farmborough's articles on "Uncommon Pets" was published. This dealt with jerboas and kangaroo rats. The accompanying photograph by Mr. Herbert Lazenby, of York, gives an excellent idea of the former animals, but it is unnecessary to describe them again after what has been so recently said about them in the article referred to. The little creatures illustrated belong to Mr. H. C. Shann, of York, to whom they were sent by Captain Flower, of the Zoological Gardens at Ghizeh.

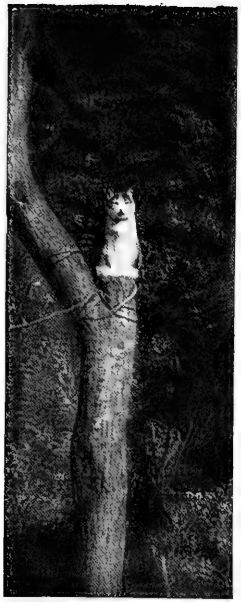
A Prolific Ewe.

The next photograph represents a half-bred Cheviot and Leicester Ewe that became, on April the 3rd of this year, the proud mother of six lambs, or rather five, for although she gave birth to six, one was born dead. The other five, however, she successfully reared, and as the picture (which was taken three weeks after the event) shows, they are average-sized, healthy lambs. It is a very unusual occurrence for a ewe to have and to rear such a large number. Miss Jones, of Cramlington, who sends the photograph, tells us that the lambs were born on Lord Ridley's home farm at Blagdon, Northumberland.

A EWE AND HER FIVE LAMBS.

Chained Enthusiasm.

Miss May Laurie sends us a photograph of an eccentric cat that spends most of its time in a position with which one generally associates St. Simon Stilites. The reason of this is that his devotion to hunting has necessitated life on a chain. He wears an ordinary small dog-collar with a long cord appended, and to the other end is attached a ring which runs along a wire stretched between two trees, thus allowing plenty of freedom to the animal, while it debars him



A WOULD-BE POACHER.

from poaching in the neighbouring woods and probably meeting sudden death at the hands of the gamekeeper. When free, "Spot" is a good hunter, but never devours his prey. Everything he catches is brought home to his chum, a little black terrier. He spends much of his time on the stump of the old tree where he is represented in the photograph.

British Butterflies.

In last month's coloured plate we gave pictures of the Small White (*Pieris rapæ*) and its larva and pupa. The female could be distinguished from the male by its two spots on the upper wing, while the latter has only one, and occasionally none at all. This month we are able to give a photograph (by Mr. Hugh Mair) of the Green-Veined White (*Pieris napi*) immediately after its emergence from the chrysalis stage. Like the small white, the male of the *Pieris napi* has only one round spot (instead of two as in the female) on the fore-wings. "The nervures on the upper wings are darker ordinarily, and the tip a stronger black in the female than in the male, but the strength of colouring varies very much in different individuals. It is an insect, too, that fluctuates a good deal in size; but, as a general rule, we find that the female is somewhat larger than the male. The eggs are laid on cabbage, turnip, horse-radish, watercress, and other cruciferous plants, and the resulting caterpillars are of a delicate green colour. Like those of the large white, they are vigorously attacked by a special parasite, the *Hemiteles melanarius*. This butterfly is double-brooded, one generation appearing in April or May and another in July or August. They remain in the pupal state about three weeks before emergence. The specific name *napi* is bestowed on the species from the botanical name for the turnip, *Brassica napus*, one of the food-plants of the larvæ.

A variety of the green-veined white is sometimes found in which the colour of the wings, instead of being white at all, is of a beautiful canary colour, the veining, soft shading, and definite spots and tips of the wings being, as normally, black. It is a very striking and beautiful form, and, entomologically, is the variety known as *flava*. We sometimes also get very dark forms and other modifications from type, such as the *bryoniæ*, *sabellicæ*, and *napæ* varieties: these were formerly given full specific rank, but are now accepted as being merely variants. Though called the green-veined white, the veining is often really grey. When the ground-colour of the wings is white the grey asserts itself; but this ground-colour varies a good deal, and when decidedly yellow the minute black scales that form the fringing of the nervures, blending with this yellow, appeal to the eye as green."—From "Butterflies and Moths of the Country-Side," by F. Edward Hulme, F.S.A.

The Green-Veined White Butterfly, just emerged from the Chrysalis.

Photograph by D. Le Souef, Melbourne.

ALBINO WEDGE-TAILED EAGLE.

BIRD NOTES

BY

FRANK FINN,

B.A., F.Z.S., M.B.O.U.

Some Albino Birds.

EVERYONE knows that albinism, more or less complete, is not at all an unusual phenomenon in the bird world; but it is not so familiar in some groups as it is in others. Thus albinistic specimens of birds of prey are decidedly rare, although black varieties of these birds are not at all uncommon. So the white Wedge-tailed Eagle (*Uroaëtus audax*) illustrated here is a very noteworthy bird. The ordinary colour of this species, which is usually on view at the London Zoological Gardens, is dark brown; it inhabits Australia, where also occurs a very remarkable Goshawk (*Astur novæ-hollandiæ*), which is always white when adult, though brown on the upper plumage when young. No doubt in the latter case the albinism has proved to be hereditary.

At the opposite extreme to the powerfully-flying birds of prey are the flightless members of the ostrich order, and these also are little subject to albinism. White-splashed varieties of the true ostrich have, however, been seen, and the Rhea, the so-called ostrich of South America (*Rhea americana*) is exceptional in not unfrequently producing a white form. The bird in the photograph was exhibited in the London Zoological Gardens, and Molina, writing considerably more than a hundred years ago, mentions white (and also black) rheas as occurring in Chili. The ordinary colour of the rhea is grey, and as its feathers have some value at present, the birds being periodically driven in and plucked on some estates in Argentina, it would be worth while to attempt to breed the white form, as white feathers always command a higher price than coloured ones.

The Aylesbury Duck is a good example of an albino form which is now a permanent breed, especially cultivated about the village from which it takes its name. It is, of course, like all other domestic ducks

Photo. by Lewis Medland, N. Finchley.

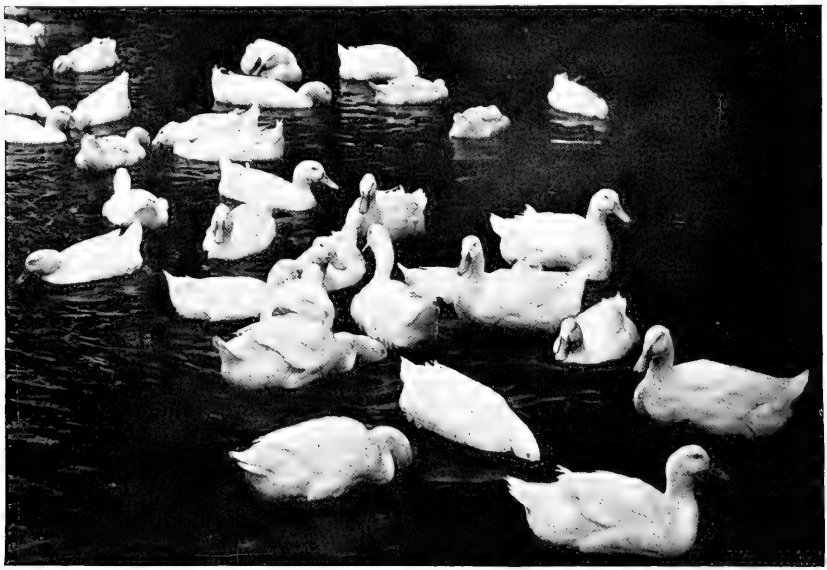
COMMON RHEA (White Variety).

except the Muscovy, descended from the wild Mallard (*Anas boschas*), and the drake still retains the curls in the tail, although his figure is sadly degenerated from the fine outlines of the wild bird. The Aylesbury duck is remarkable for its early maturity, and attains a great size; a drake 10 lbs. in weight and a yard long appears to be at present in existence, as eggs sired by such a one are advertised. The Aylesbury is the whitest of all the white breeds of ducks, even its bill being pale flesh-colour, although the feet are orange. In the Pekin Duck and the little white Call-Duck the bill is orange. It is a curious fact that the Aylesbury's delicate bill is easily discoloured, and will become very sallow if the ducks be allowed to go about in the sun or "bibble" in dirty water. A new breed of white ducks has been produced of late years from the mallard direct, two white birds having been bred from wild parents and become the ancestors of a strong-flying white strain.

Such cases as these, and the frequent occurrence of white wild birds, should make us cautious in accepting the common theory that everything goes by slow gradations in nature. Nature, indeed, is especially fond of making a jump from black to white; albinos are particularly common in the crow tribe, and no British bird is more liable to albinism than the Blackbird (*Merula merula*), which frequently throws white or pied varieties.

Hen Blackbird.

From what I have seen, however, I should say that albinistic cock blackbirds are more common than hens, which rather bears on the tendency of black to "throw" white. The hen blackbird, of course, is not black, but a dark sooty brown with light streaks on the throat, as shown in the photograph of the sitting bird. The hen blackbird is very steady on her nest, and will bear being looked at almost at arm's length—at any rate that was the case with one I have been studying in a Kentish garden lately.



Photograph by S. G. Payne, Aylesbury.

AYLESBURY DUCKS.

Photographs by G. H. Bentley, Sheffield.

HEN BLACKBIRD.

YOUNG BLACK-HEADED GULLS.

Photograph by A. H. P. Cruikshank, Wellington.

YOUNG RINGED PLOVER.

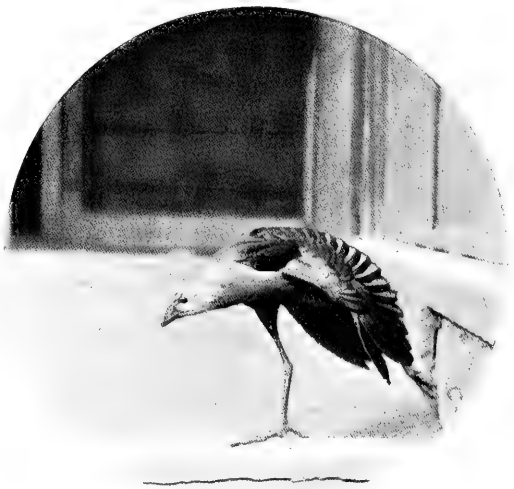
Photograph by J. Newman, Berkhampstead

YOUNG HERONS.

Some Nestlings.

The nestling birds shown in the accompanying pictures are particularly interesting as exemplifying the way in which the relationships of bird-groups appear in the young. Formerly, plovers and herons used both to be classed together as wading birds, while gulls were ranked, as swimmers, in a different "order." Anatomical research, however, showed that gulls and plovers agreed very closely in a great many points, while herons were very different from either. This is borne out by the character of the young birds. Young gulls and young plovers are hatched with a good covering of down, and can run about actively like chicks and pick up their food, though in the case of gulls this is mostly brought to them by their parents.

Young herons, on the other hand, are as helpless as young pigeons, and clad in long scanty down, and they do not leave their nest until fledged, while they gape and cry for the food the parents drop into their beaks. As they fledge they do, indeed, move about to some extent, having, unlike the ground-building waders, a very strong grip in the feet, as the hind-toe is large. This leads us to what seems at first rather an absurd idea—that the state of a bird's young on hatching can be foretold by looking at the parents' feet. But this can usually be done; a bird with helpless nestlings usually builds in a tree, and tree-perching birds mostly have a long back-toe, while ground-dwellers have a small one or none at all.



Photograph by Lewis Medland, North Finchley.
GREY-HEADED PORPHYRIO.

The young Ringed Plover (*Aegialitis hiaticula*) deserves notice for its remarkable likeness to a pebble, the little things when in danger having the instinct to squat and thus escape notice, being "not the only pebble on the beach" in many cases, though not in this particular picture.

The Moorhen's Exercise.

One of the Porphyrios, or Purple Moorhens (*Porphyrio calvus*), is here shown in the act of stretching its wings and exemplifying a family custom thereby. Most birds, as observant people have all noticed, stretch one wing only at a time, but all the Rail family, to which moorhens and porphyrios belong, appear to stretch both at once. No doubt they wish they could stretch both legs at once, but as that would leave them without a leg to stand upon, they have to be commonplace in this respect. The porphyrios, however, are remarkable among rails in having a special habit of their own. This is the trick of holding up food in one foot when eating, a habit common to several kinds of land birds, but, except for the porphyrios, unknown amongst water-fowl, not even the other rails sharing it with them.

The Lyre-Bird.

The curious Lyre-Bird (*Menura superba*) is a very "good footer," as a falconer would say; it employs its feet with great energy in scratching and turning over clods, as the

illustration shows. It can move a considerable weight in this way, and no doubt finds the accomplishment of the greatest use in securing the insects and other small creatures on which it feeds.

Photograph by D. Le Souef, Melbourne.

HEN VICTORIA LYRE-BIRD.

A Game Bird of British Columbia.

THE two last photographs are of the nest of the Ruffed Grouse (*Bonasa umbellus*)—one showing the eggs and the other the bird. These have been sent from Okanagan by Mr. R. Leckie-Ewing, who contributes the following note: "This handsome species can be found in almost every part of the Province, and apparently is quite as much at home in the higher altitudes and pine-clad mountain slopes as it is in lower-lying and open stretches of country. The manners of these grouse are solitary; often they are found singly or in pairs, although in the late fall coveys of twenty or more are met with. A marked peculiarity of the male bird is the habit he has of drumming, a peculiar and penetrating sound made by his wings when amorously calling his mate. The birds begin to pair early in April, building their nest in May. This is placed on the ground, usually in some well-sheltered spot and extremely difficult to find. The eggs are from eight to fifteen in number, of a brownish-white colour, and about the same size as a pheasant's. The young leave the nest as soon as hatched, and behave very much in the same manner as young pheasants or partridges, although the mother-bird is much more courageous in guarding her young than either of these birds. In the early autumn ruffed grouse fall easy victims to the gun, although later on in the season they become very much wilder and are difficult to shoot. With a good dog they are easily discovered, and when young they are more often treed than not, allowing the sportsman (if I may call him so) to get below the tree and shoot them off one by one, till often a whole covey is wiped out. With a shot gun there is no sport at all in killing them thus, and very little even with a small-bore rifle; the weapon I always use is a ·22 pistol with a 6-in. barrel. With this minute and light weapon a steady hand and some considerable practice is required ere the marksman can count upon making a decent bag. Where birds are plentiful I have shot as many as fifteen or twenty brace in a

Photograph by R. Leckie-Ewing.

NEST AND EGGS OF RUFFED GROUSE.

few hours with my pistol. The grouse is an excellent table-bird, more especially so in September, when saskatoon, whortle, and partridge-berries are plentiful. During winter they feed on the tender tops of pine trees when other food fails them. A strange feature I have noticed in the ruffed grouse, and in no other bird in this country, is that the further away from civilization one gets, and the less this bird is hunted or shot at, the wilder he appears to be. I have come across coveys of them in mountainous regions, where they never saw the face of man before, and it

Photograph by R. Leckie-Ewing, British Columbia.
RUFFED GROUSE ON NEST.

was absolutely impossible to get within range of them. On the other hand, I have hunted birds which have been continually shot at and driven from place to place, and they appeared to get tamer the more they were molested. With the blue grouse the very opposite is the case. This handsome bird, the largest of his kind, is tame and fairly easy to shoot on grounds where he has not been disturbed before." The ruffed grouse, it may be mentioned in conclusion, is the typical representative of a small group of which all the members are North American.

NOTICE.

The Editor begs again to draw attention to the notice on page 24 of Animal Life, No. XIII., which contains full particulars of the Photographic Prize Competition open to all readers (amateur and professional) of this magazine. The Prizes offered are a Silver Medal, Two Bronze Medals, and various consolation prizes of Natural History Books. The Competition closes on October 31st, 1903. The Editor is pleased to announce that the following gentlemen have kindly consented to act as judges (*hors concours*): R. Lydekker, Esq., J. M. Swan, Esq., A.R.A., W. P. Dando, Esq., F.Z.S., and the Editor of "Photography."

DEADLY ENEMIES—BROWN SNAKE AND BLUE-TONGUED LIZARD.

THREE COMMON REPTILES OF THE AUSTRALIAN BUSH.

By Cyril Grant Lane.

Illustrated with Photographs by the Author.

WHAT more certain to overwhelm the stout heart of the most experienced bushman with sudden fear, and fill his mind with a knowledge of imminent danger, than the sudden hearing of that gentle, dreaded voice—the warning hiss of an angry snake!

Little wonder that the city-dweller, with but vague conceptions of "bush-life," so frequently refuses to venture "up-country," even though the rapidly-increasing facilities for travelling are so obvious a consideration, for, in the mysterious regions of "up-country" and "back-blocks," have not treacherous reptiles of dread repute to be contended with daily at every turn and bend in the track, and is not one obliged, from well-justified motives of self-preservation, to hunt *in* the bed, *on* the bed, *under* the bed, and thoroughly investigate every nook and cranny which might perchance conceal the lithe body of some poison-fanged visitor?

Something of this is indeed beyond refute, *but*—and there is much in that little word—like numerous imminent dangers, this also is constantly and absurdly exaggerated. Danger undoubtedly there is, and fully the fact is realised by one who has spent long years in snake-infested localities! Notwithstanding, if propensities of a designedly vicious nature are characteristics of Victorian snakes, they seem only recognisable when the reptiles are labouring under real or fancied provocation. Then, I admit, no more deadly or determined enemy can be encountered in the wilds of the bush!

In certain localities, where water is abundant, Brown, Black, and Tiger-Snakes may be found in great numbers, occupying such cover as hollow logs, decaying stumps and disused burrows. Their food consists chiefly of frogs, mice, lizards, and even young water-rats or partly-grown rabbits.

When camping on the banks of the Acheron river (tributary of the Goulbourne, Victoria) my companion and I killed a great number of these venomous reptiles, for thereabouts they literally infested the scrub-belts bordering the water. We indulged in regular snake-hunting expeditions, as much to ensure our personal safety as to secure the beautifully striped and spotted skins, which, under the hands of skilled workers, furnish very handsome belts.

It was there, tenting beneath the shadow of ti-tree scrub and lofty blue-gums, that I was enabled to study the habits of three of the most common snakes of Victoria. The Tiger-Snake—which name it derives on account of its colour and general markings closely resembling the striping of a tiger's skin—was perhaps the most numerous, and certainly regarded our approach with greater animosity than its near relatives.

I could enumerate many instances which would amply prove that this snake, when wounded or even greatly provoked, recklessly risks its life, blindly oblivious to the possibility of resultant disaster in the all-absorbing, eager desire to strike home with deadly fangs that blow which seldom fails to certify the virulence of its poison. To one armed with a long pliant stick and possessed of a fair amount of agility the tiger-snake falls an easy victim, for the great aversion it evinces to being compelled to vacate some pet position, even when persistently harrassed, offers many favourable opportunities for its dispatch.

I have sometimes tested the force of a large tiger-snake's blow by pinning the reptile to the ground with the butt of my rifle and placing a green sap stick within its reach, afterwards examining the depth of the punctures inflicted on the soft bark. On two occasions my leather leggings have borne the spittle and "trade-mark" of a tiger-snake, the result of my accidentally treading on their mottled bodies while they lay concealed among tussocky grass.

It is not surprising that these reptiles are so numerous when it is taken into consideration that one Black Snake will sometimes give birth to as many as forty-two lively little youngsters at one time. Having killed a very fine specimen some years ago, and knowing that the handsome red bands on the belly proved it to be a female, I subjected the carcase to the keen edge of a dissecting-knife, thereby exposing no less than thirty-six perfectly-formed, healthy little snakes of a slaty hue and some four inches in length. Vigorous and full of energy, they immediately commenced to wriggle about in the grass, quite unconcerned, and apparently cognisant of the fatal power peculiar to them, since, with natural instinct, they struck out at any object which failed to find favour in their eyes. The parent snake measured six feet seven inches, and was possessor of a beautiful glossy skin.

One early morning, while watching some platypuses (*Ornithorhynchus paradoxus*) disporting in the waters of a mountain creek, sliding with swift but noiseless movements beneath the surface only to reappear a moment afterwards where least expected, my attention was attracted elsewhere. Upon the lower twigs of a ti-tree bush I espied a dozen or more little snakes, about six inches in length, happily wriggling about from twig to twig and amusing themselves by striking at the trembling dewdrops which hung like brilliant jewels from every leaf and stem.

The Brown Snake, when fully grown, is usually of greater length than its black companion, and, on the whole, more whip-like in appearance. Nevertheless there are exceptions to this rule, for the biggest snake I ever killed in Victoria measured nearly eight feet, and its coal-black, well-glossed skin left no room for doubt regarding its species.

I have had very many narrow escapes from the fangs of the brown snake, attributable, I conclude, principally to the wonderful adaptation of its colour and faint markings to

FULL-GROWN BLACK SNAKE.

TWO TIGER-SNAKES.

the objects amongst which it moves—grass-grown banks of rivers, creeks and lagoons so nearly similar to the reptile's body in general hue as to give rise to feelings of astonishment that dwellers in the bush are not more frequently victims of its poison-glands.

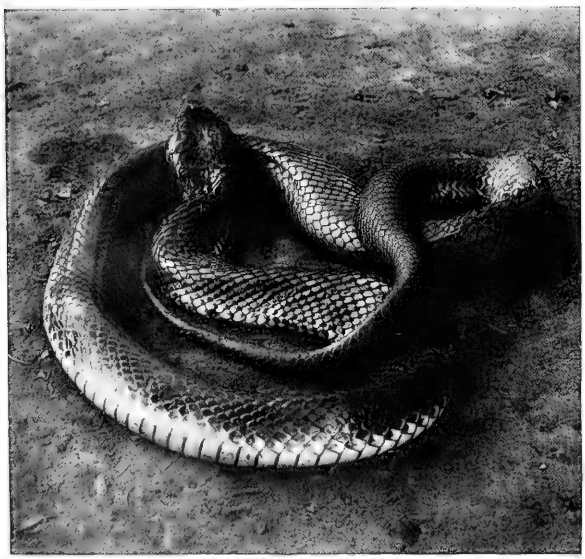
On one occasion, while quietly writing in my tent, a brown snake actually coiled up beside my feet. It seems inexplicable what power induced me to glance in the direction of the reptile, for my thoughts were lost in realms far distant from the haunts of snakes. A sudden movement on my part resulted in the speedy departure of the intruder to the outside of the tent, where I utilised a charge of shot with telling effect.

On another occasion, in leaping from a log I alighted right on the body of a full-grown brown snake, the incident for the moment so unnerving me that I permitted the injured creature to escape down a crab-hole.

I could relate various other "close calls" if space would allow, such as bathing while for some time quite unconscious of the fact that my nearest neighbour was a finely-striped tiger-snake coiled in watchful attitude upon the bank, two or three yards from my divested garments. Also . . . . but I will make reference to a few notes dotted down when the circumstances of which I am thinking transpired, for I truly think—so far as a horrible fear and the nearness of a dreaded death are concerned—that they rank first among the many and often dangerous incidents which have helped to make my life in the far-stretching expanses of the bush and forest country of Victoria of a somewhat adventurous nature:—

By my side, upon a bunk composed of Australian "feathers" (young gum-boughs), my companion lies—a young fellow eighteen years of age—quietly sleeping, with a big retriever at his feet.

Day after day we have pushed further back into the mountains, bent upon securing typical photographs of the bush and its inhabitants. Tired out with many a hard day's tramping, we flung ourselves down in this hut upon some dry ferns, and soon reclined in the kindly arms of sleep. The sensations of awakening I recollect full well. Something seemed to rest heavily on my mind; what it was I could not tell. Neither could I, for quite a minute, decide whether in reality I was awake or sleeping. 'Twas actually hard mental labour to struggle with my thoughts and attempt to form a correct conclusion of any kind, although I recollect being extremely anxious to do so. These sensations of uneasiness gradually awakened me, and I slowly

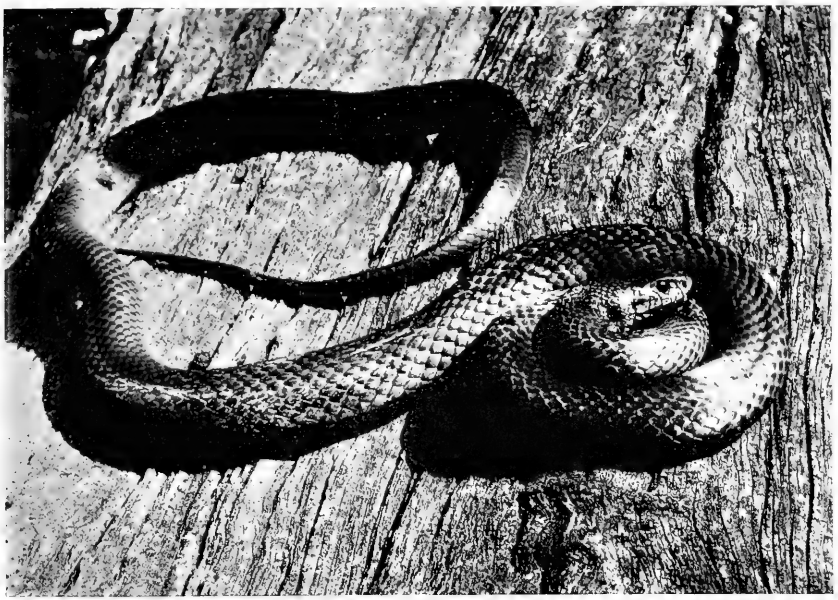


FULL-GROWN TIGER-SNAKE.

opened my eyes. Sleep was immediately a thing forgotten, while fear of a sickening nature filled its place. As I lay upon my side I stared straight at a snake which lay curled up on the wood-slab floor only two or three feet from my head!

Slowly, though without cessation, its graceful head and sinuous neck swayed from side to side. I could feel the sweat roll off my face and hear the thumping of my heart; but worst of all was a decided disinclination to move—a sort of inability to rise; and yet I was, strange to say, fully cognisant of a great longing to escape this pending danger. With a truly desperate effort I strove to pull myself together and obey the misty reasonings of my mind; nevertheless I felt I dare not move!

Still the graceful swaying of that small, well-shaped head, with its brilliant bead-like eyes, continued, while across my dizzy brain faint suggestions of a present fascinating power nearly drove me mad.



A MONSTER BLACK SNAKE
Which nearly cost the Author his life.

At length every spark of energy I possessed was exercised, and I flung myself in the opposite direction across my companion, who still slept peacefully on. In an instant I had rolled him over and begged him to get up, while I pointed to the doorway through which the snake was fast retreating. Seizing my rifle I followed the reptile, pinning it to the ground with the stock, and my companion—now very much awake—dealt the fatal blow.

The horrible experience of those few dread seconds, while lying so close to a possible death, is but inadequately expressed in words! Neither my companion nor those who read these lines can measure the extent of such suffering—the *agony* of the mind. It is known only to those who, in like manner, have suffered

* * * *

These snakes are remarkably good swimmers, and, considering their length, far from ungraceful. I have frequently observed that, on first taking the water, they often slide right beneath the surface, quickly reappearing, however, and swimming in a direct line for the opposite bank. The wriggling motion common to snakes when moving on *terra firma* seems to be exaggerated when they take to water, for by means of a similar wriggling motion—though far more rapid in water—the reptile, its elegant head always raised some few inches above the surface, propels its whip-like body from bank to bank.

Judging from a pathetic incident which came under my notice a short while ago it would seem that snakes recognise, in the blue-tongued lizard, a natural enemy. The illustration will testify to the hate these reptiles possess the one for the other. In a dark gully beneath the shade of drooping tree-ferns the enraged combatants must have fought and struggled till overcome by the poison they freely injected. Thus they lay, side by side in the throes of death, incapable of further enjoying the freedom of the bush.

I have failed to obtain veritable elucidation respecting the matter of accustomed antagonism between these two occupants of the bush; also it seems, so far as bush knowledge extends, to be a doubtful point whether the bite of the blue-tongued lizard, or dew lizard, as it is commonly called, is indeed poisonous. By some it is averred that its fine but powerful teeth alone inflict the wounds which cause the death of its opponents.

Snakes by no means enjoy entire despotism in the bush, for numbers of these reptiles, when in youthful stages, are destroyed by the merry "Laughing Jackass" (great kingfisher). Bush fires, also, and floods are responsible for the annual extermination of a great many. Although I have not had the opportunity of proving the following statement for myself, I am nevertheless aware that it is an accepted belief with many that the porcupine-anteater, when encountering a snake in the vicinity of its hunting-ground, will instantly assume a ball-like shape and roll upon its unfortunate companion, with a full array of sharp spines bristling defiance and inflicting fearful wounds.

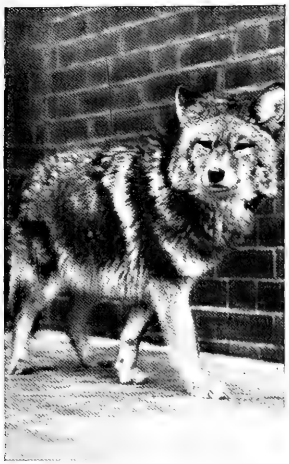
BLACK SNAKE TAKING AN EVENING DRINK.

ZOO NOTES.

With Photographs

BY

W. P. Dando, F.Z.S.

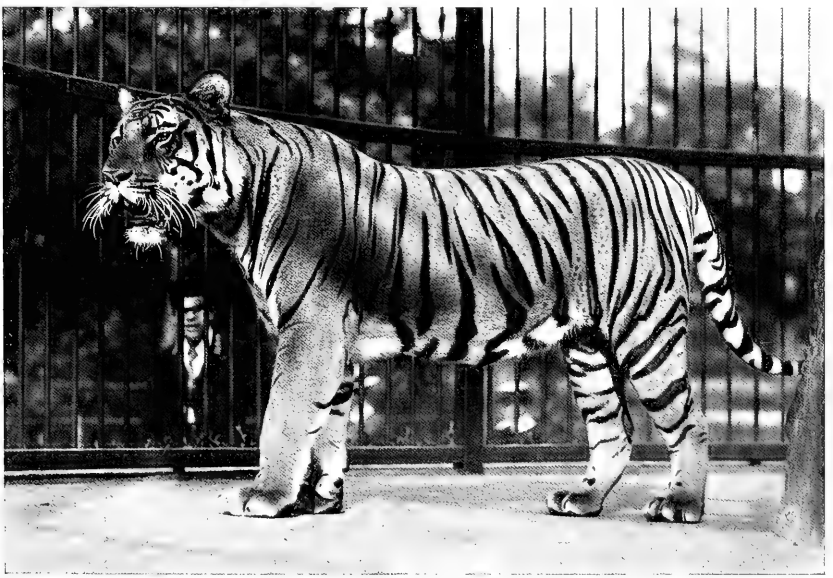


PRAIRIE WOLF.

BLACK-BACKED JACKAL.

BLACK-BACKED JACKAL.

The Prairie Wolf or Coyote (*Canis latrans*) of North America is a much smaller animal than the common wolf, its body and head together measuring only about three feet, and its tail not quite one-half that length. Its colour is a dull yellowish grey, clouded with black.



"PRINCE," THE INDIAN TIGER.

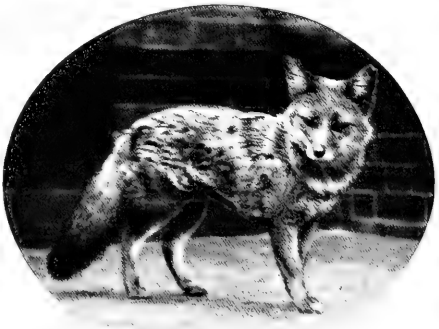
"PRINCE," THE INDIAN TIGER, is one of the finest specimens in the Gardens. He is not yet fully grown, but his beautiful shape, colour, and markings are things to admire.

"PRINCE."

THE JACKALS illustrated on this and the previous page come from South Africa and Egypt—the black-backed jackal from the former country and the variegated from the latter.

VARIEGATED JACKAL.

THE EGYPTIAN FOX (*Canis vulpes niloticus*) is another member of the family to which the jackals belong, and really only a variety of the common fox, whose reputation for craft and cunning is not by any means overrated.



EGYPTIAN FOX.

THE OCELLATED BLADDER FROG, depicted on page 75, takes its name from the highly-developed forelimbs it possesses. So powerful is the grip with which this amphibian is able to hold almost anything it seizes, that it is exceedingly difficult to withdraw even one's fingers from its vice-like grasp.

THE LONG-FINGERED FROG, next shown on the same page, is one of those species which only differs in trivial details from certain other members of its tribe.

THE NOISY FROG, the last of the trio, well deserves its name. One of these animals is enough to make sleep an impossibility; but when several hundred join in concert, and their din can be heard a mile off, the results defy description.

THE RING OUZEL (*Turdus torquatus*) of Europe is one of our summer visitors, breeding in Devonshire, Derbyshire, the north of England, and

some parts of Scotland, Ireland and Wales.

THE GREY-WINGED OUZEL (*Turdus boulboul*) of India is a new addition to the Zoo. It is now caged in the Western Aviary, but will probably be transferred to the new one which is being made on the banks of the canal. This will be so large (enclosing trees thirty feet high) that one almost wonders if the smaller birds will ever be seen.

OCELLATED BLADDER FROG.

LONG-FINGERED FROG.

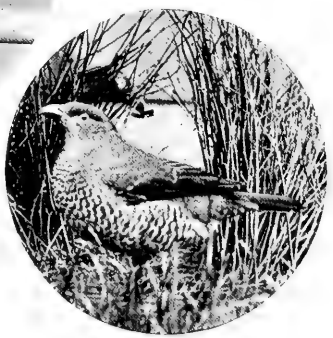
NOISY FROG.

RING OUZEL.

GREY-WINGED OUZEL.

ERRATUM.—We are indebted to an Australian correspondent for pointing out that in Mr. Dando's "Zoo Notes" in our February number, the author should have stated that the Dingo is the only *large* non-marsupial mammal in Australia.

THE BOWER BIRD, of whose nest a description was given on page 150, Vol. I., but whose portrait it was not then possible to reproduce, is here shown. The reader is referred to ANIMAL LIFE for last October in order to gain some idea of the wonderful architectural and artistic results which these birds achieve in their native haunts.



BOWER BIRD.

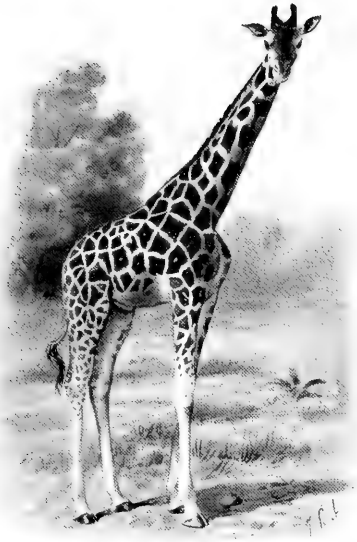


Fig. 1. Immature Bull Giraffe from the Egyptian Sudan.

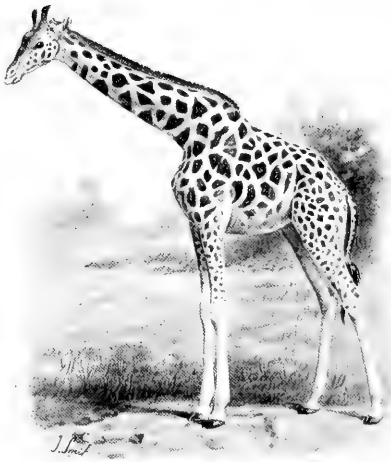


Fig. 2. Immature Cow Giraffe from the Egyptian Sudan.

Fig. 3. Immature Bull Giraffe from Kordofan.

Fig. 4. Adult Bull Giraffe from British East Africa.

FEMALE GIRAFFE (from Lake Baringo) IN THE BRITISH (Natural History) MUSEUM.
From an Original Painting by J. Smit.

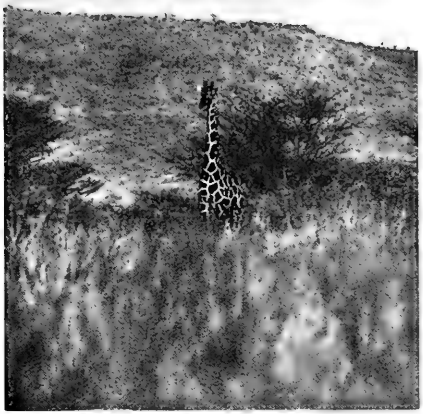


Fig. 5. The Somali or Netted Giraffe.

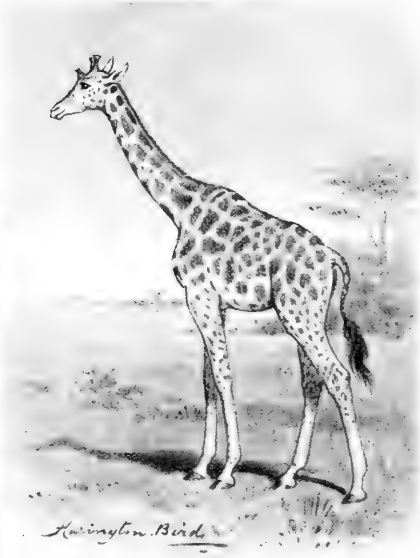


Fig. 6. Bull Giraffe from the Congo Free State.

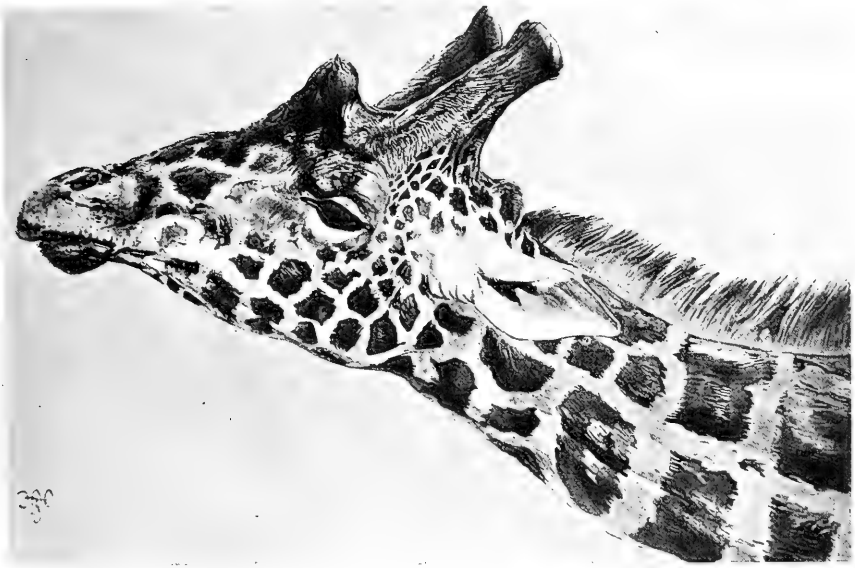


Fig. 7. Head of Mount Elgon Giraffe, from a sketch by Sir Harry Johnston.
Reproduced by permission of the Author and Publishers of "The Uganda Protectorate."

LOCAL VARIATION IN THE GIRAFFE.

By R. Lydekker.

FOR many years it has been known to naturalists and sportsmen that giraffes from different parts of Africa display considerable variation as regards markings, colour, and the degree of development of the median horn on the forehead, which may indeed be practically absent; and distinct specific or subspecific names have been from time to time assigned to these local forms. Recently, as hitherto unexplored districts of the Dark Continent have been opened up, and facilities for transporting the skins and bones of large animals from the interior have increased, much fresh information with regard to these local variations has come to hand, and attempts have been made by several distinguished naturalists to put our knowledge of the subject on something like a satisfactory footing. Hitherto, however, there has been one great difficulty, namely, the lack of a sufficiency of well-preserved specimens, of which the locality is ascertained, for comparison. Nor is this a matter for wonder, since the transport of such bulky animals, whether alive or dead, involves much difficulty and expense, and even when skins are brought to Europe few museums have either the means or the space to mount and exhibit them in a manner to display their mutual resemblances or differences to the best advantage.

During the past twelve months or so naturalists in this country have, however, been afforded exceptional and hitherto unprecedented opportunities of instituting comparisons of this nature. The collection of the British Museum, for instance, which previously contained mounted heads and necks of three very distinct forms of giraffe, respectively from the Lake Rudolf district, Mount Elgon, and the Kalahari Desert, has been enriched by two complete mounted specimens from British East Africa—the one the gift of Mr. Walter Rothschild, and the other of Captain Powell Cotton. There is also a mounted male from Angola in Mr. Rothschild's private museum at Tring. Of living specimens, the Zoological Society's Gardens in the Regent's Park contain a handsome pair of immature giraffes from Kordofan, in addition to the older female from South Africa which has been in the collection for some years. Then, again, last winter the Duke of Bedford had a trio of these animals—a male and two females—living at Woburn. The females were still flourishing when these lines were written, but the bull unfortunately died in July, when his head and neck was presented to the British Museum, where it will in due course be exhibited. All three specimens, as I am informed by Mr. Carl Hagenbeck, by whom they were imported, came from the Egyptian Sudan. Another bull, reputedly from Abyssinia, which I have not yet seen, has just been received at Woburn.

With this unrivalled series of specimens in the country, it occurred to me that it would be most important to have accurate coloured sketches made of as many of them as possible; firstly, because we should then have a permanent record of their colours and markings, and, secondly, because without such sketches it was utterly impossible to make accurate comparisons between the specimens at Woburn Abbey and those in the Regent's Park, or between either of these and the stuffed examples in the British Museum. When the matter was brought to the notice of the owner of the Woburn specimens, his Grace was good enough to see it in the same light, with the result that I am enabled to illustrate the present article in a manner that would not otherwise have been practicable.

The reader's attention may now be directed to some of the leading points in connection with what is already known with regard to the various local forms of giraffes. And here it is essential to observe that, as the subject is somewhat more abstruse than many of those discussed in ANIMAL LIFE, a certain amount of technicality is unavoidable. I shall, however, treat the subject in as popular a manner as the nature of the case permits.

Apparently giraffes may be divided into two distinct species, of which the one presents only a single colour phase, while the other has several. The first of these is the Somali or netted giraffe, ranging from Somaliland through the Lake Rudolf district to the northern part of British East Africa. It was originally described as a race, or local variety of the ordinary blotched giraffe, under the name of *Giraffa camelopardalis reticulata*; but now that it has been promoted to specific rank, it must be known simply as *G. reticulata*. No living example of this very handsome giraffe has hitherto been brought to this country, nor, so far as I am aware, to the Continent; neither is there a complete mounted skin in any of our museums. The British Museum has, however, a mounted head and neck; and excellent photographs of dead individuals, as well as of living ones in covert, were obtained during Lord Delamere's expedition to East Africa, some of the latter having been reproduced in earlier issues of this journal and in "The Living Animals of the World." One of the latter is here reprinted (Fig. 5) for the sake of comparison.

The body and neck of the Somali giraffe are coloured of a deep-liver red, marked with a very coarse network of narrow white lines, the meshes of which gradually decrease in size towards the head, although they are everywhere large. On the head itself the markings change to rounded chestnut spots on a fawn-coloured ground, the back of the ears being pure white, as are the legs below the knees and hocks. The liver-coloured areas on the body and the lower half of the neck are for the most part quadrangular, and show no tendency to become rounded. The essential feature of the colouring is the superposition of a white network on a liver-red ground, so that this species cannot properly be described as a spotted animal. The unpaired horn on the forehead is moderately developed.

The type of coloration distinctive of the Somali giraffe seems, as previously explained in this journal, a special adaptation to render the animals as invisible as possible when in the scrub-jungle to which they habitually resort.

All the other known forms of giraffe may apparently be regarded as local variations of a single specific type, popularly known as the common or blotched giraffe, and technically as *Giraffa camelopardalis*. In none of the phases of this species are the dark areas of the deep liver-red tint characteristic of the Somali animal, while the light markings never form such a distinct and coarse network, and are usually tawny-coloured instead of pure white. It is, however, very noteworthy that the northern or typical form of the common giraffe is the one which makes the nearest approach in coloration to the Somali species, being a chestnut-coloured animal with an irregular network of light markings. It has, moreover, the three horns characteristic of the Somali species. On the other hand, as we travel down the eastern side of the African continent, it is noticeable that the pattern of the giraffe's colouring shows a gradual tendency to pass from the reticulate, or netted, to the spotted, or blotched, type, this being brought about by the increase in the width of the light markings and a darkening of their colour, accompanied by a corresponding diminution in the size and multiplication in the number of the dark areas. The culmination of this gradual change is that the Cape giraffe may be best described as a fawn-coloured animal marked with irregular dark blotches, which are chestnut-coloured in the cows and young males, but deep chocolate in the old bulls. Nor is this all, for the males of the Cape giraffe have almost completely lost the unpaired frontal horn so conspicuously developed in all or

most of the northern and eastern races of the species; neither has it any distinct external traces of the small back-horns found in some of the eastern forms.

As already incidentally mentioned, the typical or true *Giraffa camelopardalis* is the northern form of the species, and, in the absence of any evidence to the contrary, we may take Nubia as the type locality. The *Camelopardalis æthiopicus* of Ogilby,* which from the absence of any sufficient description ranks as what naturalists call a *nomen nudum*, may be regarded as a synonym. The name *C. sennarensis*, Geoffroy (*fide* Gray), likewise lacks definition, and may therefore be disregarded. There is, however, the name *C. antiquorum*, first employed by Swainson,† but subsequently used by Sir William Jardine,‡ which is available for the Kordofan form of the species, since it was especially applied by the latter writer to an animal from the district in question figured in a coloured plate in the volume quoted in the footnote.

For the Cape form, which has been regarded by one recent naturalist§ as a distinct species, and by a second‖ only as a local race, the name *capensis* is employed, the later *australis* being a synonym.

For the giraffe inhabiting that district of German East Africa lying between Ujiji and Lakes Tanganyika and Nyassa the name of *Giraffa tippelskirchi*¶ has been proposed, and that of *G. schillingsi*** for the one from the tract between Taveta and Mount Kilimanjaro. Both these latter are best regarded as local races rather than distinct species.

Finally, the name *Giraffa camelopardalis peralta*†† has been applied to a giraffe killed at some distance from Lokoja, at the junction of the Niger and Benue rivers, in West Africa, on the evidence of the skull and cannon-bones.

With these preliminary remarks I proceed to the consideration of the specimens forming the special subject of this article.

First of all with regard to the three immature Woburn specimens. These, as already mentioned, came from the Egyptian Sudan, that is to say, in all probability, Upper Nubia. I accordingly regard them as representatives of the typical race of *Giraffa camelopardalis*; and I may add that, so far as my recollection serves me, they agree well in general coloration with the original Nubian herd formerly living in the London Zoological Gardens. One of the cows is considerably smaller than the other. Their immaturity is shown not only by their stature (which at the date of the death of the bull fell considerably short of that of average-sized giraffes), but also by the comparatively small size of the main horns and the very slight development of the median frontal horn of the bull (Fig. 1), as well as by the light colour of all three. Possibly the narrowness of the network of light lines may also be in some degree a feature of immaturity, but of this I am by no means sure. It is important to notice that both the cows are alike in their markings, and that the bull differs in this respect only by such slight details as might naturally be expected to occur in different sexes of the same form. So far as it goes, therefore, this resemblance tends to show that giraffes from the same locality are practically alike, as, indeed, was to be expected. This is confirmed by the similarity between the two Kordofan specimens in the London Zoological Gardens.

As regards the general type of coloration of the bull, it will be noticed that the spots are large and quadrangular, with the intervening light lines narrow and

* "Proc. Zool. Soc. London," 1836, p. 134.—The older naturalists used the term *Camelopardalis* in the sense in which *Giraffa* is now employed.

† "Geography and Classification of Animals," p. 95 (1835).

‡ "Naturalist's Library," Vol. XXI., p. 187, pl. XXI. (1838).

§ De Winton, "Proc. Zool. Soc. London," 1897, p. 277.

‖ Thomas, *Ibid.*, 1901, p. 479.

¶ Matschie, "Sitzungsberichte Ges. Naturfor. Berlin," 1898, p. 77.

** *Ibid.*, p. 79.

†† Thomas, "Proc. Zool. Soc. London." 1898, p. 40.

pale-coloured, in some parts of the body and on the limbs being nearly white. A special feature is a row of five large spots, of which the first is partially divided, extending from just below the point of the shoulder in a curved line to the middle of the back. On the outer side of the fore-limb the spots extend well down to the knee, and in the hind-limb a considerable distance down the cannon-bone. The under-parts are comparatively free from spots, as is the inner surface of the upper segment of both limbs.

In the female (Fig. 2) the spots are smaller and more numerous, this being especially noticeable on the hind-quarters and the upper part of the fore-legs. Correlated with this is the greater width of the light interspaces, which are nearly white on the greater part of the body. Faint spotting occurs on the belly and the fore part of the inner surface of the front legs. The position in which the cow is drawn shows that, while the side of the face is fully spotted, the front of the face (as in the bull) is uniformly reddish-fawn. As a whole, the female may be described as a more decidedly spotted animal than her consort.

I believe that even old bulls of the Nubian giraffe never have the deep chocolate spots of old males of the eastern and southern races.

I now come to the bull and cow from Kordofan in the Zoological Society's Menagerie, which were considerably younger than the two larger Woburn specimens at the time the sketches were made. The bull is shown in Fig. 3. Compared with the Woburn bull, it will be seen that the Kordofan male differs by the dark areas on the neck and body being decidedly smaller, more numerous, and more irregular in shape, while the light interspaces, more especially on the neck, are wider and darker. The difference in the number and size of the spots is well shown by taking those corresponding to the line of five in the Woburn bull between the point of the shoulder and the middle of the back. Of these only two near the middle of the series are at all comparable in size and form to those of the latter, those on either side being smaller, more numerous, and more irregular. There are, in fact, seven or eight spots in this line. In the neck there are a number of quite small spots between the larger ones, of which there is no trace in either of the Woburn specimens.

A further difference is to be found in the presence of a triangular area immediately below the ear of which the ground-colour is pure white. The spotting on the side of the face is also less abundant in the Kordofan animal. A more important difference from the Woburn bull is to be found in the circumstance that in the fore-limb from just above the line of the abdomen, and also on the hind-limb half way up the thigh, the spots suddenly break up into a numerous series of very small and irregular spots, similar irregular spots also occurring all over the abdomen and on the inner surface of both pairs of limbs. In the hind-leg the spots extend only a very short distance below the knee. Although, as already mentioned, the cow of the Woburn pair has smaller spots than the bull, there is none of that sudden transition from comparatively large to very small spots on the limbs so noticeable in the Kordofan bull, from which the Woburn cow further differs by the almost complete absence of spotting on the belly and the inner side of the hind-limbs.

The foregoing points of distinction between the Woburn and the Zoological Society's bulls (which, as being both immature, are strictly comparable) indicate that they are almost certainly referable to distinct races.

As regards the name to be applied to the giraffe of Kordofan, I have already mentioned that the specimen from that district figured by Sir William Jardine in the volume of the "Naturalist's Library" cited above is entitled to be regarded as the type of the so-called *Camelopardalis antiquorum*. If the plate of that specimen (which is an adult bull) be compared with the figure of the younger bull in the Zoological Gardens, it will be apparent that the two agree precisely in the very remarkable feature

of the sudden breaking-up of the large spots of the body into small and irregular ones on the upper part of the limbs, and also, so far as can be seen, in the presence of similar spots on the inner side of the limbs. As regards the spotting of the body and neck of Sir William Jardine's specimen, this agrees (making allowance for the somewhat crude execution of the plate) with that of the London specimen, although the small spots on the neck of the latter are not shown. The much darker colour of the spots in Sir William Jardine's animal is, of course, merely due to its greater age. I have no doubt whatever that the latter and the two immature animals now in the London Zoological Gardens belong to the same form, which is distinguishable from the typical Nubian *G. camelopardalis*, as represented by the Woburn specimens, by the characteristics already mentioned. The Kordofan race may therefore be known as *G. camelopardalis antiquorum*.

I now come to the mounted male specimen in the British Museum, which is from Quashengerhue Plateau, British East Africa, and is shown in Fig. 4. It is very differently marked from either of the preceding animals; and, as shown by its dark colour and the full development of the median frontal horn, was fully adult at the time of its death. Compared with the Nubian giraffe (Fig. 1), the markings on the body differ by their more irregular form and greater individual variation in size. The line of five large and nearly equal-sized spots extending in the former obliquely backwards to the middle of the back is wanting in the present specimen. On the other hand, it has two very large spots, placed one directly above the other in the neighbourhood of the shoulder-blade, which are quite unrepresented in the Nubian bull. Other differences in the form and pattern of the spots will be apparent from a comparison of the two figures, but the presence of large spots on the inner side of the upper half of the fore-limb and on the under-parts may be specially noted, the inner side of the thigh being also partially spotted. Then, again, the spots on the fore-legs stop short of the knee, and in the hind-legs do not extend below the hock. On the sides of the face the spots are much more numerous and cover a larger area between the eye and the horn, and likewise extend more on to the front of the face below the eye. Very noticeable in the Museum bull is the white triangular area extending downwards from the crown of the head through the eye and behind the ear. It should be added that the ground-colour (for this specimen is distinctly a spotted animal) is much darker than in the Woburn bull, but this may be partly due to difference of age.

From the Kordofan giraffe the specimen under consideration is at once distinguished by the large size of the spots on the limbs and thighs, and the absence of any trace of the sudden breaking-up of large spots into small ones as the limbs are reached which constitutes such a characteristic feature of the former. In the young Kordofan bull there is a small white area below the ear, but it is neither so large nor so conspicuous as in the Quashengerhue bull.

That the latter animal is racially distinct from both the Nubian and Kordofan forms of the species seems therefore most likely. Not improbably it is specifically identical with the giraffe obtained by Sir Harry Johnston at Mount Elgon, as represented by the mounted head and neck of an old bull in the British Museum. It is true that in this specimen (Fig. 7) the posterior rudimentary horns are much more strongly developed than in the Quashengerhue specimen, while the ground-colour is darker, the form of the spots somewhat different, and the light-coloured area on the side of the upper part of the face less conspicuous; but these differences may perhaps be due to age.

For the present, at any rate, I do not intend to assign a distinct name to the Quashengerhue giraffe, as it may prove to be identical with *G. camelopardalis schillingsi*, from the district between Taveta and Mount Kilimanjaro, which is chiefly characterised,

according to its describer, by the white lower portion of the legs and the curvature of the light lines between the spots.

The last of the five specimens forming the special subject of this article is the mounted female in the British Museum, represented in the coloured plate, which was killed to the eastward of the north end of Lake Baringo. That lake, it may be observed, lies to the north-east of Lake Victoria Nyanza, or about 150 miles east of Mount Elgon.

That this specimen is unlikely to be the female of the Quashengerhue form will be, I think, sufficiently apparent from a comparison of the figures, the differences between the bulls and cows of the Nubian and Kordofan races making no approach to those between the mounted bull and cow in the British Museum. As there is no bull from the Lake Baringo district available for comparison, I cannot say whether or no this race has a median frontal horn. In regard to its plan of coloration, the Baringo giraffe differs very widely indeed from all the specimens with which we have been hitherto dealing. On a groundwork of bright yellow fawn are a number of very irregularly-shaped chestnut spots, with jagged outlines. On the neck they become somewhat less jagged and very sparse, and on the upper part of the limbs they break up into much smaller spots, although not quite so suddenly as in the Kordofan race. In the fore-limbs the spots stop just short of the knee, but in the hind-limbs they reach well on to the hock. Both limbs are spotted on the inside—the hind-pair less than the front ones. The under-parts have a few spots near the fore-legs, but are otherwise white. A very small white area occurs in the neighbourhood of the ear, but does not reach within a considerable distance of the eye. The spotting on the sides of the head does not extend nearly so much towards the front as in the Quashengerhue bull.

In the ragged and somewhat star-like form of its spots this giraffe approximates to the description of *G. camelopardalis tippelskirchi* from German East Africa between Ujiji and Lakes Tanganyika and Nyassa. That form was described on the evidence of two specimens, in one of which the lower part of the legs was spotted, while in the other it was white, and it may be that these are really distinct. However this may be, it would be very rash to identify the Lake Baringo female with a race from a district so far to the south as Ujiji without further evidence, more especially as we do not yet know the characteristics of the male. It would be still more rash to assign a distinct name to the specimen in question. For the present, therefore, it may remain unnamed.

Finally, I have to mention a male giraffe from the Congo Free State mounted in the museum at Tervueren, near Brussels, of which the Secretary of the Interior has been good enough to send me a photograph, from which Fig. 6 was drawn. From the presence of a well-developed frontal horn, this animal is clearly allied to the northern and eastern forms of the species. On the other hand, it resembles the South African race (*G. camelopardalis capensis*) in having the hind-legs spotted right down to the hoofs; the fore-limbs also displaying the same feature, although less distinctly. The sides of the head are much more fully spotted than in the Cape form, and the tail is remarkable for the great fullness of its terminal tuft. In the spotting of the legs it resembles the description of one of the type specimens of *G. camelopardalis tippelskirchi*, although the dark markings show no trace of the ragged and star-like form characteristic of that race. As to the possibility of the Congo giraffe being identical with the imperfectly known *G. camelopardalis peralta* of Nigeria, it may be remarked that the latter takes its name from the great length of the cannon-bones of the legs, which indicate a very tall animal. The Congo specimen, on the other hand, although apparently adult, is a comparatively small animal. It seems to me, therefore, that it indicates a distinct race, for which the name *G. camelopardalis congoensis* will be appropriate. This race will

be characterised by the presence of a well-developed median front horn, coupled with the fully-spotted legs and the normal form of the body-spots. Possibly Mr. Rothschild's Angola giraffe may indicate another race, unless indeed it belongs to the one represented by the Tervueren specimen.

In conclusion, my readers may perhaps be interested in the following note in connection with the dentition of giraffes which the Editor of "The Zoologist" was good enough to publish for me a short time ago:—

"In the course of his memoir on the Okapi, published last year in the 'Transactions' of the Zoological Society, Prof. Ray Lankester drew attention to the circumstance that all the living, and many (if not all) of the extinct members of the *Giraffidæ*, are distinguished from other ruminants by the crowns of the outermost of the four pairs of lower front teeth (corresponding to the canines of other mammals) being bifid, or bilobed; this bilobed structure having been observed in the Giraffe and Okapi, as well as in the extinct *Sivatherium* of India and the *Samotherium* of Southern Europe. No explanation was at the time given for this departure from the normal structure.

"Recently I have had an opportunity of watching carefully the mode in which a Giraffe plucks the leaves from a bough. The leaves are first grasped by the long and extensile tongue, and are then stripped from the bough by being drawn between the lower teeth and the front of the palate in such a manner that the twigs of the bough itself are left practically uninjured. The lower front teeth act, in fact, as a kind of comb in stripping off the leaves; and I think there can be little doubt that the broad bilobed crowns of the outer pair of teeth have been developed in order to increase the breadth of this 'comb,' and at the same time to render its comb-like action as efficient as possible.

"Deer and cattle, when browsing, eat the twigs as well as leaves, and since this difference of habit is correlated with a simple lower canine, while there is almost certainly some good reason for the bifid crown of that tooth in the Giraffe and its allies, there appears to be a strong probability of the truth of the foregoing suggestion. Should it be well founded it will be evident that the *Sivatherium* and other extinct relatives of the Giraffe and the Okapi fed in the same manner as those animals."

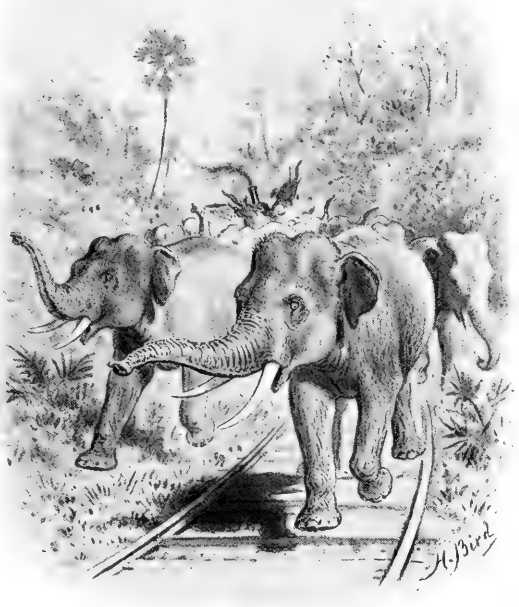
ANIMAL ANECDOTES.

Ant Armies Meet.

A NATURALIST gives the following description of an exciting battle between two great armies of ants as witnessed by him in a Californian orange grove:—"For some days before the battle I had noticed a great restlessness in the colonies of ants around two large oak trees. They were in a state of simmering excitement, which came to a head one morning, when I observed that, instead of going about their work as usual, they were massing in columns. Four columns, each composed of many thousands of ants, issued from one tree, and four similar columns advanced to meet them from the tree adjacent. In a few moments they met, and then commenced a battle unequalled for sheer ferocity. No quarter was given. Ant seized ant, and the victory went to the one with the stronger jaws. There were charges, flank movements, and other manœuvres, for it was plainly to be seen that the ants had their officers in command, and that occasionally messengers were sent from column to column. The ground was piled with the slain, and the survivors sometimes fought on the top of a hill formed of the bodies of their fellows; but the columns generally kept their formation until the close of the battle, when the victorious army, by sheer weight of numbers, threw their opponents into disorder, and then began to close in on all sides. The weaker army showed not the faintest disposition either to retreat or to surrender. Like the old Greeks, its members closed their ranks and fought doggedly until they were at last overwhelmed and exterminated. Then the victors advanced on the tree which was lately the home of their enemies, annexed it, and established a colony there."

An elephantine obstruction.

Railway trains have often been stopped by curious obstacles, including ants (see page 54 of this Volume), but probably no engine-driver has had a more surprising experience than that which recently befell a man employed upon the Assam line. He turned a corner suddenly—to find himself just behind a troop of savage elephants. The great creatures, evidently finding the iron road a pleasant path for travelling, had spread themselves across it, making such a considerable obstruction that the train was driven off the rails before the driver could bring it to a standstill. Then ensued confusion amongst the passengers, but still more amongst the elephants. Happily the former were scarcely hurt; the latter fled in wild confusion, utterly terrified by an enemy they did not understand.



"The elephants fled in wild confusion, utterly terrified by an enemy they did not understand."

The Wasp and his Home

Mr. Oswald Latter, writing on the subject of wasps finding their way home, says: "I once had an opportunity of seeing how wasps take their bearings. A lucky accident revealed a nest in an old meat-tin that had been thrown into a ditch. Wishing to observe the operations somewhat more comfortably, I cautiously lifted the tin on to the bank, a distance of two or three yards. The wasps that were abroad at the moment of removal all came straight back to the old spot in the ditch, and were evidently perplexed at the absence of their nest, but after some search most of them discovered it in its new position. Those, however, which were within noticed, as soon as they came to the exit preparatory to taking flight, that a change had occurred, and paused upon the threshold, looking about and waving their antennæ; then they took wing and hovered over the tin, flying to and fro in ever-increasing swings, noting carefully the exact surroundings. Soon their oscillations brought them to the edge of the ditch, and then, all being here familiar, they dashed straight away. After an interval wasps began returning direct to the nest in its new position, and I have no doubt that these were the workers who had thus carefully noted the alteration when they emerged from their home."

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough, f.z.s., f.e.s., etc.

IX. FOREIGN BATS.

THOSE who may be in search of the uncommon in the way of pets can derive an extreme amount of pleasure and interest from a study of the habits of the Exotic Chiroptera. Those who have not attempted to keep these animals as pets have very little idea of what extreme interest they are capable of giving their owner, and usually describe them as being "slow." Well, that is as may be, but the writer, who has had a considerable number of Foreign Bats as pets during an experience of animal-keeping now extending over a period of years, can unhesitatingly state they possess an entrancing interest peculiar to themselves.

MASTIFF BAT.

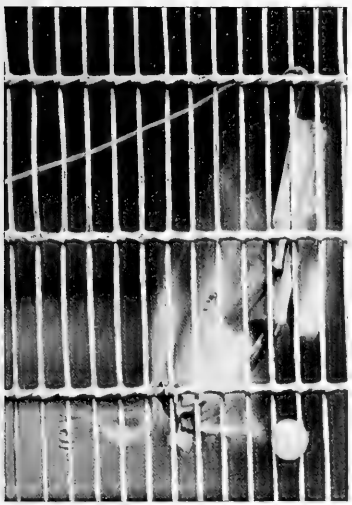
Those bats possessing the greatest interest to the average pet-keeper are the frugivorous bats, or Fruit Bats, as they are popularly called. There are three species which are not uncommon in captivity, and which, according to the writer's experience, are the most easily cared for; they are the Collared Fruit Bat (*Rousettus collaris*), the Indian Fox Bat (*Pteropus medius*) and the Common Short-nosed Fruit Bat (*Cynopterus marginatus*). There is also an Australian species of fruit bat, the *Pteropus poliocephalus*, but these do not seem adapted to a life in captivity, and are a much greater trouble to look after than the other mentioned varieties.

These animals are almost entirely nocturnal or crepuscular in their habits, and to an unobservant individual are perhaps too quiet or inactive in the daytime to make up for their increased liveliness during the evening and early night hours. As twilight becomes apparent bats get very lively indeed, more so in fact than most other animals are during the daytime, and the "swish" and gentle rustle of their wings as they move about the cage can be heard some little distance away. Unfortunately, as bats are not possessed of a "homing" instinct, their powers of flight cannot be observed unless their owner has a spare room in which they may be permitted to have partial freedom for a short time, a privilege they will much appreciate, and one that should be given them as often as circumstances permit. It is an extremely interesting sight to see the dexterity with which these creatures, during their flight, will avoid any obstacles in their way.

The insectivorous bats which are adapted for a captive life are very few, owing to the difficulty of providing them with suitable food. The three species the writer has been successful with are the Indian False Vampire (*Megaderma lyra*), the Chestnut Mastiff Bat (*Molossus glaucinus*) and the Brazilian Wrinkle-lipped Bat (*Nyctinomus*

brasiliensis). Of these the first-named species is the most easily cared for, and is no more trouble than the frugivorous bats.

The cage for bats, of whatever species they may be, must be most carefully and exactly finished, in order that there may be no projecting points to catch or tear the wings, as the tiniest splinter may either tear or scratch the tender membranous texture, which closely resembles a very fine quality of sheet-rubber closely ramified with nerves and bloodvessels, with the result that an inflammation sets in round the wound, suppuration takes place, and eventually eats away the surrounding membrane, giving the bat a most miserable and wretched appearance. There is no advantage gained in having too small a cage; a convenient size is three feet six inches long by three feet in height, and a couple of feet in depth. This will hold from two to six bats very comfortably without overcrowding, a thing to be guarded against, as bats are by no means amicable in disposition, and often quarrel and bite one another, especially if wrangling over some coveted tit-bit.

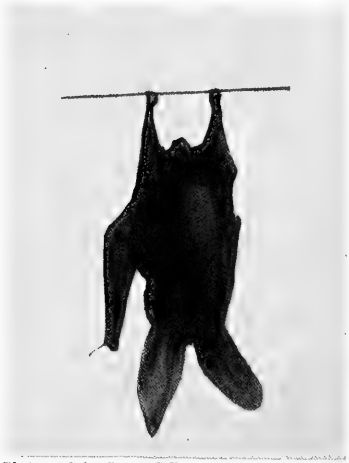


COLLARED FRUIT BAT EATING GRAPE.

If the task of making the cage be given over to a practical carpenter, he must be carefully instructed to plane the interior free from all roughness and splinters. The wires must not be galvanized wire netting, but the best tinned bird-cage wire. The doors should be two in number, one at the top of the cage, the other at the bottom coming quite flush with the floor, so that the interior can be readily got at for cleaning and to facilitate the refilling of the food vessels. The perches must be arranged differently from those in a bird-cage, as bats do not use them to stand upon, but to suspend themselves from; therefore the perches must be fixed about an inch from the top of the cage, three or four inches apart, and extending from one side to the other, parallel with the front; they do not require to be very thick—no larger than an ordinary lead pencil—so that the creature can easily get the wing-hooks and feet-claws round them. As bats are unable to jump up to these perches, some wooden slots must be fixed at the back of the cage to enable the animals to climb up by; these can be about an inch in width and nailed a couple of inches apart; both these and the perches must be carefully smoothed down. The food and water vessels are preferably of china, as this material is more readily cleaned than metal and is not liable to rust; and the use of proper utensils keeps the food fresh and less likely to be wasted than if thrown promiscuously into the cage, when it is liable to be spoilt by the excrement or by being trodden upon. Bran is the best covering for the floor. For many years the writer used sawdust, but latterly he has given up the use of it and now uses bran only. The reason is a simple one. When feeding, the bats often take their food up with them and eat it in the roof; but it often happens that, especially if another one takes to quarrelling for the possession of the bit, it slips from their grasp and falls on the floor, where it gets coated with whatever it happens to fall on. Should sawdust be on the floor at the time, some of it gets into the stomach of the animal along with the food, where it acts as an irritant; whereas if a little bran be eaten there is no harm done at all, and the bat is none the worse for it.

As the bats above named come from tropical or sub-tropical regions, the cage ought to be kept in a fairly warm room, especially if it is desired the collared species should breed, as they readily will if kept properly. In order that the inmates may not be annoyed by the glare of light and inquisitiveness of prying eyes during the daytime, a blind or curtain should be suspended in front of the cage, if not over the whole at least covering the upper half. During the daytime bats are very quiet, and spend most of their time in sleep; if anyone comes to have a look at them, all they usually do is just to blink an eye at the intruder and then cover up their head with one wing from the light. The temperature should not fall below fifty degrees, and a higher temperature is much better and makes the animals more lively; they mope considerably if kept in too cold a room, as they are very susceptible to a chill.

Cleanliness is an imperative necessity with these and all other animals, and those people who have failed as pet-keepers have nearly always fallen over this particular stumbling-block, viz., uncleanliness. The floor must be thoroughly cleaned out every day and fresh bran put down, and not less than once a week the floor must be scrubbed over with boiling water and disinfectant soap. Unless this be done the cage and its inmates speedily become an offensive nuisance, not only to the owner but to the bats themselves, as there is a peculiar, yet not naturally unpleasant, odour emanating from bats of all species, which speedily becomes intensified with the slightest neglect.



Photograph by George Solly.
LONG-EARED BAT.

The staple diet of the frugivorous bats is fruit of various kinds, preferably dates, figs, bananas and grapes, but apples, pears and raisins, and almost any kind of good ripe fruit may be given. A little boiled rice serves as an *hors d'œuvre*. The water must be always sweet and fresh, as bats are very particular animals with regard to this. Boiled carrot sweetened with sugar or honey has been recommended.

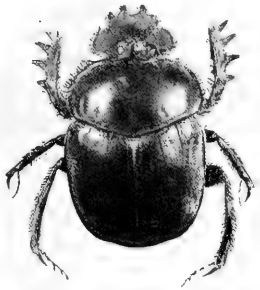
The insectivorous bats are best fed on most finely-shredded beef or mutton, insects of various kinds, such as beetles, grasshoppers, etc.; frogs, too, are particularly acceptable to the Indian false vampire. Cockroaches may be offered when beetles cannot be obtained.

The insectivorous species, as might be well inferred, are more strongly scented than the frugivorous kinds, and extra cleanliness is advisable; they are also more quarrelsome, and those of smaller size than the other insectivorous ones should be kept in a separate cage, as occasionally cannibalism is developed, with the result that the larger make meals off their companions of smaller size.

NOTES AND COMMENTS.

The Sacred Scarabæus of the Egyptians.

Mr. T. A. Gerald Strickland, F.E.S., who supplies the two photographs on this page, writes: "To the entomologist this beetle is simply looked upon as a more or less interesting example of the family *Scarabæidæ*, and the knowledge that the large balls made by these insects of a mixture of clay and camel's dung are simply reserve supplies of food for themselves or their larvæ knocks any later mysticism on the head. With the ancient Egyptians it was far otherwise. The sight of these beetles' peculiar evolutions as they rolled spheres larger than themselves over the desert, and also the fact that the creatures seemed to appear and disappear from and to they knew not where, naturally was quite inexplicable to these ancient peoples; consequently the insects were held in great reverence—not to say awe. According to Pliny the scarabæus was worshipped as one of the gods of the country: but be that as it may, as an emblem and symbol it abounded. Representations of the beetle in the sculptures are extremely numerous. It was an emblem of the sun (to which deity it was particularly sacred), symbolically represented the world, was an emblem of Ptah, the Creative Power, of Ptah-Socharis-Osiris, of the world, and finally was connected with astronomical subjects and with funeral rites."



SACRED SCARABÆUS

SACRED BEETLES ROLLING THEIR BALLS ON THE FACE OF THE DESERT.

A TAME MARTEN

The Marten.

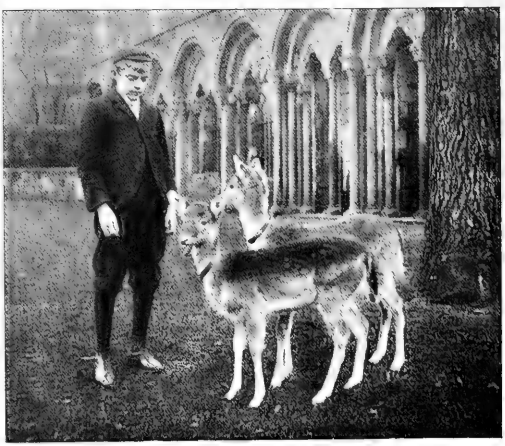
Amongst the Weasel tribe are to be found some of the most graceful of created things, and perhaps most graceful amongst them are the Martens. Only those who have been able to watch this agile murderer in his native haunts, actually running down the nimble squirrel in his native branches or catching with agile bound the bird in flight, can form an idea of the poetry of motion exhibited. But this does not add to the eligibility of the animal as a subject for the photographer; and after giving up as a bad job the two white-throated Beech Martens, which leapt like wildfire from branch to branch of their roomy cage, our photographer was more fortunate with his picture of "Micki," Mr. H. C. Brooke's tame Pine Marten, which was kept still for at least three consecutive seconds by means of a saucer of milk. The martens are easily tamed if taken young, and exhibit great fondness for the company of dogs. The pleasant musky odour they exhale also renders them more suitable pets than many other members of the weasel tribe. They are also not so strictly carnivorous in their habits, but are very fond of cherries, grapes, strawberries and other sweet fruits. In South Germany the beech martens approach nearer to the haunts of men than does the "Edelmarder," often even making their nests in the roof of a farmhouse, busy in the vineyards and cherry orchards.

Fallow-Deer as pets.

"This photograph," writes Mr. Herbert Lazenby, "of a pair of young Fallow-Deer may be of interest to the readers of Animal Life. These graceful but timid animals have been reared by a well-known game-dealer in York, and considerable interest has occasionally been caused by seeing the deer being led by their young keeper through the streets of the old city. The photograph was taken in the cathedral grounds whilst the deer were having a morning outing."

The Somerford Park White Polled Herd.

Mr. G. H. Parsons, whose two photographs are reproduced on page 91, writes as follows: "The Somerford Park Herd is a domesticated herd and a polled one; but



TWO TAME FALLOW-DEER FAWNS.

A YOUNG HEIFER.

A GROUP OF SOMERFORD PARK CATTLE.

its cattle are very characteristic, and have all the peculiar features of the white forest breed. It is certainly of great, though unknown antiquity, and is probably, now that the Gisburne Park cattle are extinct and the Hamilton herd has acquired horns, the best representative yet extant of the polled form of the old white breed of park cattle. Lyme Hall is fifteen miles to the north-east, and Chartley is thirty miles to the south-east, and the three herds probably form a group. Perhaps, however, the Somerford herd is still more nearly allied to the Gisburne and others which came from Whalley Abbey. The herd, which is without horns, consists of twenty-six head in all (June, 1903)." The distinctive features noted by the late Rev. John Storer in 1875 are still retained, and we cannot do better than quote his words: "The three-year-old bull," he then wrote, "was not very high standing, but compact and well made: fine in the bone—the hair rather wiry. He was fair in the ribs and loin; not particularly neat, nor yet specially defective, in the hind-quarters: moderately good in the twist, but rather light in the leg, and in these respects resembled (as did the herd generally) the wild animal. The fore-quarters, chest, girth and bosom very good: plates and fore-flanks remarkably good; shoulders very neat, and head and neck very beautiful—the head broad, short and blood-like; the neck strong, very much arched and of great substance. There was a tendency to a mane, which is more prominent when in full coat. The colour was pure white; the ears, rims of the eyes, muzzle and hoofs being quite black. There were a few black spots on the fetlocks of the two fore-legs, and immediately above the bare black skin of the muzzle was a strong, deep black line, perhaps an inch wide: and immediately above it, clustering together, there were a few small black spots." This description tallies very closely with that of the four-year-old bull now at Somerford. Like all other old herds of the forest breed of white cattle, they have a strong tendency to produce small black spots on the neck, sides and legs. The cows are pure white or nearly so, but there is a certain amount of black or of black spots immediately above the hoof on the front part of the fore-leg; and a line of about an inch wide of jet black hair round the muzzle. The tails are all white. On their polls they all wear, in greater or less abundance, the "toppin" of long hair, which is considered a peculiar hereditary distinction of the race.

Honoris Causa.

We understand that Mr. R. Lydekker (to whom our readers need no introduction) has been elected a foreign member of the Royal Academy (*Reale Academia dei Lincei*) of Rome. Mr. Lydekker is already an honorary member of the Royal Zoological Society of Ireland and of the New Zealand Institute, and likewise a corresponding member of the Philadelphia Academy of Sciences and of the Boston (U.S.A.) Natural History Society. He is also a Fellow of our own Royal Society. It is seldom that one man achieves such high distinction in two separate sciences as has fallen to Mr. Lydekker's lot. This is not the place to speak of his services to geology, but we beg leave to say that, in our humble opinion, Mr. Lydekker is not only the foremost all-round zoologist in Great Britain to-day, but that there are not a dozen others who can approach within measurable distance of him. We congratulate the members of the Royal Academy of Rome on their new colleague, and we congratulate ourselves that their choice has fallen on an Englishman who will so thoroughly prove himself worthy of the high honour which has been bestowed upon him. Our readers will be interested to hear that, in addition to the very important article on "Local Variation in the Giraffe" by Mr. Lydekker which appears in this number, we have also secured from him a short series of articles on "Animal Dentition" which will begin in our next number.

AN AFRICAN LION IN THE OPEN.

At a distance this animal could scarcely be distinguished from the stone it crouches near, and is an interesting example of protective coloration.

From an Original Painting by T. F. Smith.

THE LIFE HISTORY OF THE PUSS-MOTH.

Written and Illustrated with Photographs from Life by FRED ENOCK, F.L.S.

THERE are few insects which make so strong a first impression on the mind of the young entomologist as the Puss-Moth, so called from the likeness of its face, as well as the silver-grey colour and markings on the wings, to the domestic silver-grey puss of our home. The moth is fairly common, and generally falls to the lot of the collector in his first season; but should he fail to find the perfect insect he will, if he keep his eyes open, see the strange caterpillar, with its "face" and forked tail, either at rest or feeding upon the willow or poplar during July and August; and if carefully provided with fresh food it will make its tough cocoon in the crevice of the bark, or even upon the side of the breeding-box, where it will be safe and require no further attention until the following June, when the perfect insect will emerge.

After pairing, the female flies at dusk to a considerable distance searching for willow or sallow bushes, on the upper side of whose leaves she lays from one to three circular, pin-cushion-shaped, reddish eggs, as shown in Fig. 1. These eggs of the puss-moth are hatched in about a month's time. The larvæ at first are velvety black (Fig. 2), with a thorny process at each side of the head, and a forked tail, which is kept erect; each fork being telescopic, from which a long pink, whip-like extension is protruded and waved about whenever an Ichneumon fly approaches.

From some cause or other a large percentage of the larvæ die in babyhood. Fig. 3 shows a larva which has passed through this critical period and is rejoicing in twisting and twirling its body about previous to eating up the old suit adhering to the leaf at its side.

When nearing maturity the larva frequently hides itself among the willow leaves in so successful a manner that the sharp eyes of birds and entomologists are deceived. When the larva has stripped the stems of the terminal leaves it becomes a conspicuous object (Fig. 4), and were it not for the terrifying appearance which it puts on it would soon fall a prey to sparrows; but, as I have frequently noticed, they look askance at the strange creature with a black head, surrounded by a bright crimson ring bordered by two black eye-like spots, giving the larva a most terrifying appearance, which is intensified when the pink tails are flashed forth—and the sparrow declines the anticipated feast.

Most of the larvæ are full-fed about the first week in August, when they lose their pure colours which protected them so well during their life among the leaves.

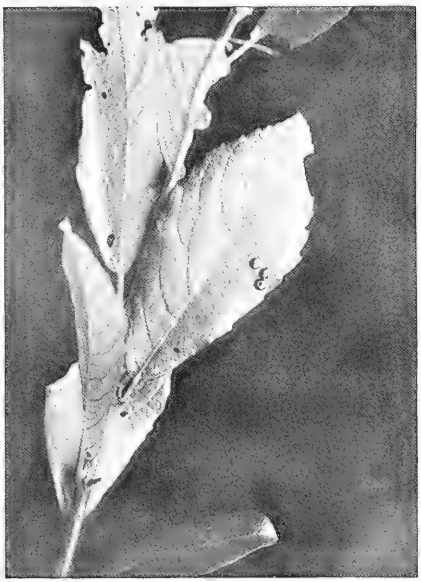


Fig. 1. Eggs of Puss-Moth on leaf of Sallow.

Nature again comes to their aid, providing them with a colour more in tone with the bark and earth over which they sometimes crawl before reaching a suitable place on which to spin their cocoons. It is an interesting sight to watch puss larvæ select nice comfortable crevices in the bark; they are decidedly fastidious, putting a few threads of silk down, then turning away like a dissatisfied customer at a draper's shop. I always give a good selection of willow stumps and virgin cork, of which they are very fond: it is soft to their teeth and full of convenient crevices. On one willow branch (Fig. 5) I watched the entire operation. The larva first went over the surface, trying it with its mouth and spinning organ. After careful measurement, it commenced at the top end by stretching a few strong silken threads across from the highest points; to these were attached cross-threads, forming a very coarse mesh. Drawing the body slightly underneath this network, it turned its head backward and worked

Fig. 2. Young Caterpillar of Puss-Moth.

Fig. 3. Puss Caterpillar in its New Dress.

the network over the middle of its body. Then, curling itself round, it stretched the network to its full capacity, bringing its head on a level with the tail, working the silken threads over and just beyond the latter, which was soon covered in, a small aperture being left open about the centre. An occasional pause was made in the spinning to permit of the larva biting off small pieces of bark, which it carefully forced between the viscid meshes; these pieces were equally distributed over the surface of the cocoon except at the top end, which was left clear and not so thick as the main part. When the larva had completely covered itself in with the coarse network of silk and fixed the small pieces of bark over the surface, it ejected a quantity of viscid fluid, with which it washed all over the inside of the cocoon, giving it the appearance of having been varnished.

Though I could not see through the cocoon, the larva was evidently hard at work smoothing down the irregularities of the bark forming the floor, as small pieces were

still occasionally pressed through the soft material. At ten o'clock next day it was quite finished and began to dry, finally becoming as hard as the surrounding bark, which it resembled so closely that no ordinary observer would have been able to detect its presence. In a week the strange larva had assumed the pupa, in which stage it rested in a quiescent state through the winter, until the warmth of spring-time awoke it into renewed life, when those mysterious and secret changes commenced and the fluid matter began to take definite form and the various organs were differentiated—until every hair was perfect. The horn-like covering was stretched to its fullest capacity, finally bursting at the suture of the thorax and legs. But before emergence could take place the hard cocoon must be pierced.

As I had never observed this act until last June, I made all arrangements to ensure success. I had already bred a number of puss-moths, and noticed that they

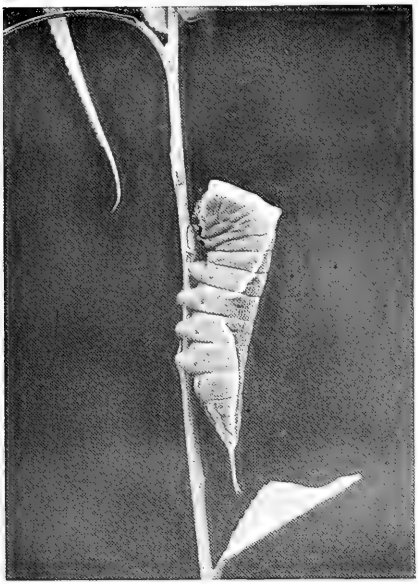


Fig. 4. Full-grown Caterpillar.

Fig. 5. Puss-Moth emerging from Coçoon.

emerged between the hours of four and six in the afternoon. I therefore focussed a large cocoon formed upon a small willow branch, drew the slide, and with the shutter piston between thumb and finger, patiently waited for the appearance of life stirring from within. After watching for three hours I gave up my vigil for the first day, resuming it at four o'clock the next afternoon—again without any result. On the third day, after watching for two hours I fancied that I could detect a slight discoloration on the top end of the cocoon, about the size of a big pin's head; my magnifier confirmed my suspicion, and very slowly the mark increased until it was half an inch in diameter. Half an hour after I noticed the centre of the discoloration becoming moist, and a tiny fissure appeared, followed by a streak of white hairs, which I instantly photographed (Fig. 5), changed my plate, and then, before I could put the slide down, I saw a flash of white protrude from the widened fissure, and in

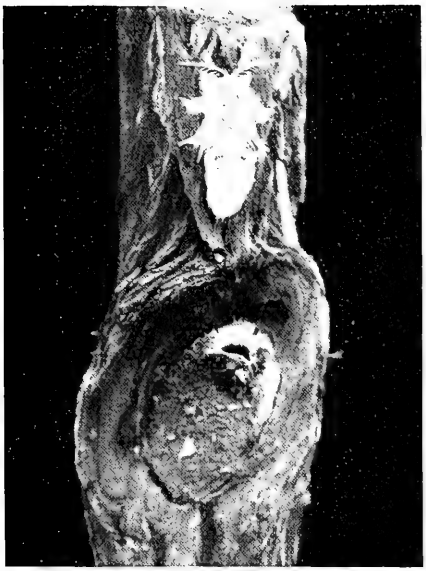


Fig. 6. Puss-Moth. Five seconds after emergence.

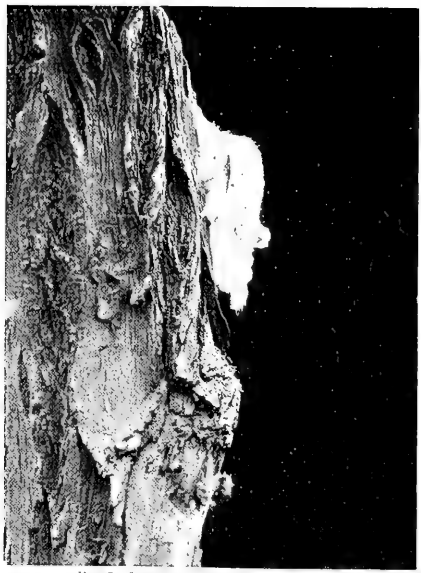


Fig. 7. Puss Moth. Wings developing.

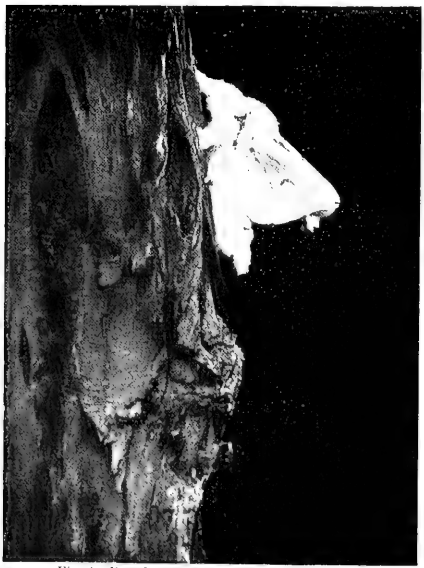


Fig. 8. Puss-Moth. Wings further developed.

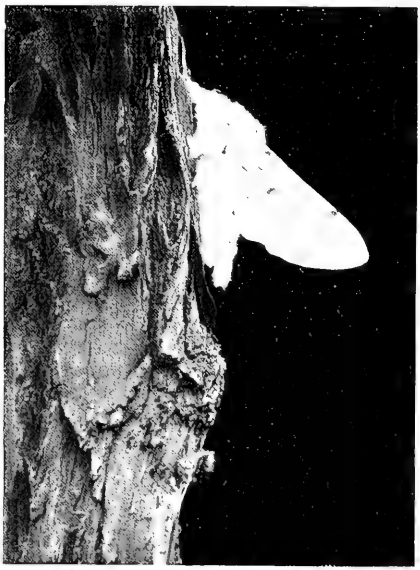


Fig. 9. Puss-Moth. Wings fully developed.

less than five seconds the puss-moth was crawling up the bark, in which act I took its photograph (Fig. 6). I have never before seen such a rapid emergence. I then swung the table round so as to bring the moth sideways, that the development of the wings could be seen and photographed.

At first the wings are not more than half an inch long, with every scale and marking in miniature; but the moment that the moth had obtained a firm footing upon the bark, she gave her stumpy wings a preliminary shake previous to going through that most wonderful and mysterious development. The wings first begin to swell out at the base (Fig. 7), the outer margin being arrested in development, though only for a few moments.

Fig. 10. Fully-developed Puss-Moth at rest.

Two minutes after emergence the wings are much swollen out at the base and puffed out away from the body; gradually the under-wings gain on the upper and are spread out first, showing all the nerves full of yellowish fluid. Now the upper wings are filling out, looking like a half-hoisted mainsail gently flapping in the wind (Fig. 8). But there is no flapping of the moth's wings yet; the movement is almost imperceptible, though, as we watch it, we see that the tip is gradually straightening out until both wings are fully expanded and stand upright back to back (Fig. 9).

In this position the moth remains for about half an hour, or until the fluid has permeated to the extreme margin of the wings; then, but not before, the wings are turned away from each other and quietly folded down over the body roof-shape (Fig. 10), not moving until the dusk of evening comes on and Nature intimates that the time for action has arrived. First she slowly erects her antennæ or feelers; next a very slight shiver seems to run through the wings, which is increased to a decided vibration until the whole body and wings quiver with excitement; and at last the power and desire to fly become too great to resist, and away she goes, rising somewhat heavily at first: but feeling her new power, she soon mounts over the tree-tops, where in all probability she will meet with a partner, the following hours being spent in distributing some two hundred eggs over half that number of willows and sallow bushes, the moth seldom laying more than two eggs upon one bush. Besides the microscopic ovivorous parasite mentioned, the puss-moth is frequently attacked by a large comb-footed Ichneumon fly, and though the caterpillar lashes out vigorously with its pink whips it is not always successful in driving off this parasite, which manages to take a firm hold with its comb-like claws; and the puss larva has to submit to having a number of eggs injected into its body, and to sustain the maggots hatching therefrom, until both have had enough and the caterpillar dies, while the parasitic maggots spin tough cocoons, sometimes within the cocoon which the caterpillar has just had strength enough to form before being overcome by weakness and death.

A NATURALIST'S NOTES FROM THE BUSH.

Written and Illustrated with Photographs by CYRIL GRANT LANE.*

I. THE AUSTRALIAN BUSH-RAT.

THE Australian bush-rat is a little smaller than the well-known English brown rat, but its fur is of much finer quality, and of a somewhat slaty hue upon the back.

So strictly nocturnal are the habits of this little animal that it is difficult to obtain much reliable information respecting it—indeed I believe few bushmen are even acquainted with its general appearance. Nevertheless, my night wanderings in various parts of the Victorian bush have supplied me with a knowledge of some of its peculiarities which may be deemed worthy of comment. My first introduction to this animal was in a certain log hut, where I was much worried by these inquisitive little beasts, which disported themselves in every part of the hut, continually uttering a peculiar short, mewing cry.

Various attitudes into which the animal throws itself while scenting for food, in the act of listening, or climbing, serve to show how extremely supple the little creature's body is. At one moment it may be seen huddled into a furry ball, the next elongated to inelegant proportions in its efforts to reach objects in difficult positions.

While reading or writing by the light of a slush-light, I used to watch, at intervals, the incautious little creatures working their way all round the log-work of the hut, and their feats of climbing at such times were sufficient to suggest that there is a large amount of truth in the statement that the bush-rat passes much of its time among the rough-barked timber so prolific among mountain gullies; in fact, while out "'possuming" on moonlight nights, I have watched them chasing each other with surprising agility along the heavier limbs of the wattle trees.

I am inclined to think—though I cannot state that such is invariably the case—that the bush-rat is particularly fond of building its nest (a construction of soft material such as fibrous bark, skeleton leaves, wattle blossom, etc.) in a decaying stump, hollow limb of a tree, or, in accordance with the geological nature of the locality, among the lichen-lined crevices of granite rock; also it is thought by some that the animal burrows, making a snug nest beneath the surface of the ground, which I think is not unlikely in situations where the soil is sufficiently soft and yielding.

The animal is a vegetarian, but that does not prevent him from making raids on the hutter's "tucker," edibles of all descriptions proving anything but distasteful to him, judging by the results of his depredations. Only once have I seen the bush-rat in captivity. This was when I captured a full-grown doe in the act of thieving my tinned jam by clapping my hand over the opening of the tin, thus entrapping the animal. I do not forget, either, that I received a sharp bite upon the finger from her long incisor teeth, which caused the blood to flow with considerable freedom.

*Previous articles by the same writer have appeared in ANIMAL LIFE, Vol. I., p. 304 ("The Wombat"), and in Vol. II., p. 67 ("Three Common Reptiles of the Australian Bush").

ZOO NOTES.

"JIMMY."

"MICKIE."

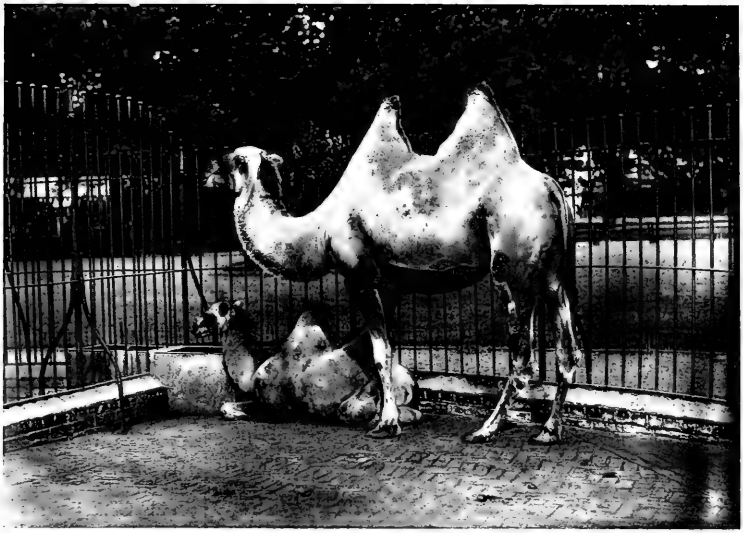
Photographs by W. P. Dando, F.Z.S.

SILVERY GIBBON.

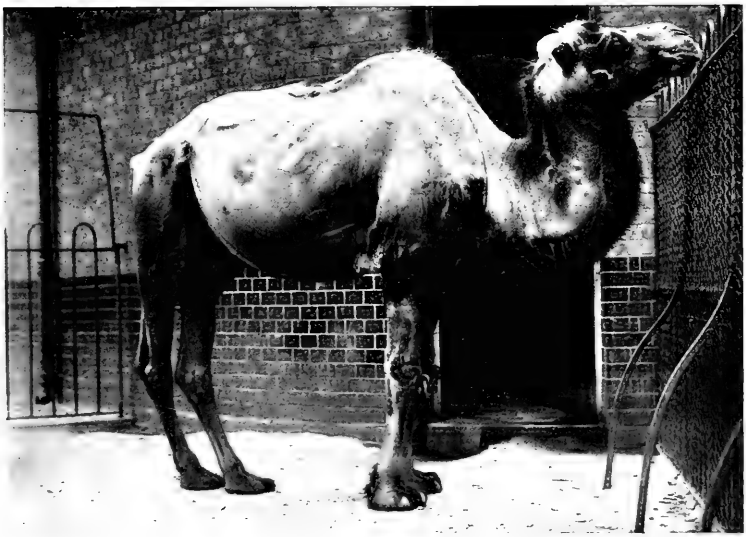
LLAMA AND FOAL.

Photographs by W. P. Dando, F.Z.S

LLAMA.



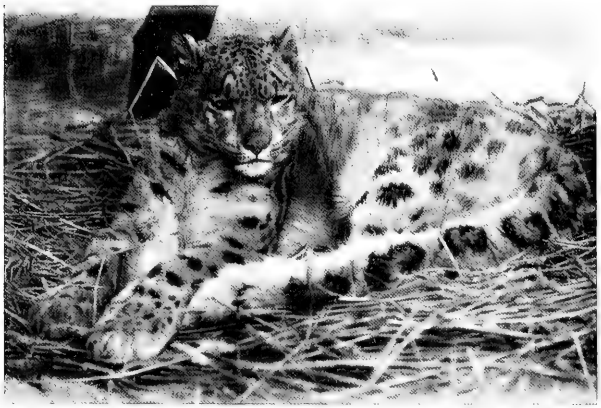
BACTRIAN CAMEL AND FOAL.



Photographs by W. P. Dando, F.Z.S.

OLD BACTRIAN CAMEL.

The New Ape-House has sustained another loss, and that a great one, in the death of the Silvery Gibbon. A good photograph of this ape, showing the upright position it is able to assume, was given on page 48 of Vol. I. The one reproduced on page 99 of this volume gives the impression of repose, but as a matter of fact the animal was only in that position for the fraction of a second, both pictures being taken in less than a hundredth part of a second. "Jimmy" and "Mickie" the late silvery gibbon's neighbours, are (at the time of writing) still with us, but the latter in its new home has lost all the attraction it possessed for the public in the old ape-house, and "Jimmy" has never had a chance of becoming a popular favourite.



SNOW LEOPARD.

Photographs by W. P. Dando, F.Z.S.

ASIATIC WHITE CRANE.

Another death to be recorded is that of the beautiful Snow Leopard, whose portrait was given in No. 1 of Animal Life. The one here reproduced was taken just before its death, which occurred on August 4th.

The photograph of the old Camel on page 101 is especially interesting as showing how the humps disappear with old age, just as they refuse to take up the erect position for some weeks after birth. To all appearance the forms of the humps have entirely vanished in the photograph, but the empty skin which enclosed them is hanging down quite loose on the other side. As an illustration of the development of the humps in young camels, a later photograph is here given of the foal born on April 1st (cf. p. 395 of Vol. I of Animal Life), the present photograph showing the young animal three months old, with the humps fully formed. It is also interesting as showing that both mother and foal have shed their coats entirely, and now appear in perfectly smooth skins.

The Asiatic White Crane, of which a photograph was given on page 335 of the last volume, has laid an egg. The male bird is very jealous of all intruders, and it was only by stealthily creeping into the next enclosure that Mr. Dando was able to make a rapid exposure just as the hen rose from the nest and exposed the egg; the male bird was after him in a second, and he says he was pleased to know that wire netting separated him from the jealous spouse.

Simony's Lizard (*Lacerta Simonyi*), although its habitat is not very distant, is a species comparatively new to science, having been first described by Dr. Steindachner so recently as 1889. It inhabits the "Roques del Zalmor," near Hiero Island, in the Canary group, and is thus an extremely local form; it is stated to subsist on crabs. Three specimens were received at the Zoo in the spring of 1890, two of which were collected by Canon Tristram and presented to the Society by the late Lord Lilford. The species belongs to the same genus as the common green lizard. The specimen here figured is noteworthy from the circumstance that it possesses two tails, having grown a second one (in reality only a fleshy substance without any bones) out of a wound received from an injury two-thirds down its original tail.

SIMONY'S LIZARD.

Photographs by W. P. Dando, F.Z.S.

BLUE LIZARD.

The North-American Blue Lizard (*Gerrhonotus cæruleus*), whose portrait is reproduced in our second illustration, although to the uninitiated very similar in general appearance to the last, belongs to a totally different family, being in fact a relation of our own blind-worm, or slow-worm. It is therefore a member of the family *Anguidæ*, whereas Simony's lizard is included in the typical family *Lacertidæ*. The characters distinguishing these two families are not apparent externally, and it would take too long to describe them here. The present North-American species is stated to be somewhat rare (at all events in collections); and the first example ever seen at the Zoo was received there in 1896.

A PASHA OF TWELVE TAILS.

By Frank Finn, B.A., F.Z.S.

Photo by W. P. Dando.
WHYDAH BIRD.

None of the small species of birds exhibited in the fine Western Aviary at the London Zoological Gardens excites so much interest as the Long-Tailed Widow, or Whydah Bird (*Chera procne*), sometimes called the "Twelve-Tailed Whydah" by bird-dealers. This name, absurd as it sounds, is really rather descriptive, for whereas the other whydah-birds common in the bird trade have only a few feathers of the tail elongated, in the long-tailed species all the twelve feathers of that appendage are of unusual length, sometimes as much as eighteen inches; and although they are not all equally long, each one would constitute a respectable tail by itself. The wearer of this fine appendage is a finch about the size of a skylark, and, as the picture shows, much resembles that bird when "out of colour." The plumage is of the same streaky brown as the lark's, and the bird walks on the ground in the same manner, not hopping like most finches. The bill is, however, characteristically finch-like in form, and pale leaden-blue in colour. The hen of the species, which is not represented at the Gardens, always possesses the lark-like plumage and short tail, but her mate in the breeding-season doffs this sober garb for one of silky black, set off by rich orange-red epaulettes, and at the same time grows the wonderful tail of long, elegantly-crimped plumes shown in the other picture. Then it is that he may be seen in all his glory; puffed out with pride, he erects his neck-feathers like a ruff, and half-expands his wings to show their glowing adornment. He is also constantly on the move, chasing other members of his species with a beautifully easy and buoyant flight, very different from the bustling or bouncing progress of the more vulgar finches.

Now and then, in an access of vaingloriousness, he spreads out his tail vertically like a common cock's and proceeds slowly through the air with stiff, heavy flaps, so that he reminds one of a gigantic Red Admiral butterfly with a bunch of black ribbons tied to it. It is a puzzle how he manages to keep the splendour of his train unimpaired when he drags it recklessly about over grass and gravel, for, unlike the more familiar Paradise Whydah (*Vidua paradisea*), he seems to be unable to raise it clear of the ground. The feathers of this wedding-garment are, however, of superfine quality and wear well, for they certainly are not easily draggled; if you watch the bird at his bath, you will see that his plumage throws water like a duck's,

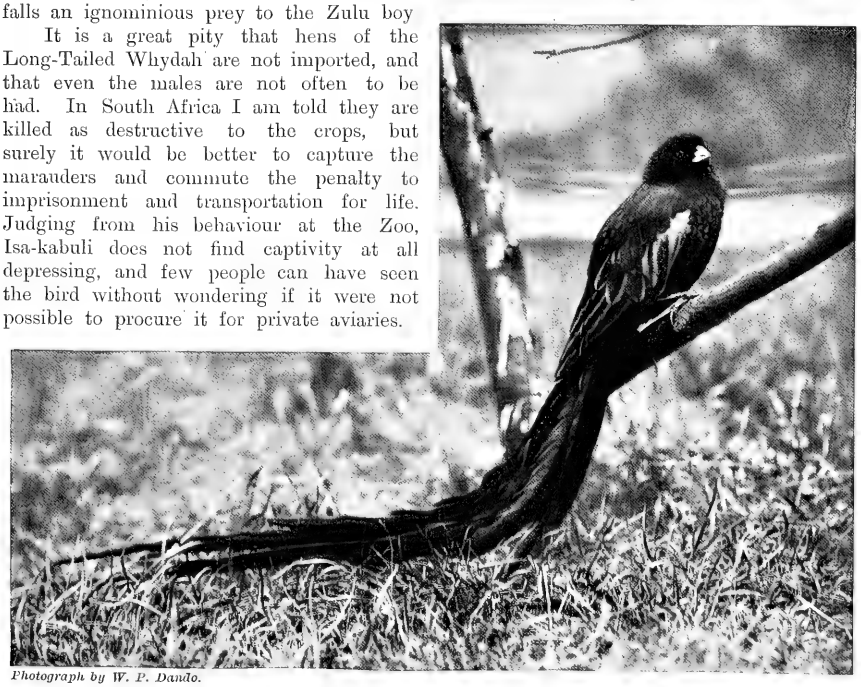
the beautiful tail floating outspread on the surface, bedewed with diamond-like drops from the splashing wings.

Beautiful and interesting as is this bird in captivity, unsolaced by the gentler sex of his species, he must be much more so in his wild state, where he has attracted the notice of all naturalists. Both in Sir Harry Johnston's book "The Uganda Protectorate" and Mr. W. Distant's "Naturalist in the Transvaal" the male has been figured on the wing, but nothing short of an instantaneous photograph could do justice to the quaint grace of this king of the finches.

In disposition the cock is a thorough Oriental, accumulating a harem of from ten to fifteen wives; these he takes to some suitable locality overgrown with long grass, in which the ladies of the zenana construct their nests, each on her own account away from the others. The proud Pasha himself of course gives no assistance, but he is not by any means a neglectful husband; for, selecting some point of vantage, he keeps guard over his various establishments, now flying out to chase off any rival of his own sex and species, and anon going round with a warning call to his wives if a man or other dangerous creature approaches. The hens in this case leave their nests and creep away under the grass till they can rise and fly at a safe distance.

It would seem that the tail of Isa-kabuli (to use his Zulu name), like Absalom's hair, is a snare as well as a glory to him. In spite of its apparently waterproof texture as seen at the Gardens, it is positively stated to get so water-logged by a shower of rain or the morning dew that its unfortunate proprietor is at times quite unable to rise, and falls an ignominious prey to the Zulu boy

It is a great pity that hens of the Long-Tailed Whydah are not imported, and that even the males are not often to be had. In South Africa I am told they are killed as destructive to the crops, but surely it would be better to capture the marauders and commute the penalty to imprisonment and transportation for life. Judging from his behaviour at the Zoo, Isa-kabuli does not find captivity at all depressing, and few people can have seen the bird without wondering if it were not possible to procure it for private aviaries.



Photograph by W. P. Dando.

LONG-TAILED WHYDAH BIRD.

UNCOMMON PETS.

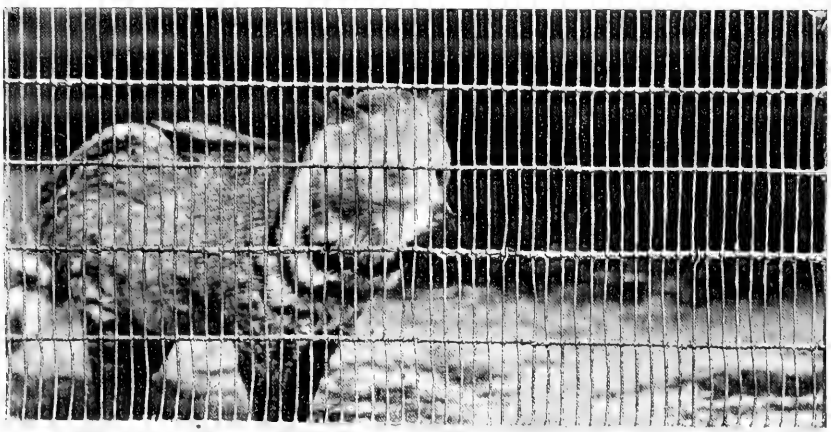
A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough, f.z.s., f.e.s., etc.

X. CIVETS.

At one time these animals were in great demand by *parfumeurs* in order to obtain the secretion produced by the anal glands, but of late years the peculiar scent of these animals has almost ceased to be a commercial commodity (musk and certain vegetable perfumes taking its place) owing to its overpowering strength. However, Orientals and Abysinnians still use this scent, and Abysinnia and Java are the two great seats of the civet industry. The Dutch used to import to Holland Civet Cats from their colonies of the East with an idea of procuring the perfume in a quite unadulterated and pure state, and this led to the civet-cats of Amsterdam having a great reputation and being greatly in demand by the perfume-makers of olden times.

Civet-cats are very often kept by those people who like their peculiar odour; the male cat has the greatest scent-giving properties, and the odour is so strong that it remains for a very long time in the skins of these animals, and is even noticeable after they have been tanned and prepared for use. The secretory glands of the civet are situated close to the tail, and if they be not artificially discharged of their contents, the perfume gradually collects and falls to the ground in a small mass about the size of an ordinary nut, when it hardens unless put into an airtight box or canister. So long as it remains in the pouch it is about the consistency of butter, and is not liquid enough to be ejected after the manner of that of the skunk and certain other mammals, and therefore the civet as a scent-bearing animal is not so objectionable a pet as the others would be.



INDIAN CIVET.

Photo by L. Medland, F.Z.S., N. Finchley.
AFRICAN CIVET.

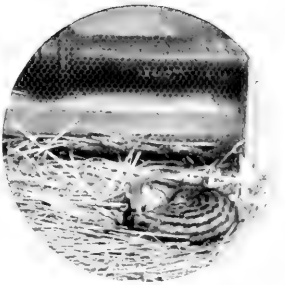


Photo by L. Medland, F.Z.S., N. Finchley.
INDIAN CIVET.

The price of civets naturally varies according to the size and condition of the animal, but from thirty-five to seventy shillings would be about what one would have to pay to become the possessor of one of these animals. The cage should be of as large a size as room can possibly be spared for, and preferably situated out of doors or in an outbuilding, although I knew one that was kept for many years in a living-room in a cage not much larger than a rabbit-hutch—so small, in fact, that the animal rubbed both ends in turning round. As civets do not usually take kindly to strangers, the wire parts of the cage must be of very close mesh—no farther apart than ordinary birdcage wires—so that the fingers of inquisitive friends may be kept outside the cage in safety. Civets are rather undemonstrative and quiet, as well as clean, in captivity; to those who have the looking after them they show some slight signs of affection if treated with constant attention and kindness. Teasing these creatures, either by their owner or his friends, must be carefully guarded against; nor should they be awakened during the daytime if sleeping, as it has a tendency to render them morose and treacherous. They are nocturnal in their habits to a great extent and do not get very lively before the evening hours; during the night hours of darkness their eyes glow with a beautiful brilliancy almost surpassing that of a cat's eyes. Should it be necessary from want of out-door accommodation that the civet be kept in the house, every irritating influence should be removed from the animal's notice, so that the creature never is excited to such an extent as to cause it to emit its odoriferous secretions. A civet can be kept, with care, indoors so that its presence can hardly be detected unless one's attention be drawn to the fact that there is such an animal in the house; fortunately the scent is unpleasant to only a few, and most people get to like it after a very short time.

The floor of the cage should be covered with fine gravel or sand, and over that a layer of sweet hay or straw which the civet will bunch up into a corner to form a sleeping-couch; there is no need to partition off any part of the cage to form a sleeping-compartment, as would be necessary for other animals. The feeding is not a difficult matter, eggs, dead sparrows, fowl-heads, horseflesh, fresh fish and a little rice forming the staple diet; of course, changes must be rung so that the diet may be varied day by day. Milk should also be given at meal times.

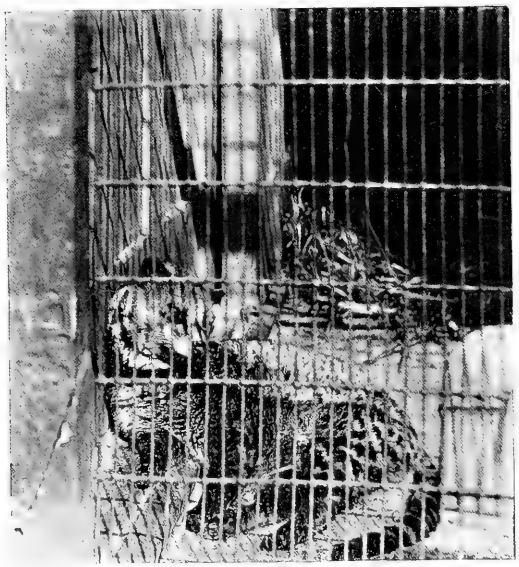
The best species for the ordinary pet-keeper to have are the African civet (*Viverra civetta*), the large Indian Civet (*Viverra zibetta*), the Malayan Palm Civet (*Paradoxurus hermaphroditus*), and the Himalayan Palm Civet (*Paradoxurus grayi*). The Rasse (*Viverra malaccensis*) is a very agile tree climber, and is the only member of the civet tribe that may be said to be all arboreal in its habits, thus differing from the other species, which are unable to climb.

Civets, when wild, feed on small mammalia as well as birds, and this trait can be utilised to keep down mice and rats in the house if the civet be allowed to roam about at night time, provided that cats and dogs, small birds, or any other pets are kept quite out of the way. A civet is much quicker in killing a large rat than a terrier ordinarily is; and as all the civets are remarkable for their lithe and agile

movements, small rodents are very soon kept under if one of these animals be permitted to prowl about after nightfall.

If ordinary food run short at any time, entrails of fowls and pigeons, snails and vegetables, as well as soaked bread or biscuit may be given. Civets, like true cats, require to keep their talons well sharpened, so a piece of wood or stone should be provided in order that they can have something to scratch at to keep their claws in order.

Many people prefer the Genettes as pets, not only because they are smaller and therefore do not need so roomy a cage as their larger relations, but also because the anal glands are not developed, and therefore no odour is emitted other than that given off by animals as individuals, and not as families or *genera*. The common genette, a native principally of northern Africa but found in the southern countries of Europe, is considered by most people to be a more handsome creature than the true civet—the fur is softer, that of the civet being harsh—and more prettily marked. The animal itself is more lithe in appearance, and when it depresses its body along the ground while watching its prey, such as a mouse or a bird, it would resemble a large lizard rather than a mammal were it not that its ears, being stiffly erected forward, destroy the illusion. The Linsangs, rarely imported into England, are probably the handsomest of all the civet-like animals, and are even more elongated in form than the genettes. The fur is most beautifully coloured and very pleasant to stroke—when the animal is dead; they greatly object to being touched or handled during their lifetime. The Palm Civet, nocturnal in its habits like the civet-cats, may be fed in similar manner; as might be expected, it is very partial to a fruit diet, being particularly fond of bananas. In the East it is generally known, and especially by Anglo-Indians, as the Toddy-Cat, this name being derived from its fondness for robbing the vessels used in collecting the palm juice from the trees.



SUMATRA CIVET

It is a matter for regret that the genettes and palm civets are not more freqently imported than they are, for their smaller size renders them handier as pets and more suitable in many ways as ladies' pets than the larger and occasionally spiteful civet-cat. Both genettes and palm civets, when they do come into the market, are slightly cheaper than civets, being about thirty shillings to fifty shillings. Zibetta (the Indian species) is dearer than the African kind, from fifty to a hundred shillings being the price.

ANIMAL DENTITION.

BY

R. LYDEKKER.

I. MAMMALS.

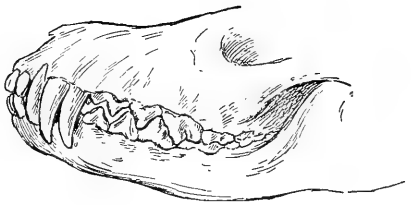


Fig. 1. Dentition of Double-Tusked Fox.

I WAS once asked by a seeker after zoological knowledge to enlighten him on the subject of "Animal Dentistry." Naturally I was somewhat astonished, as I cannot claim any knowledge of the proper way to extract a lion's tusks or to stop an elephant's molar; and I may add that I have no particular desire to learn such accomplishments. Further conversation soon showed me that the term "dentistry" was only my interviewer's ultra-popular synonym for the word "dention," and on my return home I consulted a dictionary to find out if there was justification for the former usage. The result of my search was to find, as I expected, that "dentistry" indicates only the surgical treatment of teeth. I was, however, somewhat surprised to learn from the same source that "dentition" properly means "the breeding or cutting of teeth in infancy; the time of breeding teeth." Strictly speaking, therefore, this term has no more right to be used in the sense in which it is employed by naturalists—that is to say, to designate the general characters and number of the teeth of animals—than the word "dentistry." Since, however, its employment in this sense is now universal in the scientific world, I make no apology for continuing to follow this usage. If my readers desire a more thoroughly technical term, "odontology" (that is to say, the science of teeth) is at their service.

So much by way of preliminary. I now pass on to my proper subject, in which, from its extent, I find a great difficulty in knowing where and how to commence.

Perhaps the most essential features in connection with the dentition of mammals are, firstly, that the teeth are confined to the margins of the jaws, where they form a single row, and, secondly, that (with the exception of certain aberrant types such as whales, dolphins, and manatis) their number is strictly limited and definite. Not less important is the fact that only two sets of teeth are ever developed during the whole of life, namely, a milk, or baby, set, which is shed in youth, and a permanent series, which has to do duty for the remainder of the term of its owner's existence (Fig. 2). Sometimes there is not even this single replacement, and only one set is developed. In all cases the teeth are implanted in separate sockets, and very generally those of the hinder part of the series have two or more roots.

Fig. 2. The Permanent (upper line) and "Baby" (lower line) Teeth of the right side of the upper jaw of a Dog, removed from their sockets.

Another essential feature of the dentition of most mammals is that the teeth in different parts of the jaw are unlike one another. Commonly, as for instance in a dog or a fox, the dentition is divisible into three well-marked series. First of all we have the single pairs of tusks, or canines, in each jaw, of which

Fig. 3. Enlarged outer view of imperfect lower jaw of an extinct Marsupial-like Mammal, wanting the incisors and two or three of the molars and tusk.

the upper one bites behind the lower one. The teeth in advance of these (of which, except in marsupials, the maximum and typical number of pairs is three) are the incisors, while those behind them, which do not normally exceed seven pairs, are the cheek-teeth or molars. In technical descriptions it is usual to divide these cheek-teeth into molars and premolars, but into such refinements of classification it is unnecessary to enter on the present occasion, and it will suffice if we call them all molars. I have said that the number of teeth in mammals is usually definite and limited, and that there is never more than a single pair of tusks in each jaw. The reader may accordingly ask why in the fox's skull figured at the head of this article there are two pairs of these teeth. To this it may be replied that allowance in nature must always be made for individual abnormalities, such as four-legged chickens and six-toed cats, and that such abnormalities may be inherited. This fox's skull is a very rare and interesting instance of such an abnormality, the two complete upper tusks being probably due to the splitting of the tooth-germ. That such is really the case seems to be demonstrated by other abnormalities in fox-skulls (of which there is an example in the Natural History Museum), these showing a splitting of the upper extremity of one or more of the tusks, clearly due to partial division of the germ.

The division of the teeth of mammals into incisors, tusks, and molars appears to date from very remote antiquity, and is probably inherited from extinct reptilian ancestors (the so-called anomodonts of South Africa and elsewhere), in which a similar division of the teeth into three groups is noticeable, although no such differentiation occurs in modern reptiles. In the earliest mammals, as exemplified by the imperfect lower jaw shown in Fig. 3, it is probable that all the molars were of the same general type, and usually seven or eight in number, their crowns terminating in sharp cusps. Frequently the tusk, or canine, was double-rooted. With the exception of the latter feature, such a type of dentition is preserved at the present day by the opossums of America (although not by the animals thus miscalled in Australia), and by certain other carnivorous or insectivorous marsupials.

In the great majority of existing mammals the dentition has become more or less modified from this primitive type—least so, perhaps, in the carnivorous, and most so in the herbivorous. In some cases this modification takes the form of a reduction in the number of the teeth, in others by their alteration in form and structure, both types of modification not unfrequently occurring together. For the most part these variations from the typical number and form are connected with the food of the various groups in which they occur; in other words, they are adaptations to function. In this connection it is specially worthy of notice that among the herbivorous groups reduction generally takes place in the number of the front teeth (incisors and tusks), while the cheek-teeth become proportionately enlarged and specialised. Of this we have a noticeable instance among the ruminating mammals. In the carnivorous forms, on the other hand, where they are of prime importance in seizing and holding the prey, the front teeth, for the most part, undergo

Fig. 4. Side view of the Dentition of Lion.

no reduction in number and attain great development in size. The cheek-teeth, on the other hand, tend to become diminished in number, although such as remain are specially modified for their particular function, and thus assume a form totally different from those of the herbivorous species. A notable instance of this type of specialisation (as it is called by naturalists) is afforded by the lion and other members of the cat tribe.

Among existing carnivora the group which presents the smallest departure from the primitive type of dentition is perhaps that of the dogs, wolves, and foxes. As shown in the figure of the fox's skull (making allowance for the abnormal duplication of the upper tusks), the three pairs of incisors and the single tusk are well developed in both jaws; and behind these come six pairs of cheek-teeth in the upper and seven in the lower jaw. The dentition therefore only falls short of the typical number of forty-four by two, this diminution being due to the loss of the last pair of upper molars. Even these are present in one peculiar African member of the family—the long-eared fox. The earlier cheek-teeth of the dog and fox are not very unlike the primitive type; but the fourth tooth behind the upper tusk and the fifth behind the lower one are much longer and larger than those in front of them, and have their crowns furnished with sharp flattened blades, which cut against one another like a pair of scissors. To these specially modified teeth the name of carnassials, or flesh-teeth, has been appropriately given. The teeth behind the flesh-tooth in each jaw of the dog and fox have broad and expanded crowns, mainly adapted for mastication.

Fig. 6.

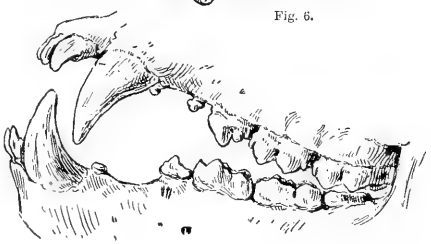


Fig. 5.

Figs. 5 and 6. Side view of Dentition of Bear and the last two left Upper Teeth of same.

An examination of the lower flesh-tooth of either of the animals last mentioned will serve to show that only its front half is designed for a scissors-like mode of action, the hinder portion of the crown being flat and tuberculated, and thus adapted for mastication. In the lion (Fig. 4), as well as in other members of the cat tribe, the carnassial teeth in both jaws are entirely adapted for cutting, and consist wholly of blade. They are, moreover, relatively larger in proportion to the other cheek-teeth, of which latter the number is much less than in the dog tribe; while the tusks are likewise very large and powerful. This is, in fact, the most perfectly-developed type of carnivorous dentition now existing, the powerful tusks being adapted to seize and hold prey and make the first incisions in the carcase. The incisors form strong pincers to strip the flesh from the bones, while the flesh-teeth sever the strips of flesh into convenient lengths for bolting whole. Unlike a dog, a cat never masticates its food at all; and this is the reason why the former animal takes so readily to a diet of biscuits, while the latter can only be persuaded with difficulty to eat this kind of food. In an extinct group of cats—the sabre-toothed tigers—the development of the flesh-teeth and tusks was much greater than in the lion, the latter teeth being in some cases seven or eight inches in length, with serrated edges. Such tusks would close the aperture of the mouth if opened only to the usual extent, and it is probable that these fell creatures had the power of lowering the lower jaw at a right angle to the palate, and then using their upper tusks to stab their victims.

In the bear tribe the flesh-teeth are much diminished in size, and have almost completely lost their cutting form and scissors-like action, as is shown in Fig. 5, where

the third tooth behind the tusk in the upper jaw and likewise the third in the lower jaw are the flesh-teeth. On the other hand, the molars to the rearward of the flesh-teeth (Figs. 5 and 6) are very large, and have broad crown-surfaces surmounted with small blunt tubercles. Apparently the teeth between the tusks and the flesh-teeth are of no use to a bear, for we find them very small and falling out at an early age. As a whole, the bear's dentition is adapted to a diet of roots and fruits rather than to one of flesh; and we know that most of these animals feed chiefly on substances of the former nature, supplemented from time to time by a meal of carrion. From a certain resemblance between them it might be supposed that the molar teeth of bears and pigs are derived from a common ancestral type. Such, however, is not the case, since it has been ascertained that bears are the descendants of dog-like animals. Accordingly we may consider that their cheek-teeth have undergone a kind of retrograde or degenerate development. That is to say, the dentition, after being specialised up to a certain stage for purely carnivorous habits, subsequently underwent a further specialisation for habits of a precisely opposite nature.

Although seals are as purely carnivorous as any animals, their cheek-teeth are totally different from those of the land carnivora. Fig. 7 shows in profile the dentition of the leopard-seal of the Antarctic, in which the teeth attain the extreme development of the structure characteristic of the true, or earless, seals in general. It will be seen that all the five pairs of cheek-teeth in each jaw are practically identical in character, and consist essentially of three sharp recurved conical cusps placed one before another; there is thus nothing to correspond with the flesh-teeth of the land carnivora. Such a type of dentition is obviously adapted to the retention of slippery prey like fish, on which so many seals subsist. It is inferred from the absence of all trace of flesh-teeth that seals are not descended from any of the land carnivora as we now know them, but may trace their ancestry direct to certain early forms which had not developed the characteristic flesh-teeth. The earless seals, or sea-bears and sea-lions, on the other hand display a different type of dentition; and it is far from improbable that these animals are more nearly related to the modern land carnivora, especially the bears. The walrus stands quite alone among the seals as regards dentition, having a pair of very long tusks in the upper jaw and a small number of simple flat-crowned teeth in both jaws. Here, again, we have an obvious instance of adaptation to habits, the long tusks being for raking up the mussels and clams on which the walrus feeds (and perhaps also at times to assist the animal in hauling up its bulky carcase on to land or ice), while the flat-crowned cheek-teeth are admirably suited to crushing their hard shells. Probably there is no mastication, the crushed bivalves being swallowed whole, like oysters.

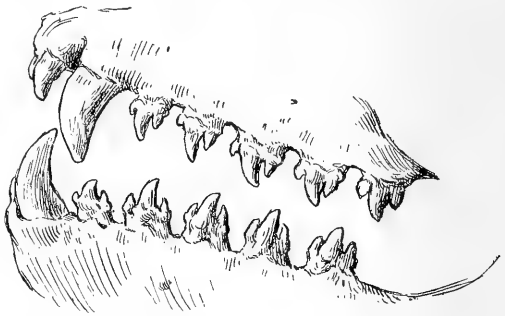


Fig. 7. Side view of Dentition of Leopard-Seal.

Quite unique among mammals is the type of dentition displayed by dolphins and grampuses and their gigantic relative the sperm-whale. In the former animals teeth are developed in both jaws, but in the sperm-whale they are confined to the lower jaw. There are three peculiarities in regard to the dentition of the "toothed whales," as the foregoing species and their relatives are termed. In the first place, the teeth are

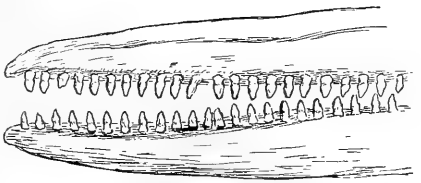


Fig. 8. Side view of the Teeth of a Dolphin.

much more numerous than in ordinary mammals; secondly, they are all alike; and, thirdly, they are in the form of simple cones. It might at first sight seem probable that dolphins present the primitive type of dentition from which the various more complicated forms have been evolved. But there are several reasons against this view, notably the fact that ancestral dolphins had teeth differentiated into the usual three series, and those of the cheek-series complex in structure. Possibly modern dolphin-teeth may have been produced by the splitting of earlier three-cusped teeth. Be this as it may, it is perfectly evident that dolphins have undergone a retrograde or degenerate dental development. Not that by this I mean to infer that their dentition is ill-adapted to their mode of life. Quite the contrary, for their numerous sharp-crowned teeth are well fitted to seize and break up the fish, cuttles, or squids on which these creatures subsist. One kind of dolphin—the Arctic narwhale—has an altogether peculiar type of dentition, the males being furnished with the well-known spiral tusk, which is usually developed only on the left side of the upper jaw, although in rare instances those of both sides attain full development. There has been much dispute as to the function of these splendid fluted tusks; but as the females manage to get on perfectly well without them, they are probably used as fighting-weapons by their owners. Of course there is the reply that if the males of other dolphins can conduct their battles without the aid of such weapons, the narwhale could do likewise. But objections of this nature could be raised against any theory of the function of these teeth that might be suggested.

Taking leave of mammals whose diet is composed to a greater or less extent of flesh, we may turn our attention first to the omnivorous and then to some of the purely herbivorous forms. An excellent example of the former is afforded by the wild boar and other members of the pig tribe. Here it will be seen (Fig. 9) that large and powerful tusks are retained, and that the hinder molars have broad and flattened crowns (Fig. 10) surmounted by blunt tubercles. Their teeth, in fact, recall to a certain extent those of the bears. The earlier molars, on the other hand, have laterally compressed and cutting crowns, well suited for breaking-up roots and tubers before they are subjected to the crushing action of the hinder teeth of the series. The forward inclination of the lower incisors is doubtless also an adaptation to the needs of an animal which obtains much of its food by grubbing in the ground. From those of the carnivora the tusks of the wild boar differ not only by the circumstance that the summits of the lower pair are worn against the sides of the upper ones so as to produce an oblique cutting-edge of razor-like keenness, but likewise by their peculiar semicircular curve and the fact that they continue to grow throughout the life of their owners. From this it results that when the upper tusk of a wild boar is broken off, the lower one continues to grow till it forms an almost complete circle and the tip pierces the jaw close to its point of origin. Advantage of this peculiarity is taken by the natives of New Guinea and elsewhere, who, by breaking off the upper

Fig. 10.

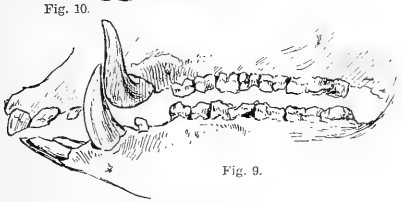


Fig. 9.

Figs. 9 and 10. Side view of Dentition of Wild Boar, and Crown Surface of last left Upper Molar of same.

Fig. 11.

Fig. 12.

Figs. 11 and 12. Side view of the Dentition of the Giraffe, and Crown Surface of left Upper Molar of the same.

tusks of wild boars kept in captivity, obtain without further trouble beautiful armlets formed by the overgrown lower tusks.

Since the food of pigs requires comparatively little mastication, molars with low crowns and of simple structure fulfil all requirements. Not so with the ruminants and other mammals which subsist on grass or leaves. These substances require an immense amount of mastication, and we consequently find that the molars of the ruminants (Fig. 12), instead of being surmounted by simple blunt tubercles, are crowned with four crescents separated from one another by deep pits, the crescents being turned in opposite directions in the upper and lower jaws. In the giraffe, which subsists by browsing, the crowns of the molars are not very much taller than in the pig, but in many antelopes and all sheep and oxen, which graze, these crowns become very tall, and thus take much longer to wear out than would otherwise be the case. From this it may be inferred that grass (and corn) takes a much greater amount of mastication than is necessary for leaves, and we may trace a gradual heightening of the molars as we pass from the browsing giraffe through the deer, which feed partly on leaves and partly on grass, to sheep and oxen, whose food is almost exclusively formed by grass.

In groups which have not to procure for themselves animal food and do not depend upon their tusks to defend themselves from peril, it is obvious that there will be little or no use for these weapons. In the camel, indeed, which is of a spiteful and aggressive disposition and is in the habit of inflicting very nasty bites, tusks, although of reduced dimensions, are retained in both jaws. The true ruminants, on the other hand, such as the giraffe (Fig. 11), deer, antelopes, and oxen, have either completely lost their upper canines, or these are reduced to mere insignificant rudiments. Moreover, all these animals have entirely lost all their upper incisor teeth, which are replaced by a hard callous pad, against which the lower incisors bite. Looking at the figure of the lower jaw of the giraffe, the reader might well imagine that the ruminants had also lost their lower canines. This, however, is not the case, these teeth having assumed much the same shape as the lower incisors, and with them forming a continuous series of four pairs in the front of the lower jaw, separated by a long gap from the cheek series, and admirably adapted to twist off bunches of grass or leaves by nipping tightly against the hard pad in the front of the upper jaw.

The giraffe's dentition is, however, worth a moment's further consideration. An inspection of the drawing will show that the crowns of the outermost of the four pairs of lower front teeth have bilobed crowns, whereas those of a deer or an antelope are simple. What is the meaning of this? Anyone who may watch a deer browsing will see that it eats both leaves and the smaller twigs on which they grow. A giraffe,

on the other hand, merely combs off the leaves without injuring the twigs; and the more complex crown of its outer pair of lower front teeth is probably to render this combing action more complete. The reason why giraffes have lower-crowned cheek-teeth than browsing deer is likewise obvious from the foregoing statement, leaves clearly requiring less mastication than a mixture of leaves and twigs. One other remark before leaving this part of my subject. Ruminants of the modern type are a comparatively late development in the earth's history, their ancestors being animals with a full series of teeth of simpler type. Evidently, then, these animals only came into being as deciduous trees and grassy plains replaced the evergreens and marshy swamps of earlier periods of the earth's history. Finally, the absence of tusks, as effective weapons of offence, is compensated in the ruminants either by the development of horns or antlers, or by the speed with which these animals are endowed.

Space permits of but brief reference to the dentition of the tapirs and rhinoceroses. The former are noteworthy as being some of the few hoofed mammals which retain the typical number of forty-four teeth, and also from the fact that their whole dentition is very like a type that was prevalent during the Tertiary epoch. The molars are low-crowned, with simple transverse crests, connected in those of the upper jaw by a longitudinal outer wall. In the rhinoceroses the cheek-teeth are of a more complex type, while the front teeth are either, as in the Oriental forms, reduced in number, or, as in the African species, altogether wanting. All the Oriental species have one pair of lower front teeth developed into triangular tusks, projecting almost horizontally from the jaws and capable of inflicting fearful gashes, these animals fighting with their tusks, and not with their horns.

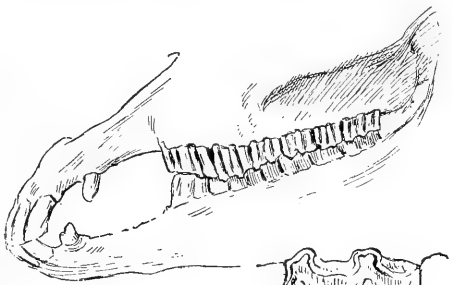


Fig. 13.

Fig. 14.

Figs. 13 and 14. Side view of the Dentition of the Horse, and Crown Surface of left Upper Molar of the same.

Although the horses and zebras are near allies of the tapirs, their dentition is of a totally different type, being modified for a diet of grass, and the molars consequently having very tall crowns. Indeed, the horse family forms in this respect a parallel to the ruminants in the group of cleft-hoofed mammals, the molars (Fig. 14) showing four crescents on their grinding-surfaces, although the pattern formed by these is quite different from that obtaining in the ruminants. Unlike the ruminants, the horses retain the full series of incisors and tusks in both jaws, although the latter are often absent in the mare. Moreover, the lower tusk, when present, is quite apart from the incisors, standing nearly midway in the gap between the latter and the molars. From the presence of a full series of incisor teeth in both jaws, which close on one another like pincers, a horse, unlike a deer or an ox, can inflict a very nasty bite. For the same reason these animals can graze much closer than ruminants of the same bodily size, and can therefore thrive on pasture where the latter would starve. It is probably owing to the absence of either horns or antlers that the members of the horse family have retained their front teeth as fighting-weapons, and the difference in this respect between these animals and the ruminants (both of which are specially adapted for grazing) affords an excellent instance of how the same end is attained by different means.

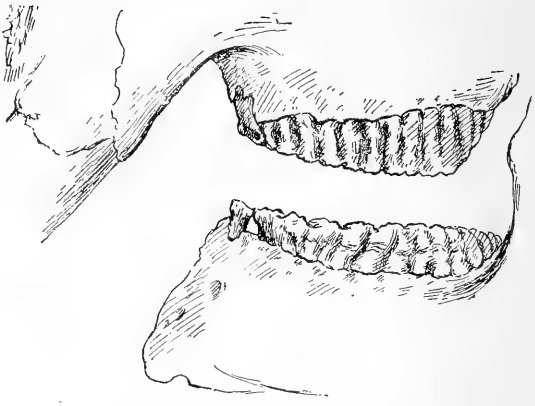


Fig. 15. Side view of the Dentition of the Indian Elephant.

Among all living hoofed animals perhaps the most remarkable and most specialised type of dentition is presented by the elephants. Nevertheless, recent discoveries have enabled us to trace this highly-modified condition into close connection with the ordinary type, although it is impossible to allude further to this subject on the present occasion. As we all know, a modern elephant has a single pair of tusks (which grow continuously throughout life) in the upper jaw, and no other front teeth whatever. Instead, however, of corresponding to the tusks, or canines, of a wild boar or a lion, the elephant's tusks represent one of the three pairs of incisors of the latter animals, this being rendered certain by their being implanted in a particular bone of the skull. An elephant never has more than portions of two pairs of molar teeth in each jaw in use at any one time, and in old age has but one pair, thus having only six teeth altogether at this period of its existence. During the whole life of an elephant there are, however, six pairs of molars developed in both the upper and the lower jaws, the first of them being quite small and in use only during the period of suckling, while the last are the huge grinders, weighing many pounds, with which we are all familiar as curiosities. As the smaller and earlier teeth are gradually worn away they are pushed out by the teeth immediately behind them, which rise from the jaw in an arc of a circle. When the last molar is worn out, the life of the elephant necessarily comes to an end; but the great size, mode of succession, and complex structure of the later molars renders this process of wearing out very slow indeed, so that the life of an elephant may embrace a couple of centuries, or even more.

No more wonderful grinding-apparatus than that formed by the dentition of the Indian elephant (in which species the molars are more complicated than is the case in its African relative) is, indeed, to be met with throughout the class of mammals. To describe in detail the structure of an elephant's molar would require more space and more figures than the publishers would care to afford. It must accordingly suffice to state that the crowns of these teeth are formed by a number of closely-packed transverse and vertical plates, made of substances of different hardnesses, and thus producing by their wear an uneven surface of great grinding power. In the Indian elephant these plates are thinner and more numerous than in the African species, and thus form a finer and more efficient mill. The reason of this is not far to seek, the Indian species feeding on grass, rice, and foliage, while its African cousin prefers roots and tubers, which require much less fine mastication.

The immediate ancestors of the modern elephants, the extinct mastodons, were evidently much shorter-lived animals, as we infer from the nature of their molar teeth (Fig. 16). In place of only two, there may be portions of three pairs of molars in each jaw in use at the same time, while the teeth themselves are smaller and of less complicated structure. The numerous and tall plates of the elephant's molar are, for instance, replaced by from three to five or six low ridges separated by wide valleys,

and in consequence of this the jaws must have had a vertical champing action instead of a horizontal grinding movement. Again, in most mastodons the upper tusks are bent downwards, instead of curling upwards like those of the elephants, and some species of the former were also furnished with a pair of tusks in the lower jaw. From such four-tusked mastodons there is a transition to other extinct species in which the tusks are but slightly larger than the other incisors (which are retained), while the molar teeth depart but little from a normal type.

Altogether unique is the type of dentition presented by the rodents, or gnawing mammals, such as squirrels, beavers, porcupines, hares, etc. With the exception of the hares, rabbits, and picas, in which there is an additional small, functionless pair behind those of the upper jaw, the front teeth in both jaws are reduced to a single pair of large ever-growing incisors, faced with enamel only on their broad front surfaces, and kept worn to a sharp chisel-like edge by constant use. As these teeth grow in the arc of a circle and are only kept of the proper length by wear, it is obvious that if one be broken, its fellow of the opposite jaw will, as in the above-mentioned case of the wild boar, continue to grow till its point re-enters the jaw close to the root. Behind these chisel-like incisors comes a long gap, without a vestige of a tusk, and then follow the molars, usually three or four in number in each jaw. In many rodents, such as squirrels and mice, the molars are low-crowned and capped with low tubercles, so as to be very like miniature mastodon-teeth. Other groups, however, such as the voles, have the crowns of their molars formed of closely-packed vertical plates, simulating the corresponding teeth of the elephants. This type of structure attains its maximum development in the large South American rodent known as the carpincho, or capibara, in which the last molar (as shown in Fig. 17) is much longer than the rest, and is composed of twenty or more plates.

Everyone who has watched a rabbit or squirrel feeding will have noticed that the jaws of these animals work with a backwards and forwards, instead of a sideways, movement, this action being characteristic of all rodents; and in order that it may be able to take place, the lower jaw is articulated to the skull in an altogether peculiar manner. The long gap between the incisors and the molars is doubtless connected with this action, as it also is with the habit of storing food in cheek-pouches characteristic of many rodents. Absolutely unique as is the dentition of modern rodents, there are nevertheless indications among fossil forms of a transition towards a normal type.

Since the teeth of the bats and their near relatives the terrestrial insect-eating mammals, such as hedgehogs, moles, shrews, etc., are all formed on a small scale, their description and illustration would be difficult in an article of the present nature. It may be observed, however, that while the fruit-bats or "flying-foxes" have smooth and low-crowned teeth, traversed by a median longitudinal groove, admirably adapted for mashing-up fruits like bananas, in the insectivorous species the crowns of the cheek-teeth are studded with sharp cusps, equally well suited to pierce the hard integuments of beetles and other insects. Many of the Insectivora have also teeth of the same type. On the other hand, the curious flying lemur of the Malay countries, which is generally included in the same group, has the lower front teeth with a remarkable comb-like structure of a type unknown elsewhere in the whole animal kingdom.

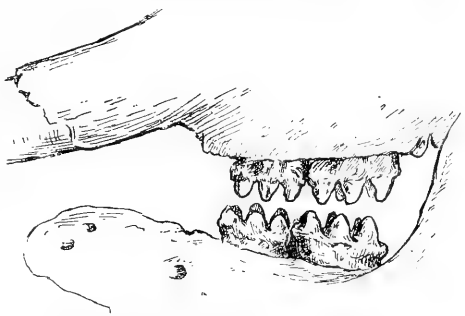


Fig. 16. Side view of the Dentition of a Mastodon.

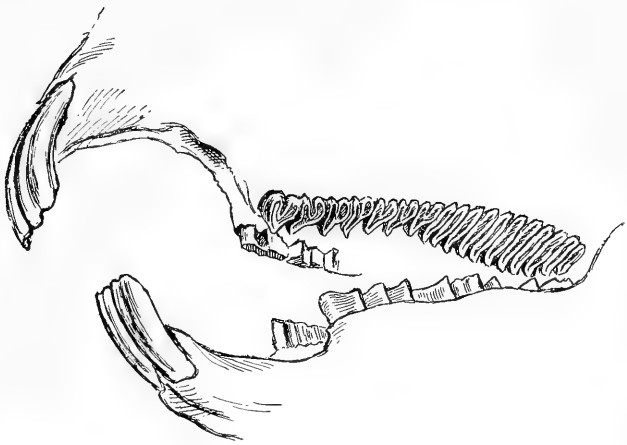
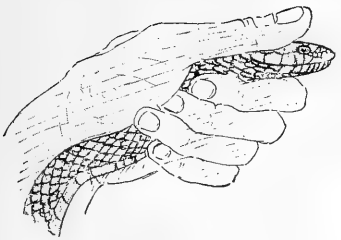


Fig. 17. Side view of the Dentition of the Carpincho, showing the Grinding-Surfaces of the Molars.

Limitations of space forbid detailed reference to many other more or less peculiar types of dentition met with in the mammalian class, most notable among which are the degenerate teeth of the sloths and armadillos of South America—a degeneration which has culminated in the total disappearance of teeth in their near relatives the anteaters of that continent. Enough has, however, been said in order to illustrate the numerous special adaptations of a common type for special functions, and likewise to demonstrate the general interest of the subject. Not less interesting is the study of the various structural modifications presented by the molar teeth of different groups of mammals and the manner in which these may be traced to a common type, but it is obvious that this could not be attempted in an article which has already largely exceeded its proper limits.

FOREWORD.

THE next article in this series will deal with reptiles, the third and fourth with fishes. Before these are published there will appear two articles on the subject of the Identification of Birds, by Mr. Frank Finn, the first of which will be found in our November issue. The Editor believes that the way in which the author has treated his subject is unique, both on account of its originality and its simplicity. Several other important articles relating to birds are in preparation by the same authority for ANIMAL LIFE, and the Editor also has pleasure in announcing that he will shortly publish in these pages two articles entitled "Traces of Animal Habits," by Dr. Walter Kidd, in which special reference is made to the conclusions which may be deduced from a scientific study of the direction and disposition of the hair in mammals.



HOW TO HOLD A SNAKE.

A DAY'S SNAKE-HUNTING IN SOUTH AFRICA.

BY

CAPTAIN W. E. TOLFREY CHRISTIE.

AS a boy in South Africa I was passionately fond of Natural History. Strange to say, the branch which fascinated me most was the study of snakes. Their grace, their exquisite colouring, and the subtle suggestion of mystery which to my boyish mind enveloped them, all combined to render their observation the most fascinating of pursuits. I kept a small Zoo of my own, which consisted mainly of snakes, poisonous and otherwise. The venomous species I rendered harmless by a method I will touch on later. The work of procuring new specimens was my greatest delight, and in this I was assisted by a schoolfellow, who was as keen as myself at the business. Many expeditions we took together, but none stand out as clearly as one memorable day in the summer of '91. Though South Africa is a country where snakes are fairly abundant, it requires a good knowledge of their habits to find them, a quick eye to detect them, and a still quicker hand to bring them to bag—that is, in an uninjured state. On the day in question we secured three. Starting out with our weapons of war and an ample provision even for our boyish appetites, we were well out into the flats by ten o'clock, with not a house within five miles of us and Table Mountain at our backs, looking strangely detached from its base as we gazed at it through the shimmer that rose from the scorching sand. Our equipment was simple, consisting of two long sticks with forked ends and a couple of coarse canvas bags, the mouths of which were closed by a cord run through rings sewn on outside.

Having come to a likely spot for our quarry, silence is now the order of the day. Stepping lightly—for snakes, I'm sure, are most sensitive to the slightest vibration—we pick our way over the sand, avoiding the touch of the heaths and grasses which are scattered over its surface, for a rustle from these, on a still day like this, would scare every snake within fifty yards. At last W—— throws up his hand, and silently stealing to his side I follow the direction of his finger, and there, in a tiny depression in the sand, and half buried from prying eyes, lies what we knew then as the Horned Adder. Dull grey, verging into brown in colour, with a wicked triangular head, this snake is practically identical with the Egyptian cerastes (*Cerastes cornutus*); sluggish as they look, when roused these snakes can move like the flick of a whip. Quietly separating, we approach from opposite sides, and W——, whose turn it is to try his hand, balances his stick for a second. There is a rapid thrust, a whirl of angry coils, and friend snake is writhing in the sand with the two prongs of the stick on either side of his neck. Now comes the ticklish part of the business, for a mistake here may mean an ample revenge to the angry little fury writhing at our feet. Taking my own stick I pin him down about half-an-inch behind the neck, and then very quietly place my forefinger under his throat, while my thumb slips along the half-inch of neck, moves gently along the head, and then—thumb and forefinger close in a lock that no small snake can wriggle clear of. A word to W——, and he pulls the sticks clear, leaving two feet of very angry snake winding round

my hand and vainly trying to extricate itself. Taking the bag he pulls out the neck to its fullest extent, and then, placing it on the ground, where, owing to the stiffness of the canvas, it stands by itself, he takes the two loops of the check strings in each hand and stands ready. In the meantime, with my left hand I have unwound the clinging coils, and the captive hangs for a moment inert. Now is the time. I lower him until his body is inside the bag; then with a quick jerk downwards his snakeship finds the bottom, the check strings are pulled, and the capture is complete. Such were our methods—foolhardy I daresay, but not so dangerous as would at first sight appear, for, reckless as boys often are, we never quite forgot what one small mistake might mean. Needless to say, neither of our respective parents had the faintest idea of how we procured our specimens. Had they known, our expedition would have come to an abrupt end.

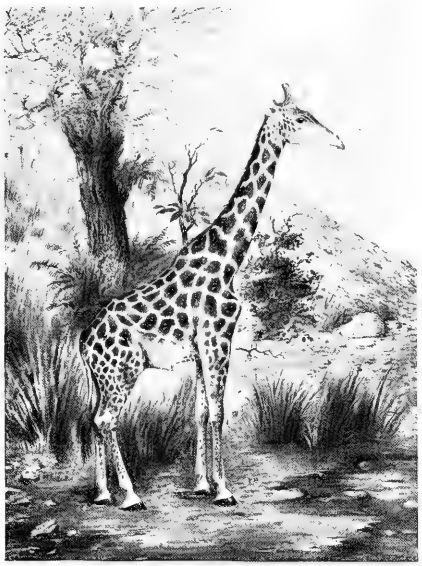
Elated by our success we struck off for a vlei about a mile away, where we intended to bathe and lunch. On our way there we make a second capture, almost stumbling on a fine Scarp Sticker, as these snakes are called at the Cape. I managed to pin it just as it was going to ground, and with scant ceremony it is bundled into the second bag, for the scarp sticker, though to all appearance a dangerous snake, is quite harmless. The Kaffirs are much afraid of them, and invariably assert that they are most deadly, which is a striking example of the gross ignorance so often shown by the natives when questioned as to the local fauna.

A long bathe and a short lunch, and then we strike out for a vineyard some three miles off, where we hope to secure a Puff-Adder, that most deadly of South African snakes. We always treated these with great respect; in fact we never attempted to capture them alive. A four-foot puff-adder would take some holding, as I doubt if there is any snake more powerfully built. Fortune again favoured us, for after a half-hour's ramble between the vines we nearly walked on top of a fine specimen, some four feet six inches long. Indignant at our intrusion it raises a hideous head, and the neck and body visibly increase in size. Then with a noise like a long-drawn sigh the air with which it has just distended itself is expelled. W—— pushes his stick forward, and the brute lashes out with a speed incredible in such a clumsy-looking snake, and a viciousness that lands it heavily flat on the ground. While W—— keeps the angry reptile employed, I make a flank attack, and one well-directed cut with a supple stick lays the puff-adder at our feet. We sling his still moving carcase on one end of a stick, with the two canvas bags to balance things at the other, and start for our tramp home, well satisfied with a most successful day. Our method of disarming snakes was simple in the extreme. Emptying the subject to be operated on into a big barrel, we proceeded to angle for him with a bit of coarse flannel, a foot of string, and a piece of springy bamboo. The fangs, being comparatively loose, become entangled in the flannel, and are jerked out. Once disabled temporarily like this, it is an easy matter to cut out the embryo teeth already formed, and the portion of the gum in rear of them. Cruel it may seem, but it appeared to inconvenience the snake very little. That it was effective I can vouch for. To anyone interested in snakes I can suggest no happier hunting ground than the vineyards and flats of Cape Colony.

NOTES AND COMMENTS.

The Angola Giraffe.

Mr. R. Lydekker writes:—"Since the article in last month's issue of Animal Life was in type I have obtained, through the courtesy of Mr. Rothschild, a painting of the adult bull giraffe from Angola in his museum at Tring, a photograph from which is herewith given. From all the giraffes figured in the article referred to, Mr. Rothschild's animal differs by the absence of the unpaired horn on the forehead, the apparent absence of this appendage in the bulls at Woburn Abbey and in the London Zoological Gardens being due to immaturity. The Tring specimen further differs from all the others, with the exception of the one from the Congo in the Tervueren Museum, in having the legs spotted nearly to the hoofs, and also in the tawny, instead of white, ground-colour of the portion below the knees and hocks.



ADULT BULL GIRAFFE FROM ANGOLA.
(Giraffa camelopardalis angolensis.)

"As regards the general coloration of the Tring specimen, it may be noted that the markings are of the netted rather than of the blotched type, the light lines on the neck and much of the body being white or whitish. The spots on the face are confined to the area lying below a longitudinal line running below the eye to the angle of the mouth. There is a small and indistinctly defined triangular area below the ear in which the ground-colour is white, and thus in strong contrast to the tawny of the face, and the under-parts are fully spotted. The body-spots have very ill-defined margins, and are very brown in colour, thereby differing markedly from the usual rufous or (in old bulls) dark chocolate tint. The spotting is of the same general type as that of the Tervueren giraffe (which, it may be remembered, was made the type of a new sub-species, under the name of *Giraffa camelopardalis congoensis* in the original article); but the spots on the upper part of the neck are shorter, the long second one in the middle row on the side of the neck being wanting. Moreover, there are more spots in the region of the withers and shoulder, while the margins of all the spots are less well-defined. Again, there is a much more sudden break-up into small spots on the middle transverse line of the thigh than in the Tervueren specimen, although this feature is by no means so marked as in the Kordofan giraffe.

"The absence of a distinct frontal horn (which is represented by a mere swelling, or tuberosity) affiliates the Angola giraffe to the Cape form (*G. c. capensis*). In the typical phase of that race, as represented by the old bull formerly exhibited in the Natural History Museum, the spots are blacker, the ground-colour is tawny, and the whole coloration is of the blotched type, the borders of the spots being ill-defined, and the intervening light areas very wide. Much the same features are displayed in the head and neck of a younger bull of the Cape race from the Kalahari desert exhibited in the Natural History Museum and figured by Mr. W. E. de Winton in the "Proceedings" of the Zoological Society of London for 1897 (p. 281). Perhaps the "blotched" type is not quite so conspicuous in this specimen as in the aforesaid old bull, which was

probably obtained further south; and in the female of the Cape form now living in the Society's Gardens the departure from the true blotched type is more decidedly marked. This may be taken to indicate a transition towards the eastern races of the species as we pass from the Cape Colony (the typical habitat of the southern race) to the more northern districts where *G. c. capensis* now alone survives. Comparing Mr. de Winton's figure of the Kalahari giraffe with the one here given, it will be seen that in the former the spotted area of the face is confined to a small area above and in front of the ear and does not extend in advance of the anterior border of the eye.

"Accordingly it appears that the Angola giraffe differs from the typical form of *G. c. capensis* by its lighter ground-colour, the more net-like type of coloration, the browner spots, and the greater extent to which the spots extend on to the sides of the face. Although it is quite probable that future researches may indicate the existence of a more or less complete transition between them, these differences justify, I think, the racial separation of the Angola from the Cape giraffe, and I accordingly propose to designate the former by the name of *Giraffa camelopardalis angolensis*, making Mr. Rothschild's specimen the type.

"It is somewhat curious to reflect that it is but a few years ago since only one form of giraffe was recognised by naturalists. Now we have two well-defined species, and some half-dozen local races of the second of the two, while it can scarcely be doubted that others remain to be discovered. I may add that I am informed by his Excellency the Secretary of the Interior for the Congo Free State that the giraffe in the Tervueren Museum was forwarded from the neighbourhood of Lake Tanganyika, but is believed to have been obtained from the plains of Katanga, in the southern extremity of the Congo State.

"I have recently been informed by Mr. Oscar Neumann that the male giraffe in the British Museum cannot be either *schillingsi* or *tippelskirchi*, in the latter of which the spots are very strongly stellate; I therefore propose to call it *G. camelopardalis rothschildi*. Its distinctive features are pointed out in the original article, but it may be added that the spots of the bulls are blackish at an early age. The female, Mr. Neumann thinks, may be *schillingsi*, *tippelskirchi* being at present unrepresented in this country."

The White Rump-Patch of Mammals.

A VERY distinct advance in our knowledge of the object and meaning of the coloration of mammals has been made in an article communicated by Mr. R. J. Pocock, of the British Museum, to "Nature" of August 13th. It is now well ascertained, as has been already explained in our columns, that the light colour of the under-parts of so many mammals is developed for the purpose of counteracting the dark shade thrown by the body when standing in full sunlight. On the other hand, the white or light-coloured patches which appear on the hind-quarters of so many ungulates have been almost universally regarded as "recognition-marks," designed to aid the members of a herd in following their leaders when in flight. And that these rump-patches do actually serve for this purpose, at any rate in the case of species, like the Japanese deer and the American prongbuck, in which the hairs are capable of expansion and erection into large chrysanthemum-like bunches, is perfectly evident. But Mr. Pocock has shown that when animals like the true quagga, and Burchell's race of the bonte-quagga, or the kiang, are lying in the characteristic ungulate manner, the white of the rump comes into line with that of the under-parts, and thus evidently aids in rendering them inconspicuous while in this posture. The fact is so simple and so evident when pointed out that it seems a marvel it was never noticed before. Nor is this all. In his chapter on protective coloration published in "Mostly Mammals," Mr. Lydekker stated that it was difficult to discover the reason why the quagga and Burchell's race of the bonte-quagga showed a tendency to lose the stripes on the hind-quarters, especially the lower part of the same, and to develop a light area

in this region. The reason, as Mr. Pocock points out, is now apparent. These animals inhabit a more open country than many of the other forms of zebra, and consequently when lying down are exposed to a much stronger light, so that they require the whole of the lower line of the body to be lightened when in this posture in order to do away with the effect of the deep shadow cast upon them; hence the light colouring of the buttocks.

The sable antelope affords another notable instance of the same type of colouring, the pure white of the buttocks forming a continuous line with that of the under-parts when in a recumbent posture, and thus no doubt neutralising the effect of the black upper-parts and of the shadow cast by the body. At the same time, the white rump-blaze in this and many other species probably also serves the purpose of a recognition-mark, so that it has a double function. It would be interesting to have an animal with this type of colouring stuffed in a recumbent position to illustrate the purpose of the rump-blaze.

The White Rhinoceros.

Had portable cameras been available in the early days of South African sport nothing would have been easier than to obtain photographs of the white rhinoceros, for these great beasts (second only in bulk to the elephant) were in the habit of coming quite close up to the waggons of the sportsmen, with the apparent intention of attacking them. Probably this was due to the creatures mistaking the waggons for some monstrous animal which had invaded their territory. Be this as it may, the white rhinoceros (apart from the race existing in equatorial Central Africa) is now on the point of

WHITE RHINOCEROS.

The first and perhaps the last photograph from life of a well-nigh extinct African monster.

extermination, surviving only in a remote corner of Zululand, where it is zealously protected by Government. And hitherto it has never, we believe, been photographed alive. Some time ago, however, Mr. C. R. Sanders, Chief Magistrate and Commissioner in Zululand, obtained a couple of excellent photographs, taken after death, of one of two of these rhinoceroses which had escaped from the reserve and been killed by the natives. These photographs were reproduced in a recent issue of the "Proceedings" of our Zoological Society. In the covering letter Mr. Sanders stated that he believed about ten of these animals were then living in the reserve, and that he did not despair of obtaining a photograph of some of them in life. In this he has been successful, as exemplified by the accompanying photograph, which we owe to the courtesy of Rowland Ward, Ltd., Piccadilly, to whom it was sent by Mr. Sanders, with permission to be reproduced. Unfortunately, the original photograph was on such a small scale that no great degree of enlargement was practicable. This reproduction clearly shows, however, four of these huge animals marching in single file through the jungle. The double horns are distinctly visible, although the characteristic square form of the muzzle is not apparent.

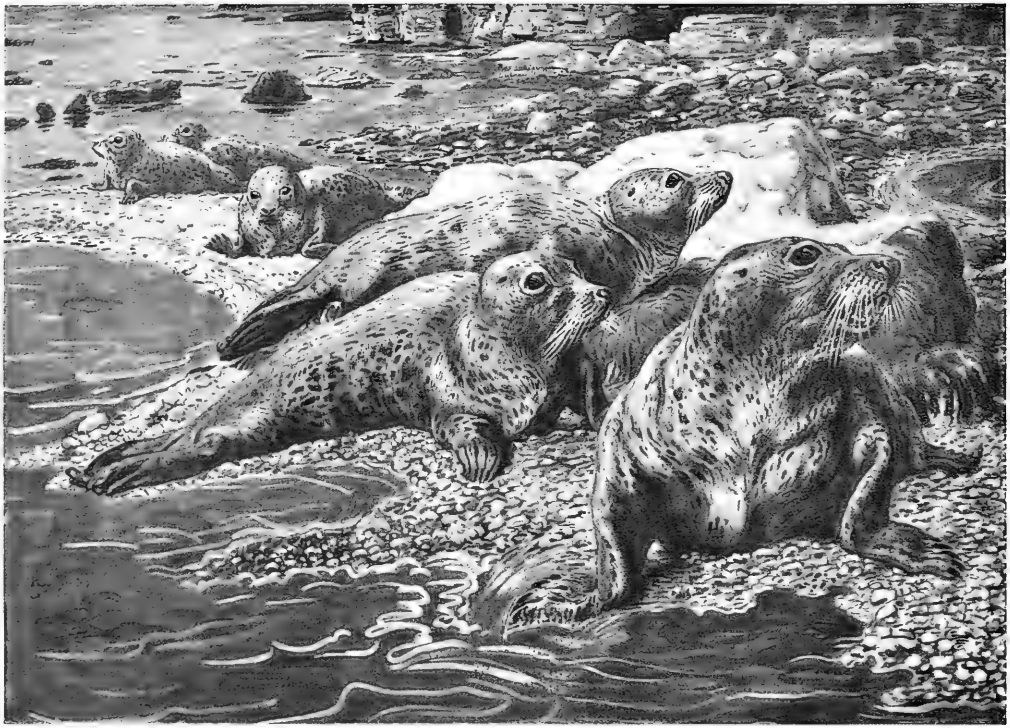
Some New Books.

We have to acknowledge the receipt of two books—"Following the Deer," by William J. Long, and "Rabbits, Cats and Cavies," by C. H. Lane. The former is not the less welcome because it has previously appeared as a series of animal studies in another volume. We have already had occasion to refer in these pages to Mr. Long's books. Here we cannot do more than say that any volume bearing his name as author, and Messrs. Ginn & Company's imprint as publishers, is certain of popularity with all animal lovers. Mr. Charles Copeland is again the illustrator. The other book, "Rabbits, Cats and Cavies," may be described as a companion volume to "All About Dogs." Mr. Lane has had much experience with the animals he writes about, and in this volume he gives his readers the benefit of that experience. The book is illustrated with about 100 original drawings by Rosa Bebb. Two other books received from Messrs. Ginn are "Ways of the Sixfooted," by Anna Botsford Comstock, and "The Insect Folk," by Margaret Warner Morley. Both are intended for children, especially the latter, and both are freely illustrated.

While on the subject of Natural History literature, mention should also be made of Mr. R. Lydekker's "Mostly Mammals," an interesting and important collection of zoological essays which practically brings the researches of naturalists during the past decade on many subjects within the compass of a single volume; and Sir Harry Johnston's "British Mammals," a work which has long been needed, and which few were capable of supplying. Always excepting the author of "Mostly Mammals," we doubt if, taking everything into consideration, a more capable author could have been found for this volume in the Woburn Library. Sir Harry Johnston, we happen to know, has taken an infinity of pains over this work, both as regards the text and the illustrations, and we think that the public will reward him with their unanimous approval.

An Excellent Appointment.

We had the pleasure of recording last month a high honour conferred upon one of our contributors—Mr. R. Lydekker, and this month we are able to announce that another contributor has been singled out for distinction, though of a lesser kind—this is Mr. W. P. Dando, who has been appointed Official Photographer to the Zoological Society. He is, we believe, the only contributor whose name has never been absent from a single issue of Animal Life since its publication. We understand that Mr. Dando is to illustrate the new Guide to the Gardens which the Society is about to publish.



THE COMMON SEAL *(Phoca Vitulina).*

From an original painting by Sir Harry Johnston: Author of "British Mammals," in The Woburn Library.

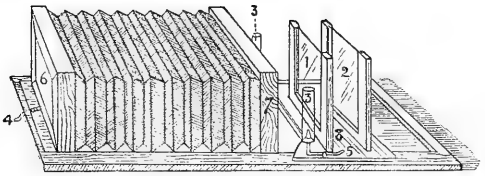


Figure of Apparatus.

HOW TO PHOTOGRAPH INSECTS.

Written and Illustrated with Photographs by T. A. GERALD STRICKLAND, F.E.S.

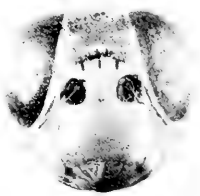
THERE are few things nowadays in which photography does not play a part. Is photography an Art? Some there are who ——, no matter! They say —— let them say! It is the scientific aspect that interests us. Many, no doubt, who go in for entomology own a photographic kit of sorts and would like to illustrate their notes, etc., especially if they write for the various magazines.

Some little time since I designed an apparatus for this work, and I am enabled, through the courtesy of the Editor of the "Amateur Photographer," to give an illustration of the camera.

First of all, and perhaps most important, it is not an expensive arrangement, as, in the event of the reader already possessing an outfit, the reversing-back, dark-slides and lens can be utilised without alteration. Lancaster, or any other maker, could make the necessary parts quite cheaply, for the woodwork may be pine, if well seasoned, and the bellows cloth.

Now to describe the Figure: You will see that the apparatus consists of a baseboard of suitable length carrying a simple camera and a couple of glass plates (1 clear and 2 ground) in grooved upright frames which are fastened on to a small supplementary baseboard (8) that slides to and fro and clamps where desired; (6) is the focussing screen and reversing-back, which we are supposing to be borrowed from the ordinary kit; (4) is an archimedean screw for fine focussing, and the front frame of the camera (7) is also made to slide and clamp; (3) are lamps, which may be for incandescent gas, electric light or oil. If we are working by daylight, the lamps (3) are removed and mirrors, preferably on ball-and-socket joints, put in their places.

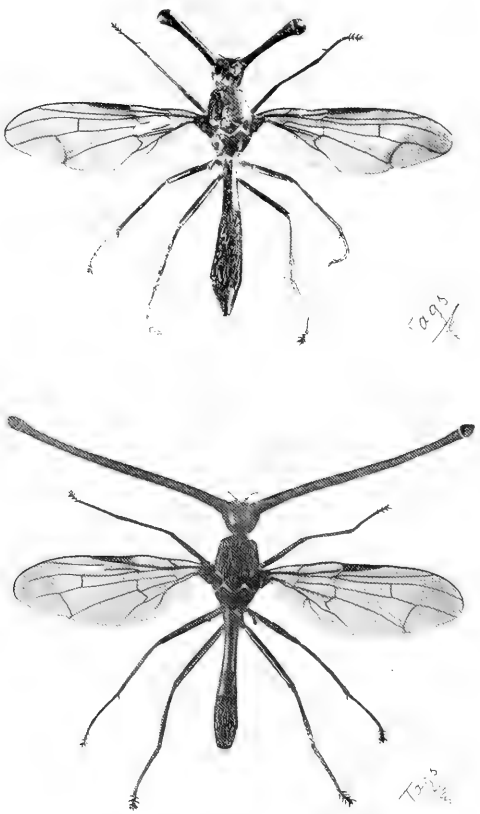
To use this "direct enlarging apparatus" we proceed as follows: If the illuminant we purpose using is daylight, we place the camera, etc., on a strong rigid table *facing* the window—that is to say, the light falls *behind* the insect or what not. The insect, if unmounted, is fastened on the sheet of clear glass (1) in this way: a tiny bit of cork is stuck on the centre and the object pinned on *that*. The piece of cork must be sufficiently small not to show at the sides of the insect's body in the ensuing photograph. A dipterous or other minute wing will often stick on the glass if the latter is first breathed on, so in this case the cork is unnecessary.


A Fly's Face, showing Compound Eyes and Antennæ Pits. × 9.

Having got our "sitter" in position, we cover the ground glass (2) with a sheet of cardboard or other opaque substance. With the aid of the mirrors in the daytime, or lamps at night, we throw the light on to the specimen, focus, insert the dark-slide and expose. Just before the exposure is complete the

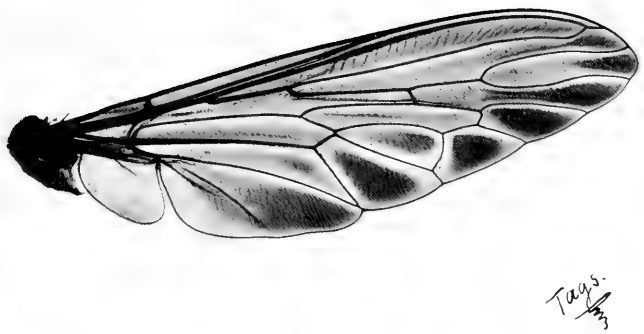
cardboard is removed for, say, two seconds to allow the light, artificial or otherwise, to shine through, thereby ensuring a pure white background, so essential in this work.

Before having the apparatus constructed you must decide what will be the greatest amount of enlargement you are likely to require, as it is simply a matter of length of bellows. We will suppose your lens has an equivalent focus of five inches. In this case, to photograph a specimen natural size the bellows must have sufficient "stretch" to allow a distance of ten inches between the plate and the optical centre of the lens, the specimen being the same distance from the lens. But to enlarge up to, *e.g.*, eight diameters, the plate must be 45 inches from the centre of lens and the specimen $5\frac{5}{8}$ inches; therefore you will note that for enlargements of many diameters a long "stretch" is essential. No guide can be given as to requisite exposure, so much depending on the *amount* of enlargement, the colour of the specimen, speed of plate, class of illuminant, etc. An isochromatic plate I find the most satisfactory, and sometimes a yellow screen is necessary, especially if the specimen is highly coloured. The frames holding the glass plates (1 and 2) are about five inches apart—thus, in the case of an unmounted insect, avoiding the bugbear shadow.



STALK-EYED FLIES. × 2.

In some instances it is not advisable, or indeed possible, to unmount a specimen from its card. In such cases special care must be given to the lighting, or bad shadows will result. Experience is the only guide.



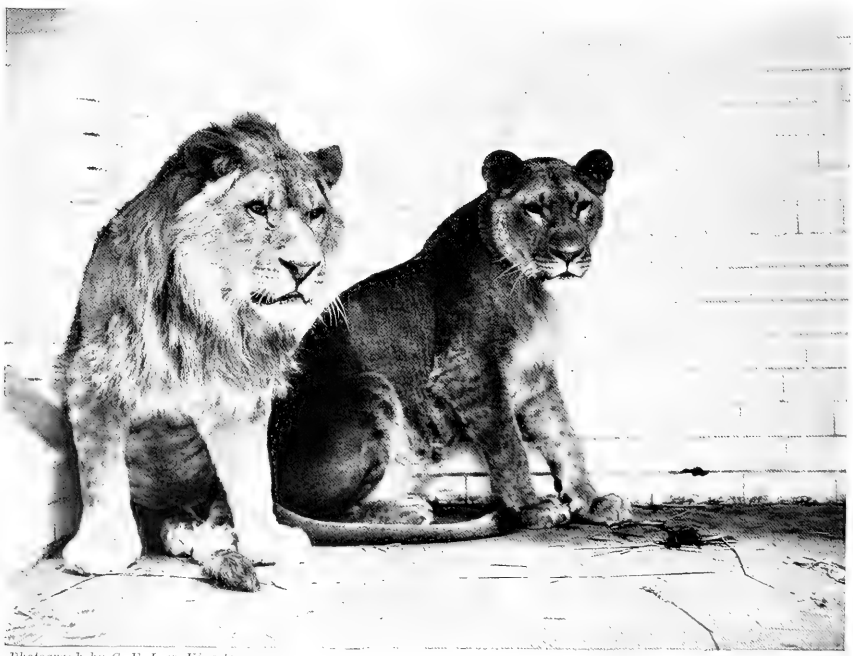
ASILUS CRABRONIFORMIS. WING OF ROBBER FLY. × 10.

BOMBEX DISCOLOR. A BEE-LIKE FLY FROM THE NEW FOREST. × 6.

THE DUBLIN LIONS.

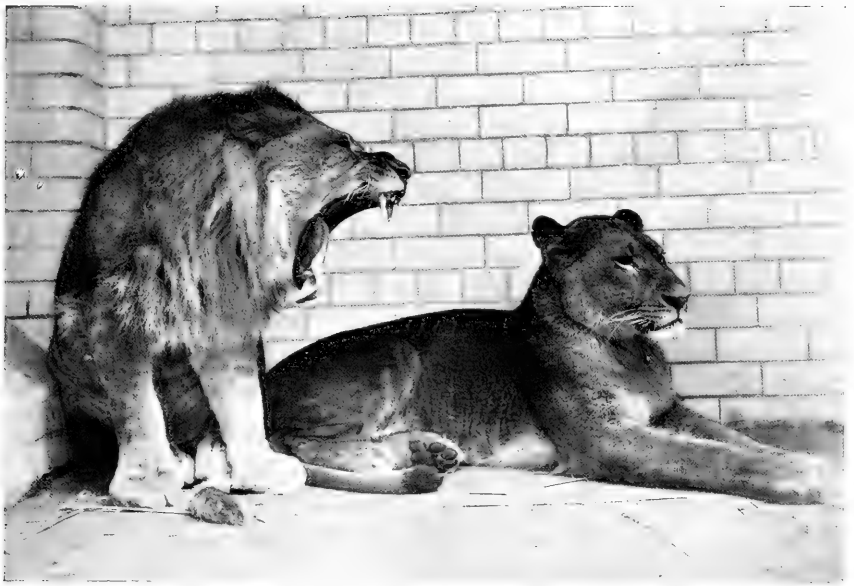
By Professor D. J. Cunningham, f.r.s.

FOR more than half a century the Dublin Zoo has been famed for its lions. About 230 cubs have been born in the lion-house, and these have been scattered all over the world and realised by their sale more than £5,000. Recently an interesting experiment has been tried. It is now well known that the distribution of the lion in prehistoric times was much wider than it is at present. In those early times the lion roamed over the greater part of Europe and was common in some parts of England—more particularly in Somersetshire. It is clear, therefore, that at that period it must have been capable of thriving in districts which possessed very different climatic conditions; indeed, even in Africa at the present day, the variations of temperature which it has to endure are very great indeed. Arguing from these facts it occurred to the Council of the Royal Zoological Society of Ireland that by keeping their lions in carefully-heated houses they might be pampering them unnecessarily, and they consequently resolved to place a pair in the open air and keep them there both day and night.



Photograph by G. E. Low, Kingstown.

JUST WOKE UP.



Photograph by G. E. Low, Kingstown.

BORED.

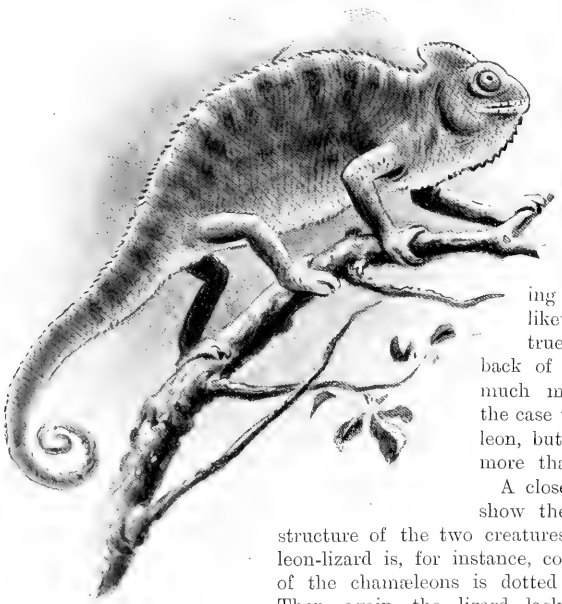
For this purpose they selected last October a young male and a young female, both of which had been bred in the Gardens, and both of which had up to that time been rather weaklings in comparison with the others out of the same litters. From that time to this, now nearly eight months, these lions have been in the open air. They are provided with a kennel, into which they retire at night, but with the exception of this and a roof which keeps them dry they have no other protection. From the first they have shown no signs of being cold, although they have passed through some exceptionally bitter and trying weather. Our photographs show them as they are now, and a finer pair of young lions it would be impossible to see anywhere. One difference will be noted, and that is in their coats. These have become long and almost shaggy, with a thick undergrowth of thick fur. Further, there is a reasonable expectation and almost belief that their reproductive capabilities, so far from being retarded or interfered with, have in reality been stimulated by the change. The Council await with anxiety definite results in this direction because, if matters turn out as they expect, they will be induced to greatly extend the practice of keeping lions in the open air.

A STRANGE RESEMBLANCE.

By R. Lydekker.

MOST people, I suppose, know what a chamæleon is; but even the readers of Animal Life may not perhaps be aware that these lizards have a somewhat peculiar geographical distribution. As a matter of fact, their range includes the extreme southern portion of Spain, the whole of Africa and Madagascar, together with the southern part of Asia Minor, the western and southern borders of the Arabian peninsula, and southern India and Ceylon. Such a distribution, it may be remarked in passing, is very different from that of any group of mammals; but that does not concern us on the present occasion. What I want to bring to the notice of my readers is that chamæleons are quite unknown in the countries to the east of the Bay of Bengal. Not very much in this, it may be said; and perhaps not. The curious circumstance is that Java, which forms part of the eastern boundary of the aforesaid bay, is the home of a certain lizard—technically known as *Ganyocephalus chamæleontinus*—which, although having no sort of relationship to the chamæleons, yet presents such a strong superficial resemblance to them that probably nine out of ten non-zoological persons, seeing a specimen for the first time, would say that it belonged to that group.

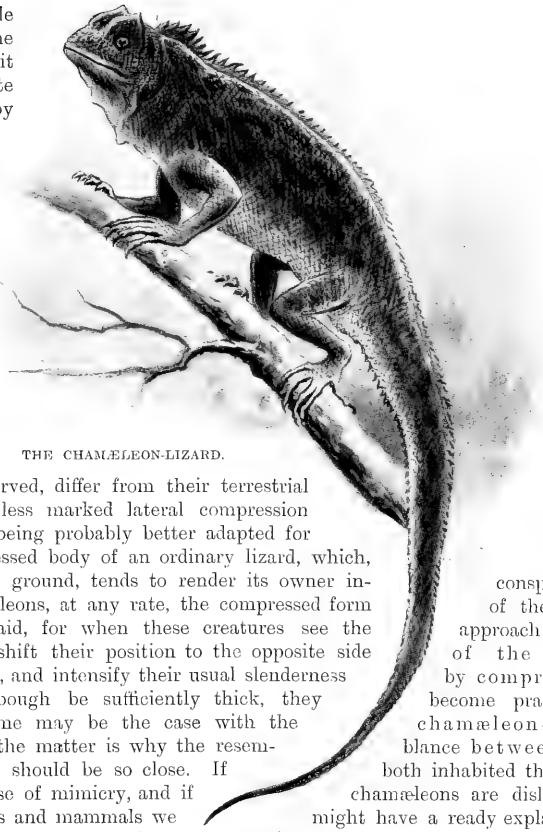
How curiously close is the resemblance between the two creatures will be apparent by a glance at the two figures reproduced herewith—the first showing the Indian chamæleon, and the second the chamæleon-lizard, as it may be popularly called. Both show the same helmet-like form of the head, the laterally-compressed body, with a sharply-keeled back, and the long tapering tail. The general colour is likewise very similar. It is true that the ridge on the back of the chamæleon-lizard carries much more distinct spines than is the case with that of the true chamæleon, but this might well be nothing more than a specific difference.



THE INDIAN CHAMÆLEON.

A closer examination will of course show the essential difference in the structure of the two creatures. The skin of the chamæleon-lizard is, for instance, covered with scales, while that of the chamæleons is dotted over with minute granules. Then, again, the lizard lacks the peculiar "telescopic" eyes, the remarkable divided feet, and the prehensile tail

of the chamæleons; while if we were to examine the tongue of the former it would be found to be quite unlike the type assumed by that organ in the latter.



THE CHAMÆLEON-LIZARD.

The resemblance between the two reptiles is, in fact, entirely superficial, and is doubtless correlated with the similarity of their mode of life, both being purely arboreal creatures, of slow and sluggish habits, and feeding upon insects. Arboreal lizards of all kinds, it may be observed, differ from their terrestrial cousins by the more or less marked lateral compression of their bodies, this form being probably better adapted for climbing than is the depressed body of an ordinary lizard, which, when pressed close to the ground, tends to render its owner inconspicuous. In the case of the chamæleons, at any rate, the compressed form of the body is likewise a protective aid, for when these creatures see the approach of an enemy they immediately shift their position to the opposite side of the bough to which they are clinging, and intensify their usual slenderness by compressing the ribs, when, if the bough be sufficiently thick, they become practically hidden. Possibly the same may be the case with the chamæleon-lizard. The strange thing about the matter is why the resemblance between the lizard and the chamæleon should be so close. If both inhabited the same country it might be a case of mimicry, and if chamæleons are disliked as food by reptile-eating birds and mammals we might have a ready explanation of the phenomenon. As it is, the chamæleon-lizard occurs, as already said, just beyond the limits of the range of the chamæleons.

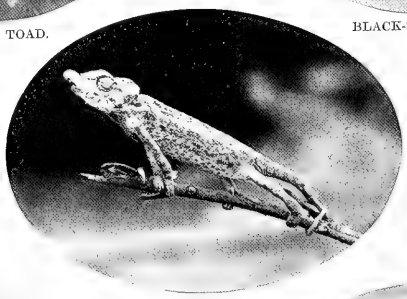
It might be suggested that chamæleons once inhabited Java, but have become extinct in that island. One among many objections to this idea is that the chamæleon-lizard is a member of a large genus, some of the species of which are inhabitants of a part of chamæleon-land, that is to say, India and Ceylon. But these species, I believe, do not present nearly such a close resemblance to chamæleons as is the case with *Ganyocephalus chamæleontinus* and a few other closely-allied Malay species.

The resemblance appears therefore to be an inexplicable puzzle. I had hoped to find some reference to such an interesting point in Dr. Gadow's excellent volume on reptiles in the "Cambridge Natural History," but was somewhat surprised to see that he does not even mention the genus of which the chamæleon-lizard is a member.

ZOO NOTES.

MOORISH TOAD.

BLACK-SPOTTED TOAD.



CHAMÆLEON.

CHANGEABLE LIZARD.

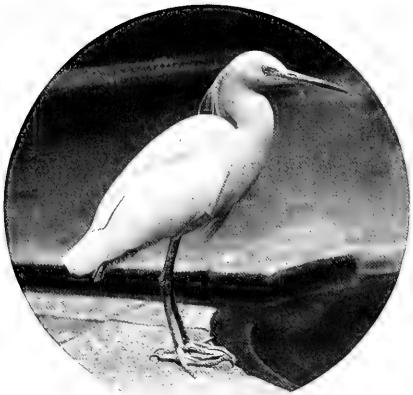
GIANT TOAD.

Photographs by W. P. Dando, F.Z.S.

A WALLABY.

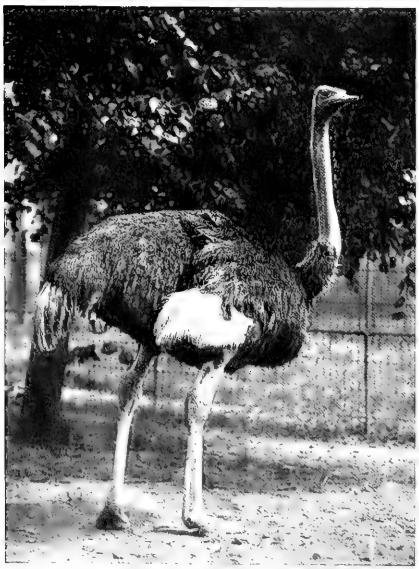
Photographs by W. P. Dando, F.Z.S.

GREAT KANGAROO.



SNOWY EGRET.
(*Leucophoyx candidissima.*)

MASAI OSTRICH.



SOUTH AFRICAN OSTRICH.

COCOI HERON.
(*Ardea cocoi.*)

Photographs by W. P. Dando, F.Z.S.

The Wanderoo Monkey here depicted is one of a pair which took up their quarters in the New Ape House, where lately resided the Silvery Gibbon, whose death we chronicled last month; but they have now moved to the Monkey House. Both animals are extremely shy, and it was only after many visits and a great amount of patience that the accompanying photograph was taken. The Wanderoo is about 25 inches in height, and with its tail about a yard long.

Photograph by W. P. Dando, F.Z.S.

WANDEROO MONKEY.

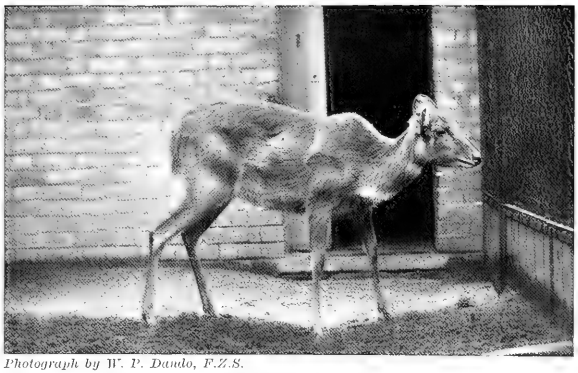
Selous's Antelope, as readers of Sir Harry Johnston's articles in the last volume of Animal Life will know, is a water-dwelling but not exclusively aquatic bush-buck from the Upper Zambesi and Lake Mweru. The photograph herewith reproduced is of a female specimen at present caged near the Hippopotamus Pond.

The Two Marsupials on page 129 are familiar examples of the large kangaroos and the smaller forms known as wallabies. The former are really magnificent animals, the Great Kangaroo having been known to attain a length of about eight feet from nose to tail, and a weight of well over eleven stone in some instances. This, however, applies to the male or "Boomer" only, the female being very much smaller. The "Boomer" is a formidable opponent to hounds, his great weight and power inclining him to fight rather than run, and when at bay he is dangerous to approach; for, although marsupials are credited with a low intelligence on the whole, the Kangaroo is quite clever enough to know that man is a more serious adversary than his dogs, and will leave these to attack him accordingly.

The wallabies, in their general habits, are much the same as the large kangaroos, although they are of shorter and stouter make. There are numerous species.

The Herons and Egrets form other examples of natural and closely-allied groups differing mostly in size and build, although in this case the smaller are the more slender and elongated in form, the largest Egret (*Herodias alba*) being a very slender bird compared to the typical Herons, some of which it equals in height. As a rule, however, egrets are not so tall as the herons proper, and they also differ in their adornment of filmy plumes in the breeding-season. These, as everyone knows, are always termed "ospreys" in the millinery trade, and have been the cause of wicked destruction of the birds. The species

shown, an American one, has been an especial sufferer, for in America this contemptible persecution of breeding birds has been carried to a great extent. The name "osprey," so curiously applied to the plumes, is probably a corruption of the French "*esprit*," by which these feathers were known in the time of the naturalist Pallas, who wrote about a century ago. All the true egrets are pure white.



Photograph by W. P. Dando, F.Z.S.

SELOUS'S ANTELOPE.

The Cocoi Heron is also an American species, but confined to the southern half of the New World. It much resembles our common grey heron, but differs conspicuously by its black cap.

The Two Fine Male Ostriches from Masailand, of the larger of which a portrait is given, agree with the North-African Ostrich (*Struthio camelus*) in having pale necks and legs without any tinge of grey; these parts in the males of the Cape and Somali ostriches being blue-grey or lead-colour. The Cape Ostrich is now dead, but the Somali Ostrich which has been lately acquired shows the difference in complexion well. These dark-skinned ostriches are nowadays separated specifically, the Cape Ostrich being called *Struthio australis*, and the Somali bird *S. molybdophanes*. The female and young of the latter bird, now also on view, are pale-skinned, and the difference does not seem a very important one, seeing that, according to Mr. Cronwright Schreiner, dark- and fair-skinned ostriches both occur on farms at the Cape.

Toads form the chief subject of illustration on page 132. Many persons have a great objection to these—we were going to say reptiles, but this is not zoologically correct, and we must therefore style them amphibians. Nevertheless, they are really very interesting creatures, and although some of them are downright ugly, others, like the Moorish, or Panther, toad (*Bufo mauritanica*) of North Africa, are very prettily coloured. This particular species is coloured very like our own natterjack. The black-spotted species (*B. melanostictus*), shown in our second illustration, which ranges from India to China, takes its name from the black warty pustules with which the limbs and body are covered, and is further remarkable for the presence of a pair of ridges on the head between the eyes. The chief claim to distinction of the South American and West Indian Giant, or Aqua, toad (*B. marinus*) is its huge size; the length being frequently as much as six inches, and the width of the body when in the usual squatting posture two-thirds of this. The skin is very warty, and the general colour dark brown above, with black patches. These creatures appear in swarms on moist evenings, and hop instead of crawling; as the males utter a kind of snorting bark, they are rather apt to alarm strangers not used to their ways.

The Lizard (*Calotes versicolor*) shown in the left lower illustration is a member of an Indo-Malay genus of so-called agamoids, all of which are remarkable for their habit of changing colour after the fashion of chamaleons. They are easily distinguished by the presence of a crest down the head and back, and the long tail; and in some the males have a large throat-sac.

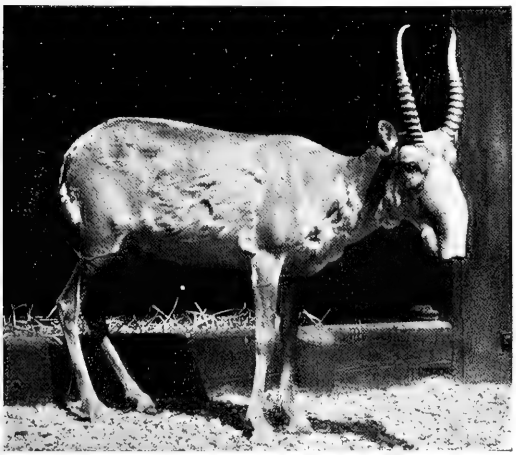
NOTES AND COMMENTS.

A Rare Mammal.

For the photograph on this page we are indebted to the Duchess of Bedford, and for the note accompanying it to Mr. R. Lydekker, who writes:—"Between the years 1864 and 1866 the Zoological Society's Menagerie in the Regent's Park received four specimens—three males and a female—of the strange and somewhat melancholy-looking antelope known as the Saiga. None of the four survived long in captivity, and since 1869 or 1870 (at latest) the species has been unrepresented in the collection. A few years ago, however, a small herd of these creatures was added to the Duke of Bedford's wonderful collection at Woburn Abbey, but unfortunately they were somewhat injured during the voyage to this country, and most or all of them died after a short sojourn in one of the paddocks. More recently another small herd was purchased by the Duke, and these have been more successful, several of them being in excellent condition at the time the accompanying photograph of one of the rams was taken. It is true that the creature looks in a somewhat dilapidated and 'out-at-elbows' condition, but this is due to the circumstance that when the portrait was taken it had not succeeded in getting rid of its shabby winter coat, which is shed piecemeal.

"Saigas are somewhat clumsily built sandy-coloured antelopes of the size of small sheep, distantly related to the graceful gazelles, and not improbably nearer cousins of the chiru of Tibet, which shows some approximation to them in the form of its muzzle. Although the males alone are furnished with horns, both sexes have the curious inflated and trunk-like muzzle which forms the most characteristic feature of this antelope, and communicates to the whole physiognomy the aforesaid air of melancholy and deep depression. What is the object of this strange nasal development no one knows; it is correlated with a remarkable shortness of the nasal bones and consequent large size of the nasal aperture in the dried skull. Judging from the portrait, it might be assumed that saigas would find a difficulty in grazing; but inspection of the Woburn herd shows that when thus engaged the creatures have a habit of 'reefing' their noses so that they become tucked up out of the way.

"At the present day saigas, which go about in large flocks, are confined to the trans-Volga steppes, but within the historic period they occurred as far west as Poland; and a skull dug up in the gravel at Twickenham, and others found in the superficial deposits of Germany,



Photograph by the Duchess of Bedford.

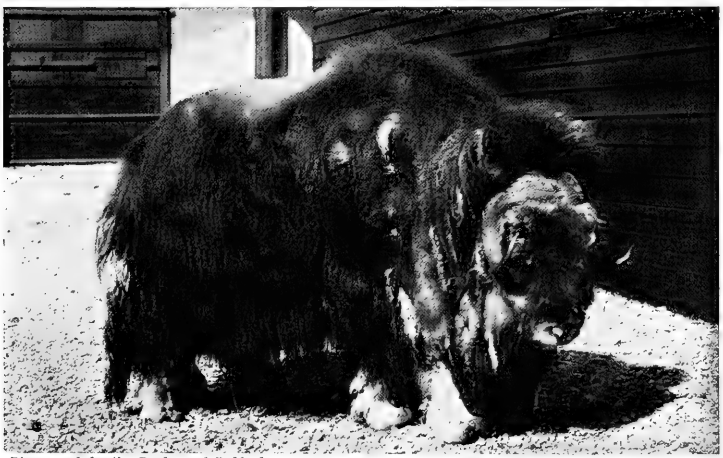
MALE SAIGA (*Saiga tatarica*).
From a living specimen at Woburn Park.

serve to prove that at an earlier epoch of the earth's history their range was much more extensive. Their general colour—sandy in summer and dirty white in winter—harmonises admirably with their natural surroundings; and to protect them from the piercing winter cold of their native steppes, saigas at that season are clad in a fur coat of great thickness and warmth.

And Another.

"A STILL more effective 'motoring-coat' is donned all the year round by the Musk-Ox, although the winter garb, the remains of which are seen hanging in ragged flakes in the present photograph, is thicker and more shaggy than that of summer. When the accompanying photograph was taken—in the early part of last summer or late spring—the animal looked fit and thriving. Unfortunately it did not long survive, and there is at the present time no living specimen of its kind in the kingdom. When first received at Woburn Abbey a few years ago, this musk-ox was a tiny little creature without trace of horns. Together with a comrade whose tenure of life in captivity was of the shortest, it was brought from Clavering Island, on the east coast of Greenland, and during the greater part of its sojourn at Woburn grew with great rapidity. At the time of its death the bases of the horns had met in the middle line of the forehead, although they would have increased somewhat in vertical depth had the creature lived longer.

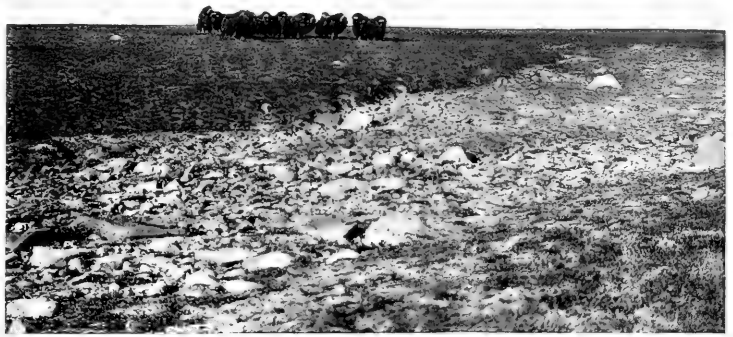
"The Greenland Musk-Ox (*Ovibos moschatus wardi*) represents a race apart from the typical Canadian animal, being distinguished, among other features, by the presence of a certain amount of white on the forehead. Musk-oxen, like saigas, were once found in Britain, although not perhaps at the same time, their occupancy having taken place when a large portion of our islands was covered with an ice-sheet like that of their native home. Despite the thickness of its coat, the Woburn musk-ox seemed by no means uncomfortable or out of health during the summer (and we had at least one real summer during its sojourn). Its hoofs grew, however, to an unnatural and inconvenient length, although the ground of its yard was strewn with rough stones. It may be, indeed, that these stones were too rough and rugged for a glacier-haunting animal, and that rounded ones would have been better. Anyway, if another specimen be received, it might be well to try the effect of hustling it round its enclosure in the hope of keeping its hoofs shorter. The great length of the hair of the under-parts of the musk-ox, it may be observed, is doubtless for the purpose of protecting the vital



Photograph by the Duchess of Bedford.

GREENLAND MUSK-OX (*Ovibos moschatus*).
From the specimen (a male) lately living at Woburn Park.

organs from cold when the creature is reposing on snow or ice, a similar feature being noticeable in the case of the Yak of Tibet. Unlike many Arctic animals," concludes Mr. Lydekker, "the musk-ox is dark-coloured; the explanation of this may be that the creatures, when lying down, assimilate in appearance to the boulders and bosses of dark-coloured rocks protruding here and there through the ice or snow or perched on its surface." In addition to the photograph of the Woburn specimen, we are able to give one of a herd of musk-oxen taken by a Danish naturalist in Greenland.



Photograph by Johannes Madsen.

A HERD OF MUSK-OXEN AT HOME.

An Announcement

APROPOS of this we may mention that in the next issue of ANIMAL LIFE there will be published a fully-illustrated article on "Arctic Animals," by Captain Frederick G. Jackson, who commanded the Harmsworth-Jackson Polar Expedition. This, the December issue, will be a Double Christmas Number, and besides several special articles appropriate to the season, and the usual features, it will also contain two coloured plates, and a résumé by Mr. Lydekker of the year's progress in Zoological Science.

Addendum.

ON page 148, among the aerial land birds with long wings and small feet should be inserted:—"The Guacharo, or Oil-Bird (*Steatornis caripensis*), which represents a family by itself. It has a strong, toothed, hawk-like bill and three toes in front not joined at the base, with a smaller hind-toe; the shanks are very short indeed, and have no scaly covering."

The Coloration of Seals.

THE coloured plate this month is taken from Sir Harry Johnston's volume on British Mammals in "The Woburn Library," and the following note is likewise extracted from that book:—"The coloration varies very much in individuals and according to age. The young at birth is covered with a coat of thick, soft fur, lemon-white in tint. In the species under review this woolly coat is shed by the infant seal a few hours after its birth. In some cases this woolly covering when shed seems to form a kind of mat for the young seal to lie on. When the white fur has been discarded, the bright little creature (and young seals are beautiful with their large liquid eyes) is seen to be smoothly clad with the shiny silky hair characteristic of the adult; but it is generally much more vividly spotted and streaked with dark on light. The ground colour of the hair of the common seal may be described as a lemon-yellow inclining to a sickly white or an amber tint.

Sometimes this lemon ground is almost greenish by the admixture of gray or brown hairs. On this light ground are scattered many irregular spots, bluish-black with the sheen of the hair. The hind limbs incline more to umber brown. The strong *vibrissæ* are white. In some specimens the spots are very thick on the back, and are brownish. Some examples of the common seal are almost black all over. Others, again, are a greenish-yellow, with only a few black spots. The large eyes are one uniform tint of deep bluish-brown."

A CORRESPONDENT writes to us as follows:

New Contributions to the Study of Animal Coloration.

"Since attention has been directed on several occasions in your journal to animal coloration, your readers may like to hear something of two new contributions to this subject. In 'The Field' of October 17th, Mr. Lydekker, amplifying an investigation recorded in earlier articles (reproduced in 'Mostly Mammals'), feels himself justified in asserting that in mammals a seasonal change of colour is correlated with the fall of the leaf, and does not take place in tropical and sub-tropical species. And he suggests that the same law may hold good in the case of birds. In mammals of the temperate zone, as well exemplified by the roe-deer, the change is very generally from some shade of chestnut or rufous-brown in summer to grey or brownish-grey in winter. It is also pointed out that in Arctic and sub-Arctic mammals, the change is from grey or grey-brown in summer to white in winter; so that these changes seem to be merely an extension of those which take place in mammals of the temperate zone. Further, a certain number of tropical or sub-tropical species, such as the males of the Indian black-buck and of Mrs. Gray's water-buck of the White Nile, exchange the typical rufous tint when fully adult for a sable livery (this, of course, not being a seasonal change). Hence it would seem that all these changes form part of a connected series; rufous, or bay, being the primitive type, or starting point. As to the reason for this prevalence of rufous as the summer coat of so many temperate mammals and the permanent livery of tropical kinds, it is suggested that its power of resisting the bleaching effects of sunlight may be the most important factor.

"The second contribution is by Mr. W. L. Power, of Chicago, who gives in 'Decennial Publications' an exquisitely-coloured plate showing the gradual development of a deep chestnut colour, variegated with black markings, in a long-horned beetle. Starting from a pure white pupa, we notice the first appearance of colour in the head, whence it extends in successive stages backwards till the deep adult tints are attained. Dark spots and stripes are likewise shown to make their appearance in a precisely similar manner in another kind of beetle.

"Colours of this type are the result of pigment developed in the dermal tissues of the insects, and the various markings (when present) correspond to a great extent with the subjacent vital organs. Moreover, they are largely due to the nature of the integument (or 'chitin') itself, which has a marked tendency to turn brown as it hardens. Hence the prevalence of brown and yellow in beetles, cockroaches and earwigs, which display the typical 'chitinous,' or horny integument. Moreover, this type of coloration is evidently very ancient — probably, indeed, as old as insects themselves.

"On the other hand, many of the more specialised insects, such as peacock and red admiral butterflies, develop a totally different type of coloration, which in place of being situated in the integuments, has its origin in the minute scales (or modified hairs) with which the latter is clothed. Moreover, since it has no sort of connection with the vital organs, or with the brown chitin of the integument, it can run riot in the matter of brilliant hues and of eccentricity of pattern. Hence we have an explanation of the reason why butterflies are so much more elaborately and gorgeously coloured than beetles, so far at least as the pigment colouring of the latter is concerned; the metallic tints of many beetles being due, of course, to the prismatic breaking-up of light, and not to pigment at all."

THE IDENTIFICATION OF BIRDS.

PART I.

By F. Finn, B.A., F.Z.S.

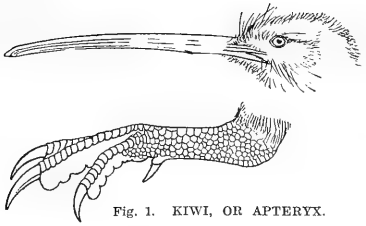


Fig. 1. KIWI, OR APTERYX.

THE exact relationship of the various natural families of birds to each other has been long a matter of discussion among scientists, and will probably continue to be so. But the limits of the families themselves are well agreed upon, and it only remains to give for these brief diagnoses so that they may be readily recognised by external and easily appreciable characters. This task Dr. P. Chalmers Mitchell and I embarked upon together, but when it was about half completed the appointment of my coadjutor to the Secretaryship of the Zoological Society prevented us from working further together, and so I am reluctantly compelled to finish it alone, as Dr. Mitchell's multifarious duties preclude any further co-operation.

The real difficulty in assigning any bird to its proper family lies in the great number of these families, which never have been, and perhaps never will be, satisfactorily combined into large "orders" such as accommodate the groups of families in mammals and reptiles. For the old arrangement of perchers, swimmers, and so forth has long ago been found to be unnatural, combining under certain broad resemblances of structure and habit families of birds which were really essentially different. These families themselves, however, are not really hard to determine, and when they are once learnt any scheme for their combination into "orders" is more readily mastered. The points to which attention will especially be drawn are the situation of the nostrils and the extent of the gape of the mouth, and the scaling and webbing of the feet, points which hitherto have been rather too much neglected by ornithologists, both from a scientific and practically diagnostic point of view. Other points will of course be introduced when necessary, but bill and feet will separate most families of birds satisfactorily.

In studying the feet of birds it must be borne in mind that no more than four toes exist in any species (the "fifth toe" of certain fowls being merely a double monstrosity), and that in the usual arrangement of three in front and one behind the back toe is the first, corresponding to our own great toe, while the three front toes, beginning from the inside, represent our second, third, and fourth toes respectively.

THE RATITE BIRDS.

The comparatively small number of species included under this name (derived from *ratis*, a raft, from the raft-like, because keel-less, condition of their breast-bone) are all incapable of flight, and usually of large size. Their lax hair-like plumage will distinguish them at once, and, with the exception of the Kiwis, they have short beaks and no hind-toe. Taking the families in detail:—

The Ostriches (if there be really more than one species), (*Struthionidæ*), are diagnosed from all other birds not only by their pre-eminent size, but by having *two toes only*, both in front, these being the third and fourth.

The Rheas (*Rheidæ*) have better-developed wings than any other Ratites, these being quite large, covering the back, and folding in a Z-shape at the elbow and

wrist as in ordinary birds, which is not the case in any other family of this group. There is no tail, and three toes are present.

The Emus (*Dromæidæ*) have very small wings, hanging down unfolded, and scarcely noticeable. They have short curly feathers on the head, and three toes with equal nails. Their colour is grey at all ages, though an extinct species was black.

The Cassowaries (*Casuariidæ*) have equally small and useless wings, but these are armed with several long conspicuous black spines, the remains of secondary quills. Their feet are furnished with an extra large claw on the inner of the three toes, and their heads with a conspicuous helmet of bone plated with horn.

The Kiwis (*Apterygidæ*) are quite small birds compared to the rest, not exceeding a large fowl in size. Their bills are very long, and they have a small hind-toe. The wings are so small that they have to be felt for. (Fig. 1.)

THE CARINATE BIRDS.

All other birds are classed as *Carinatæ*—provided with a *carina* or keel—their breast-bone, as everyone has seen when carving a fowl, being provided with a great ridge of bone to carry the huge breast-muscles which move the wings. In some species which have lost the power of flight this is wanting, but these never have the hairy-looking plumage of the Ratitæ, which must have degenerated into flightlessness at a much earlier date, their whole structure being more primitive. All Carinates are also very much inferior in size to any Ratite except the Kiwis. Among themselves they differ very much, and as there are so many families the only way of treating them intelligibly is to divide them, somewhat as used to be done in the old classifications, according to their habits of life and general structural characters, though it must be clearly understood that this does not imply that the families grouped together are really related, the less conspicuous features of structure and habit being more important than the grosser ones.

DIVING FAMILIES.

With short or moderate wings and feet placed far back.

The Penguins (*Spheniscidæ*) are at once distinguished from all other birds by their wings, which, although well developed, are not folded, but hang down as the birds stand erect, and have no quills, being uniformly covered with small stiff feathers resembling scales. Consequently these birds cannot fly in the air, but they do so under water, and hence have a well-developed keel to the breast-bone. Their bills vary in shape, but their feet have always very short shanks, and three webbed toes in front and a small useless one on the inner side.

The Divers (*Colymbidæ*) have three webbed toes in front and a small hind-toe. This distinguishes them from the Auks, which have no hind-toe.

The Grebes (*Podicipedidæ*) have three toes in front and a small hind-toe, all of them lobed or individually webbed, with flat nails. (Fig. 2.)

The Auks (*Alcidæ*) have three webbed toes in front; no hind-toe. (Fig. 3.)

The Cormorants and Darters (*Phalacrocoracidæ*) have four toes all united by a web, although the first points backwards as usual; their tails are well developed, unlike those of most other diving-birds. (Fig. 4.)

The Finfoots (*Heliornithidæ*) possess four toes, the hind one rather small, the front ones lobed or individually webbed, somewhat as in the grebes; but the claws are shaped as in ordinary birds, and the tail is well developed and of good size, whereas the grebes have no tail—merely a wisp of hairy down.

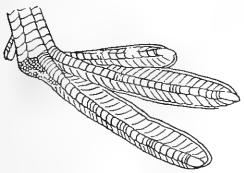


Fig. 2. GREAT CRESTED GREBE.

Fig. 3. GUILLEMOT.

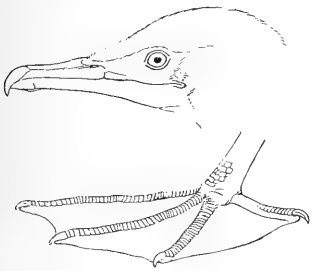


Fig. 4. TUFTED CORMORANT.

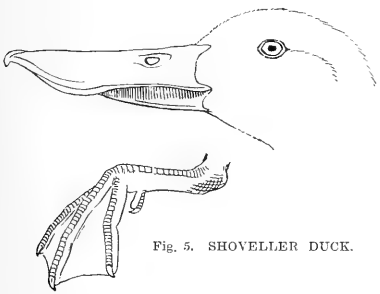


Fig. 5. SHOVELLER DUCK.

SURFACE-FEEDING WATERFOWL.

With wings of varying length and more or less webbed front toes; many of them feed much ashore, but all swim at times.

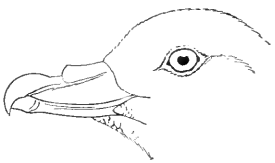
The Ducks (*Anatidæ*), including Geese, Swans, and Mergansers, have a straight bill, with teeth or outstanding ridges along the edge of both jaws, and covered with skin, instead of horn as in most birds; the feet have a small hind-toe. (Fig. 5).

N.B.—The Magpie Goose of Australia (*Anseranas melanoleucus*) has a large hind-toe and only small webs to the front toes; but its bill shows ridges, though small ones. Many of the geese seldom enter the water, and many ducks constantly dive, but they do not resemble the true diving-birds.

The Pelicans (*Pelecanidæ*) have a very long beak, hooked at the tip, with the lower jaw supporting a great pouch. All four toes are webbed together, and the tail is short, and thus, with the long bill, separates them from the other birds (gannets, cormorants, &c.) with similarly constructed feet.

The Flamingoes (*Phœnicopteridæ*) have excessively long legs, with webbed front toes, and the hind-toe small and useless, or absent altogether. The bill is short, with the lower jaw much stouter than the upper, and both edged with ridges, as in the ducks; it is bent down at an obtuse angle in the middle in a way which renders it strikingly different from the beak of any other birds.

The Screamers (*Palamedeidæ*) are large birds with fowl-like heads and all the toes long, with a short web between the two outer front ones. The wings are large and armed at the bend with two spurs—a feature distinguishing them from all other birds, since no other spur-winged bird has more than one weapon on each wing.



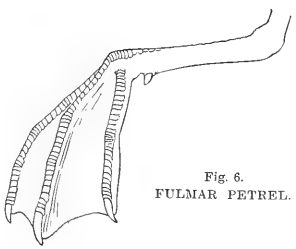


Fig. 6. FULMAR PETREL.

AERIAL WATERFOWL.

With three front toes webbed and wings very long.

The Petrels and Albatrosses (*Procellariidæ*) are characterized by a hooked beak with its covering of horn divided into sections by grooves and the nostrils tubular, the tubes being contiguous in the Petrels and separate in the Albatrosses. The hind-toe is only represented by the claw, and even this may be absent. (Fig. 6.)

N.B.—The Diving Petrels (*Pelecanoides*) in form and habits resemble Auks, having short wings and diving constantly, but the beak at once distinguishes them.

The Gulls and Terns (*Laridæ*) possess bills with the covering of horn in one piece and the nostrils open and slit-like. The bill is more or less hooked in the Gulls and straight in the Terns. There is usually a small hind-toe, and in the Kittiwakes (*Rissa*), where it is rudimentary, the bill will distinguish the bird from any petrel. (Fig. 7.)

The Gannets (*Sulidæ*) exhibit straight bills with the covering divided, and no perceptible nostrils; the hind-toe is united to the front ones by a web, as in the Cormorants.

The Tropic-Birds (*Phäethontidæ*) show also straight bills but with uniform covering and slit-like nostrils; the hind-toe is united to the front ones by a web, this distinguishing them from the Terns, which they much resemble.

The Frigate-Birds (*Fregatidæ*) have long hooked bills with the covering in sections; all the four toes are united by very small webs and the legs are feathered; the wings are enormous, and the tail excessively long and forked.

LONG-LEGGED WADING BIRDS.

With well-developed hind-toe, perching much in trees, &c.

The Herons (*Ardeidæ*) are easily distinguished by their long straight bill with the mouth reaching to the middle of the eye and the nostrils at the end of a groove; the feet have three toes in front, with short webs at the base of the outer two only; the hind-toe is of large size. (Fig. 8.)

In the Storks (*Ciconiidæ*) the bill is also long, straight or curved at the end, but without a groove; the mouth reaches about to the eye; in the feet all the front toes are united by short webs, and the hind-toe is not so large as in Herons.

The Ibises and Spoonbills (*Plataleidæ*) have the bill long and curved downwards throughout or broadened and curved down only at the end (Spoonbills); the three front toes are united at the base by short webs and the hind-toe is well-developed, whereas in the Curlews, often confused with them, it is short and useless.

N.B.—The Tantalus Storks have the bill curved down, but only at the tip, and this is not broadened as in the Spoonbills.

The Hammerkop (*Scopus umbretta*) forms a family by itself; it is a bird with comparatively short neck and legs, three toes before, all webbed at the base, and a well-developed hind-toe; the head crested and with a deep bill hooked at the tip, and the general plumage brown and buzzard-like.

The Sun-Bitterns (*Eurypygidæ*) are birds showing long slender bills and necks, broad rounded wings and large broad tails very beautifully coloured, and feet with small but useful hind-toe. The short hind-toe is a sufficient distinction from the true Bitterns, as well as the close-feathered neck, the Bitterns proper having a full ruff there.

USUALLY LONG-LEGGED RUNNERS OR WADERS.

With hind-toe never large, and seldom perching.

The Cranes (*Gruidæ*) much resemble Herons and Storks, with which they are often confounded, being tall, leggy, straight-billed birds with large wings. Their feet will at

once distinguish them, the hind-toe being so small and high up as to be of no use; only the two outer front toes show a web at the base. In the bill the corner of the mouth does not extend further back than the forehead, and the nostrils are set well forwards, the front being in the middle of the bill; in the Storks and Herons they are at the base.

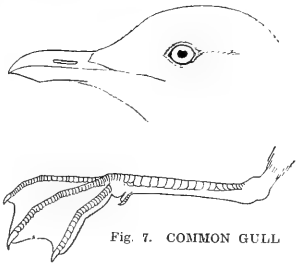


Fig. 7. COMMON GULL

The Rails, including Moorhens and Coots (*Rallidæ*), are very narrowly-built birds with flat-sided bills, having the nostrils set far forward as in the Cranes, and the three front toes quite free. The hind-toe is large enough to be of use, and these birds are the only ones of the present section at all given to perching. The wings are always short. (Fig. 9.)

The Courlans (*Aramidæ*), in their anatomy said to be allied to the Cranes, resemble large Rails in outward characteristics.

The Plovers (*Charadriidæ*), belonging to a family which includes the Sandpipers, Snipes, Avocets, Curlews, and Oyster-Catchers, are easily distinguishable, and yet possess only one point in common—the very forward situation of the corner of the mouth, which is well in front of the forehead. This peculiarity does not occur in any birds which could be mistaken for the present group.

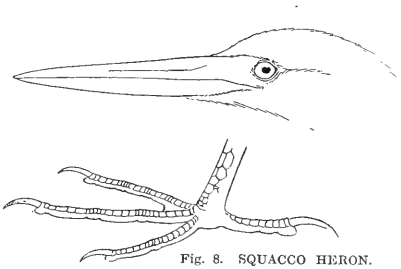


Fig. 8. SQUACCO HERON.

The bill itself varies immensely; in the Plovers it much resembles a pigeon's, and these birds have large round heads; in the Sandpipers it is long, and especially so in the Snipes; in the Curlews it is turned down, in the Avocets upwards, and in the Wry-Billed Plover (*Anarhynchus frontalis*) to one side!

The feet are equally variable; the three front toes may be free altogether, as in the Snipes, or webbed more or less, even for half their length, as in the Avocets; the shanks may be as short as a pigeon's, as in the Turnstones; or as long in proportion as the Flamingo's, as in the Stilts. The hind-toe is always small, usually useless, and often absent altogether. (Fig. 10.)

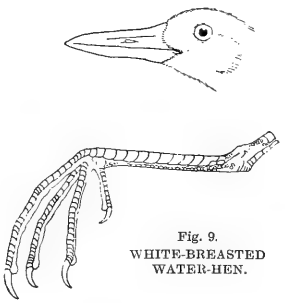


Fig. 9.
WHITE-BREASTED WATER-HEN.

The wings are usually characteristic, the inner quills or tertiaries being much longer than the adjacent secondaries, and reaching to the tip of the wing; but in some this curious formation is less striking.

The Crab-Plover (*Dromas ardeola*) has a family to itself; it is a pied bird with a strong crow-like beak with corner of mouth running back to eye, feet with the three fore-toes webbed well at the base, and the hind-toe large enough to be of use. Its foot and bill are rather like a small Stork's; but its plover-like wings and short neck will distinguish it

The Stone-Plovers (*Œdicnemidæ*) have large, strong, crow-like bills, with the corner of the mouth extending

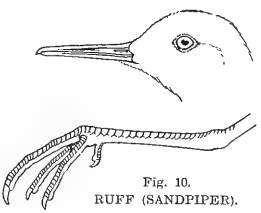


Fig. 10.
RUFF (SANDPIPER).

back to the eye, which is large; the feet have the three front toes only, connected at the base by webs, and the shank is covered with small scales as in the Bustards. From these birds, in addition to their usually smaller size, they may be distinguished by their large heads and comparatively short necks.

The Coursers (*Glareolidæ*), with which are also grouped the Pratincoles or Swallow-Plovers, have much the appearance of ordinary Plovers, but the corner of the mouth extends to the eye or nearly so, and the bill is usually curved. The Pratincoles have long wings and forked tails, and feed mostly on the wing like swallows.

The Sheath-Bills (*Chionididæ*) are white birds with a short stout bill and the nostrils with an overhanging sheath; the feet have three toes before and a short useless hind-toe.

The Jaçanas (*Parridæ*) have pigeon-like bills and long legs with excessively long toes, the hinder being well developed as well as the three front, and all devoid of webs and provided with remarkably long straight claws.

The Kagu (*Rhinochætus jubatus*) is the sole member of its family and has a stout, rather long bill, with the nostrils overhung by a scrolled membrane, the hind-toe small, the head and eyes large, and the wings short and broad.

The Trumpeters (*Psophiidæ*) have pheasant-like heads, and long legs with a small hind-toe; the wings are short and rounded and the tail not noticeable.

The Mesites (*Mesitidæ*) is a curious Madagascar bird with short wings and bill, ample rounded tail, and rather long legs with three toes in front and a smaller hind-toe. It looks much like a Passerine bird.

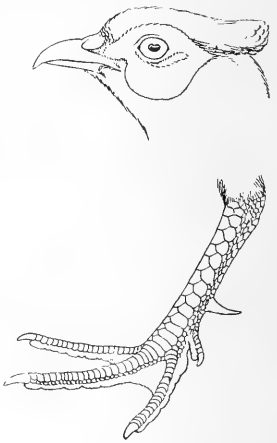


Fig. 11. PHEASANT.

GROUND-BIRDS.

With strong feet formed for running, which seldom or never enter water, even to wash

The Pheasant family (*Phasianidæ*), including Fowls, Peacocks, Partridges, Quail, Turkeys, and Guinea-Fowls. These have three toes before, united at the base by short webs, and a small hind-toe raised above the rest. The shank has two rows of large scales in front, meeting in a zigzag seam. The beak is always short, with nostrils arched over on the inner side by a gristly scale, and the profile curved; the corner of the mouth comes nearly below the front of the eye. The wings are always short and rounded. Many of these birds go up in trees to roost. (Fig. 11.)

The Grouse (*Tetraonidæ*) much resemble the above, but the covering of the nostril is feathered, and usually the shanks also. When they are not, the grouse may be distinguished by the fringe of narrow scales along the edge of each toe. The wings are short. Their separation as a distinct family is hardly justifiable.

The Mound-Builders (*Megapodiidæ*) have a large hind-toe set on at the same level as the others, and open nostrils. The wings are short, and the tail either very short or of medium length and folded like a fowl's.

The Hemipodes or Button-Quails (*Turnicidæ*) look much like Quails, but have no webs at the base of the toes and only one row of scales down the shank. Except the Australian Plain-Wanderer (*Pedionomus torquatus*) they have no hind-toe. Their wings are short.

The Tinamous (*Tinamidæ*) much resemble Partridges, but differ by having the covering of the bill in sections and the corner of the mouth reaching to the middle of

the eye; the shanks also have but a single row of scales down the front, and there are no webs at the base of the front toes. The hind-toe is very small and useless, and sometimes quite absent. The nostrils are oval, open, and situated at least as far forward as the centre of the beak, whereas in the Button-Quails, which much resemble small Tinamous, the nostrils are roofed and run back to the base of the beak, as in the Quails.

The Bustards (*Otididæ*) have long shanks, bare above the hock and covered all over with small scales (*reticulate*), and three short front toes only, united at the base by small webs. The bill is rather short, and the corner of the mouth comes as far back as the eye. The wings are large and powerful and the head small, though often thickly feathered and having a bushy appearance.

The Quail-Snipes (*Thinocorythidæ*) are birds much resembling Quails or small Partridges, with the long pointed wing of a Snipe. Their bills are partridge-like, but the corner of the mouth terminates below the forehead; the feet have three toes in front, and a small hind-toe, but there are no webs at the base of the front toes and the shank is covered all over with small scales.

The Sand-Grouse (*Pteroclidæ*) are birds of pigeon-like form, with long pointed wings and grouse-like heads. Their feet have three short toes in front; the hind-toe is very small or wanting, and the shanks are feathered. Their long wings and the absence of the fringe of scales along the toes will distinguish them from true Grouse.

The Seriemas (*Cariamidæ*) have a short curved bill with wide gape, short round wings and a long tail, and long legs, with three short front toes united by a web at the base, and a short hind-toe. They bear some resemblance to the Secretary-Bird, but the cere to the bill and the long wings easily distinguish the latter.

BIRDS OF PREY.

With hooked bills and strong talons, strong-winged, and preying on other animals or carrion.

The Hawks (*Falconidæ*), including the Eagles and Old World Vultures. In these the nostrils are separated, as in most animals, by a partition or *septum* in the middle; the mouth terminates below the eye and usually as far back as the middle thereof; feet with a strong hind-toe set on at the same level as the rest, and the outer front toes united at the base by a short web. The Old World Vultures, which chiefly differ from Eagles in their more or less complete baldness, are often given separate family rank. The Osprey (*Pandion haliaëtus*), which has no web at the base of the toes, is also frequently placed in a separate family. (Fig. 12.)

The Secretary-Bird (*Gypogeranus serpentarius*) forms a family by itself; it much resembles an Eagle, but has very long legs with all the front toes united by a web at the base.

The American Vultures (*Cathartidæ*), including the Condor, have the hind-toe small and almost useless, it being set on above the rest, and all the front toes connected by short webs; the nostrils are pervious, *i.e.*, have no partition, and the corner of the mouth terminates high up on a level with the eye, and usually far in front of it.

The Owls (*Strigidæ*) have the face usually surrounded by a ruff of feathers; there are no webs at the base of the toes, and the outer front toe is turned back when perching, so that the toes fall into pairs. (Fig. 13.)

The Barn-Owls (*Strix*) are sometimes separated as a family (*Strigidæ*); they may be distinguished from most

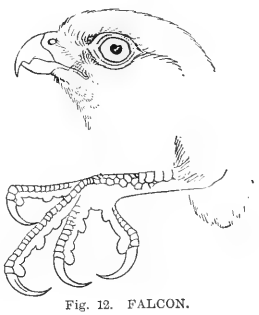


Fig. 12. FALCON.

of the other Owls (in this case called *Bubonidæ* or *Asionidæ*) by their heart-shaped face and the comb on the inner edge of the middle claw.

AERIAL LAND-BIRDS.

With very small feet and long wings, spending most of their time in the air.

The Humming-Birds (*Trochilidæ*) have slender needle-like bills of varying length, either straight or curved, with the corner of the mouth not far back; the feet have three toes before and one behind, the front toes free to the base. These are small birds, including much the smallest of all species, and have the buzzing flight of an insect. (Fig. 14.)

The Swifts (*Cypselidæ*) have very short wide bills, and the mouth is very wide, the corner coming under the middle of the eye. There are either three toes in front and one behind, or all the four toes point indefinitely forwards, like the fingers of the human hand. The first toe, whether behind or not, is always noticeably the smallest.

N.B.—These birds are frequently mistaken for the Swallows, which are Passerines, and will be noticed later. They may be distinguished by the smaller first toe, and by having only ten tail-feathers, the Swallows having twelve.

The Nightjars (*Caprimulgidæ*) have an extremely small bill and enormous mouth, very wide and reaching back to below the middle of the eye; their feet have three toes in front and a small hind one, the three front ones being united at the base by a short web. The nostrils are close together and tubular, except in the Potoos or Ibijaus (*Nyctibius*), which, however, show the tiny bill and huge mouth in its most typical form. (Fig. 15.)

The Bee-Eaters (*Meropidæ*) have long curved bills, and feet with three toes in front joined closely by a common skin, and a rather small hind-toe.

N.B.—The wings vary in length in this family, and some perch more than they fly, but on the whole they are birds of the air.

SEDENTARY PERCHERS.

With small feet and moderate wings; making sallies for their food from a fixed station.

The Kingfishers (*Alcedinidæ*) have a long straight bill and two or three front toes (the inner front (or second) toe being sometimes wanting), joined in a common skin, and a smaller hind-toe. (Fig. 16.)

N.B.—The bill is not always long, the well-known Laughing Kingfisher, or "Laughing Jackass" of Australia (*Dacelo gigantea*) having it only moderate, and the Shoe-Billed Kingfisher (*Clytoceyx rex*) quite short; but it is always straight except in the Hook-Billed Kingfisher (*Melidora macrorhina*), in which the tip only is hooked. Many kingfishers do not catch fish.

The Rollers (*Coraciidæ*) have a stout strong bill, and feet with three free toes in front and a smaller hind-toe; the back of the shank is covered with separate scales. These birds, from their general size and colour, are often confounded with Jays which, however, have a large hind-toe and the shank covered with long plates behind. (Fig. 17.)

N.B.—The Ground Rollers of Madagascar have long legs, unlike the rest.

The Trogons (*Trogonidæ*) have short stout bills, and feet of quite unique structure; the toes are in two pairs, but the inner front toe is turned back instead of the outer; thus, unlike any other pair-toed birds, the outer toe of each pair is the smaller. (Fig. 18.)

The Jaçamars (*Galbulidæ*) have long straight bills like Kingfishers, and the toes in pairs, the outer front being turned back.

Fig. 13.
SHARPE'S
WOOD OWL.

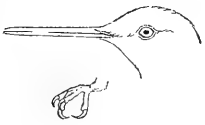


Fig. 14. GIANT HUMMING-BIRD.

Fig. 15. COMMON NIGHTJAR.

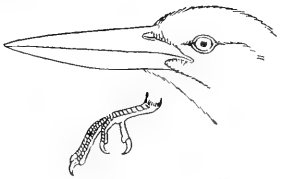


Fig. 16. WHITE-BREASTED
KINGFISHER.

Fig. 17.
INDIAN
ROLLER.

Fig. 18. TROGON.

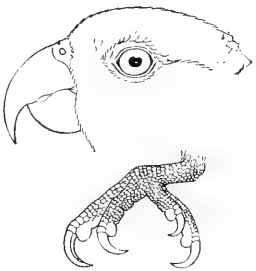


Fig. 19. AMAZON PARROT.

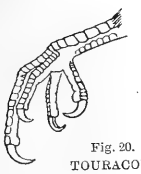


Fig. 20.
TOURACOU.

Fig. 21. INDIAN
CUCKOO.

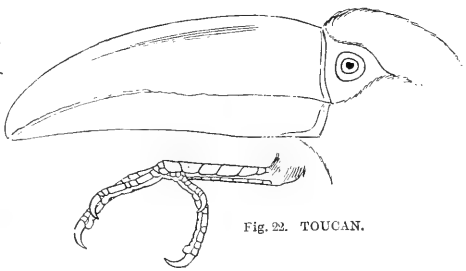


Fig. 22. TOUCAN.

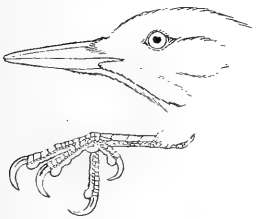


Fig. 23. GREEN WOODPECKER.

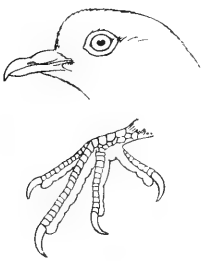


Fig. 24. WOODPIGEON.

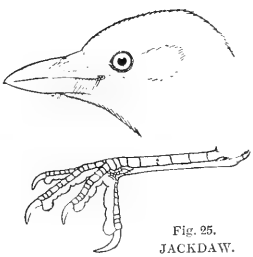


Fig. 25.
JACKDAW.

N.B.—The great Jaçamar (*Jacamerops grandis*) has a curved bill, but its pair-toed feet will distinguish it from a Bee-Eater; the Three-Toed Jaçamar (*Jacamaralcyon tridactyla*) has only three toes, the first, or true hind-toe, being missing; this will distinguish it from the Three-Toed Kingfishers, in which the missing toe is the second, or inner front one.

The Puff-Birds (*Bucconidæ*) have rather stout bills of moderate length, curved or hooked at the tip, and the toes in pairs.

The Motmots (*Momotidæ*) have a bill of moderate length and stoutness, curved, and notched like a saw along the edges; the feet have three toes in front, joined in a common skin, and a smaller hind-toe; the shanks are short, but not excessively so. This and the toothed bill will distinguish these birds from Bee-Eaters, the short-winged species of which they otherwise much resemble.

The Todies (*Todidæ*), with a long, straight, flat bill, have three toes in front, joined in a common skin, and a smaller one behind; the shank is rather long, distinguishing these birds from some flat-billed Kingfishers.

The Broadbills (*Eurylæmidæ*) have short broad bills with a wide gape, and three toes in front united at the base, with one toe behind, as large as the inner front one; the shank is covered behind with numerous small scales, which will distinguish them from Passeres, in which the hind-toe is also large.

In the Frogmouths (*Podargidæ*) the bill is stout and powerful, but very short and broad, with a wide gape, and the nostrils slit-like and well separated; there are three toes in front, webbed at the base, but the outer toe is turned out sideways in perching; the hind-toe is smaller. Their wings are short.

N.B.—The Owlet Nightjars (*Ægotheles*), which belong to this family, in their very small beak are like the true Nightjars, but their short wings will distinguish them.

ACTIVE PERCHERS.

Spending much of their time moving about in trees.

The Parrots (*Psittacidæ*) have an extremely short and much-hooked bill, covered at the base with a skin as in birds of prey, but with a narrow mouth not reaching beyond the forehead; the feet also are very characteristic, with four toes in two pairs, the outer front toe being turned backwards; the shanks are always short and covered with numerous small scales all over. (Fig. 19.)

N.B.—The Lories (*Loriidæ*), which live much on honey and have a brush-like termination to the tongue, are often ranked as a distinct family.

The Touracous (*Musophagidæ*) have a very short stout bill with curved profile and saw-like edges, shanks of moderate length, with a hind-toe smaller than the rest; the outer front toe, though joined by a short web at the base to the middle one, can be turned back, and is indeed usually so. The wings are always short and the tail long and rounded. (Fig. 20.)

The Mouse-Birds (*Coliidæ*) are small birds with long tapering tails, short wings, and short beaks with curved profile. Their feet are very peculiar, having the four toes with no special direction, but capable of turning any way; the first toe is the smallest.

The Cuckoos (*Cuculidæ*) have a bill of moderate length, with the profile curved as a rule, or, if not, hooked at the tip, and the nostrils very low down and near the edge of the upper chap (or jaw). The feet have two toes before and two behind, the outer front toe being turned back. (Fig. 21.)

The Toucans (*Rhamphastidæ*) have an enormous beak, the largest among known birds, and feet with the toes in pairs, the outer front turned back; this will distinguish them from the Hornbills, with which they are often confounded. (Fig. 22.)

The Barbets (*Capitonidæ*) have feet like the Toucans, but a much smaller bill, not unlike a Crow's.

The Honey-Guides (*Indicatoridæ*) are small birds with pair-toed feet, as in Barbets and Toucans, but with short beaks either stout and finch-like or slight and curved.

The Woodpeckers (*Picidæ*) have straight or nearly straight bills of only moderate length and thickness, used for chiselling into wood; their feet have the outer front toe turned back, so that the toes are in pairs, except in some three-toed species, in which there is only one toe behind, the first or true hind-toe having disappeared. These birds spend most of their time in climbing, not usually perching like others. (Fig. 23.)

The Hornbills (*Bucerotidæ*) have long curved bills of disproportionate size, much as in the Toucans, but their feet resemble those of Kingfishers, having three toes in front closely united, and one behind.

N.B.—The Ground Hornbills have long legs, but their toes are still united, and their bills of typical size and shape.

The Hoopoes (*Upupidæ*) have long, slender, curved bills, moderately-long square tails, and a fan-like crest; the feet have short shanks and three free toes in front and one behind.

N.B.—These birds spend most of their time feeding on the ground, but perch constantly also.

The Wood-Hoopoes (*Irrisoridæ*) also have slender bills, more or less curved; the shanks are very short, with three free toes in front and one behind, but the tail is long and magpie-like.

The Pigeons (*Columbidæ*) have a moderate-sized bill of very characteristic shape, narrowest in the middle, with nostrils pierced in a soft swollen skin at the base; the head is small, and the shanks inclining to shortness, with three free toes in front and one behind. Pigeons are often chiefly ground-feeders, and some never leave the ground, but more are exclusively attached to the trees. (Fig. 24.)

The Hoactzin (*Opisthocomidæ*) constitutes a family by itself; it has a short stout bill, broad short wings and a long broad tail; the feet have three free toes before, and a well-developed one behind.

The Curassows (*Cracidæ*), including the Guans, much resemble the pheasant family, with short stout bills, powerful feet, with three front toes united by short webs, and short round wings; but they have a well-developed hind-toe and live much in trees, where also they build.

The Passerine Birds (*Passeridæ*) form an enormous family, numbering half of the entire class of birds, and also remarkably numerous in individuals. They are at once characterized by their feet, which always have the hind-toe large and well-developed; this toe, taken together with its claw, being always larger than the inner front toe. The front toes are three and usually free, but the outer two may be joined at the base. The type of this family is the Sparrow (*Passer*), but the foot-structure is well exemplified in a larger species, such as the Jackdaw (Fig. 25). The Passerine birds vary enormously in size and structure of beak, to say nothing of shape and habits, although they are not hard of recognition to anyone who will take the trouble to note the peculiarities of foot-structure. A few birds outside the family, notably some birds of prey (*Falconidæ*) have also very large hind-toes, but will not be mistaken for Passerine birds.

[The last part of this article, to be published next month, will deal with the Passerines.]

GREAT ANTEATER.

Showing abnormal direction of hair in fore-limbs.

TRACES OF ANIMAL HABITS.

By Walter Kidd, M.D., F.Z.S.

PART I.

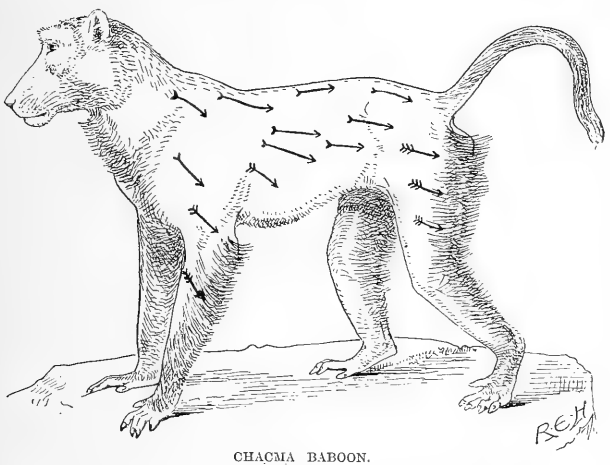
WORKS on Natural History must always find a place for the description of what is known by observation of the habits of animals. Among these the more notable and characteristic are dealt with. But there is a method of reading in simple hieroglyphs the less striking habits of animal life, and so to fill in much of the background of the picture, and that is by studying the arrangement of their hairy coverings. There is no attempt here to consider the qualities of thickness, texture, or coloration of the animal hair which so eminently make for the safety and comfort of different forms, but the arrangement, direction and disposition of that hair may be profitably studied, if in a humbler sphere. By the terms of the discussion we are restricted to such animals as Marsupials, Edentates, Rodents, Carnivores, Ungulates, Insectivores, Bats and the Primates, including such as Marmosets, Lemurs, Monkeys, Anthropoid Apes, and not excluding Man himself. Most of the groups mentioned, when examined from our standpoint, "give themselves away" at once as creatures of simple habit and low life, and we can extract no varied interest from the records of their hair-story. The most interesting groups are Edentates, Carnivores, Ungulates, and some of the Primates. We can here only look at the evidence afforded by the hair-slope of a few individual forms of life as to their favourite attitudes of repose. We are thus chiefly concerned with the numerous hours of leisure enjoyed by those which we, restless unleisured creatures, call the lower animals.

The individual hairs lie at an acute angle with the skin except on the muzzle, the eyelids and eyebrows, the mane, and on parts of the external ears. In long ages back when hairy mammals were in the making, the primitive hair-slope can have been none other than an entirely simple uniform slope from head to tail, and from proximal to distal extremities of the limbs and base to tips of the ears. The body must have been elongated and the limbs short. The departures from this simple and original type of slope are numerous, and are proportioned to the complexity of the habits of the animals concerned. We are able by these new departures in style or fashions in hair to trace clearly some of the habits of animals, *e.g.*, how they lie and how they sit, and even to calculate roughly the proportions of these two habits in individuals. A subsequent study will show also how we may gauge the active as contrasted with the passive life of certain animals.

It will be well to look first at an extreme instance—that of the Two-Toed Sloth of Central and South America. The long hair of this creature, instead of lying as the hair of a Skye-terrier does, is disposed on most of the head, trunk, and limbs so that it *falls upwards*, if one may so say. This is not at all surprising when we remember that it is in the almost unique position—which it shares with a select circle of its slothful relatives and the bats—of spending most of its life upside down. This sloth hangs all day and probably most of the night in dark moist forests, clinging by its powerful well-adapted claws to the boughs of trees, descending reluctantly and at night to the ground in search of food. A very slight examination of its tell-tale hairy coat would declare at once its prevailing habit of life, even if we did not know it from other sources.

By way of contrast let us look at the long hairy coat of a Baboon as it stands on all fours. One can have no doubt, if one examine the direction of the hair and thus decipher the record of its habits, that to sit, and not to lie, stand, or walk, is its favourite habit. In the uniform slope of hair from stem to stern, from head to gluteal region, can be seen at once the unmistakable signs of much sitting. It is on the gluteal region particularly that the direction of hair is seen to be foreign to other habits than that of sitting. The baboon is here taken as a representative of many other monkeys and apes. The two instances of the sloth and baboon show how a prevailing habit can be traced in the hair, and how the less favourable attitudes fail to impress themselves. We know quite well that a sloth can and does walk, trot and stand, and that a baboon can and does walk, trot, stand and lie, but the records of these habits are obliterated and neutralised by the *preponderating* habit of each animal.

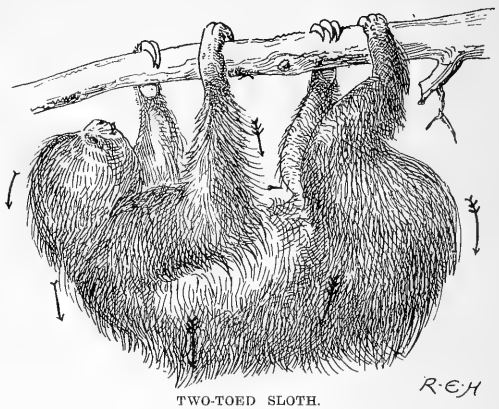
The Great Anteater is another animal that carries about on its coat clear evidence of its sluggish habit of life. Not so slothful as its near relative the sloth, it is one of the notable sluggards of the tropical world. Living in the same countries as the sloth, it spends its day in a lair among the long grass, emerging rarely into the light of day for food. It surely must have been a lineal ancestor of the rustic youth whose ideal of happiness was "to sit all day on a gate and eat fat bacon." In its most favoured attitude it lies on one side, curled up, with its limbs tucked under its body, the whole being encircled by its enormous bushy tail. It thus stamps on its hairy coat the signs of its favourite attitude and business in life; for when it stands or walks one can see that the stiff long hair lies in that direction which makes it fit the curled-up position, and certainly not that of standing. Even its skeleton is



CHACMA BABOON.

Showing streams of hair on fore-limbs and femoral region of hind-limbs altered by action of gravity.

compressed and narrow by reason of its constant habit of lying. When one examines the "set" of its hair in the standing posture one feels instinctively that there is something wrong, especially on the side of the fore-limb, for here the hairs lie at right angles to the axis of the limb instead of nearly parallel with that axis, which is the normal direction. The creature gives you the kind of impression when it stands up that a man does who has just awakened from sleep and has not had time to brush his whiskers and hair. The Great Anteater is indeed one of the few out of the myriads of animal forms that have *grown grotesque*, and this, as in other cases, is mainly from sluggishness of life—which may contain a moral for ourselves.



TWO-TOED SLOTH.
Showing action of gravity upon the hair-streams.

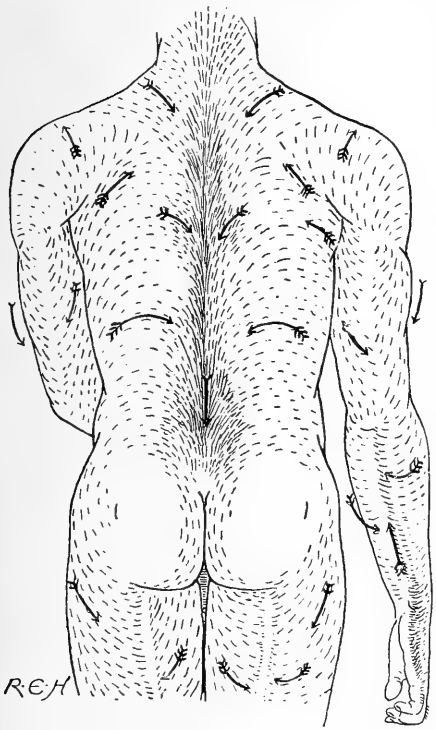
The beautiful White-Collared Mangabey recently at the Zoological Society's Gardens shows a marked impress of its prevailing attitude. The long silky hair is arranged on the side of the trunk, so that the hair-streams belonging to the back and the abdomen are parted very definitely, and this arrangement terminates abruptly near the armpit. The reason for this is seen at once when the animal is examined as it sits, the upper limit being formed by the acutely-flexed knee-joint, and the wide space occupied by the parting being produced by the constant pressure of the lower limb against the trunk in the habitual attitude of sitting.

The familiar Fox-Terrier presents points of interest, for it shows on two regions of its hairy coat definite marks of two most favourite attitudes. One cannot but ask why the hair on the under or posterior surface of the fore-limb should slope upwards to the trunk when the normal direction is from shoulder to digit, and why on the front surface the normal direction is maintained. Surely the answer comes from observation of the way in which this and most other carnivores lie with their fore-limbs planted out in front of their chest and not doubled up like those of an ox. The abnormal slope has thus at once a mechanical explanation. The fox-terrier also shows on the gluteal region a clear-cut whorl or reversed area of hair over the tuberosity of the ischium, thus proclaiming the frequency of the habit of sitting, which we also know by observation to be characteristic of this animal. No animal shows this patch of hair thus reversed unless it sits much. The callosities so common in monkeys on this part of the body are strictly analogous. No ungulate has it, for no ungulate sits.

The Fallow Deer (*Cervus dama*) of our country exhibits two marks of its very constant habits. One of these consists in a remarkable reversal of the slope of the hair which starts in a whorl just in front of the withers, and from this point to about the level of the external ears the hairs of the neck point forwards in a feather-shaped arrangement. There is thus produced along the whole of the dorsal surface of the neck a marked exception to the general and common slope of hair on an animal's body, viz., from head to tail. This central whorl, from which a feathering proceeds *against* the general stream of hair, is not peculiar to the fallow deer, but is

found in many other ruminants, such as antelopes and oxen, and it reminds one very much of the peculiar break in the stream of hair in the mane of the Giraffe, which will be referred to in the second part of this article. Such a modification of the hair-slope is not causeless, accidental, or without meaning, whether the meaning of it be important or otherwise. There are two alternative views one might take as to its causation. It might be the result of a strong oft-repeated action of the fly-shaker muscle so common and useful in ungulates. This muscle, by very constant action, is quite capable of causing a reversal of the "set" of the hairs in the skin over it. One has only to watch on a hot day the almost ceaseless action of this muscle in cows as they browse or lie ruminating to see how this could come to pass. But a more probable view of the production of this curious reversed area of hair is that the attitude so largely adopted by ruminants in their long hours of cropping grass, which they are to digest subsequently in their peculiar way, so stretches the skin of the back of the neck down to the withers that the hairs over it are reversed.

A second mark of its habits is seen on the pectoral region of the fallow deer. Here, on each side of the sternal region and extending forwards from the flexure of the shoulder-joint, is a symmetrical area of reversed hair, oval in shape, and corresponding exactly to the region where the surfaces of the chest and the fore-limb are brought in contact in the habitual ungulate attitude of rest. In its own way this phenomenon marks as clearly the great length of time spent by the fallow deer in chewing the cud, as the former one on the neck pointed to the time occupied in browsing.



BACK VIEW OF TRUNK AND UPPER EXTREMITIES OF MAN.

Numerous instances might be chosen for description, but space will allow of only one more, and that from the body of Man. Man is far from being the hairless creature which he is generally supposed to be. Hardly an inch of his skin is not clothed with fine hair visible with or without a lens. On his back the hair-streams pass in a remarkable direction, from the sides upwards towards the spine, making with the long axis of the vertebral column an angle of about 45°. Not one of the great groups of hair-clad mammals shows a direction of the hair on its back anything like this. A mechanical explanation is readily afforded by man's habitual or prevailing attitude in sleep, which is that of lying on one side or the other, with his head raised on a pillow. A slight reflection on the mechanics of the matter shows that there are present the very conditions calculated to produce this unique hair-slope on this part of man's body. It is only one of many similar new departures in hair-slope confined to the human species.

DOG TALES.

Good for Evil.

The following comes from Paris:—M. X., the owner of a small villa in the environs of Paris, had a dog—a Great Dane—an intelligent and faithful animal, of whom he was very fond. Having sold his house in order to return to Paris, he was reluctantly obliged to separate from the dog. A friendly gamekeeper agreed to take the dog, which followed disconsolately its new master, who, not being tender-hearted, grew tired of it, and resolved to get rid of his charge. He therefore fastened a heavy stone to the dog's neck, put it in a boat, and rowed towards the middle of the river Marne. When the boat was in mid-stream the man threw the dog into the water. The rope, however, broke, and the animal swam towards the boat, and had nearly reached it when the gamekeeper struck it over the head with an oar. Again the dog returned towards its executioner, who became more furious with his victim. He had not put down his oar, and now brandished it like a windmill to strike a mortal blow; but his violence made him lose his equilibrium, and he fell into the water. He did not know how to swim, and would certainly have been drowned if the dog had not seized with his teeth and supported the helpless man. The gamekeeper could thus lay hold of the boat, and so row to land. This saving of his life modified, as may be supposed, the man's feelings for the dog. Nothing, he says, when relating the story, but death shall separate him from the creature to whom he owes his life.

A Dog's Humanity.

A man once took a kitten to a neighbouring pond with the intention of drowning it, being accompanied to the scene of execution by his dog. No sooner, however, had he thrown it into the pond than in jumped the dog and brought the kitten to land again, laying it at its master's feet. Again the kitten was thrown in, and again the dog rescued it. The process was repeated, when the dog swam to land with the kitten and bolted home as fast as it could run, carrying it in its mouth. A few minutes later the dog was in its kennel, licking the half-drowned kitten with all the solicitude and affection of a mother. No further attempts were made to drown the kitten, which became the inseparable companion of its gallant rescuer.

Made £600 a Year.

Dogs with collecting-boxes attached to their collars are comparatively common. It may not, however, be generally known what large sums they earn for the charities they represent. One which used to beg for a hospital in Ireland collected in five years nearly £3,000. He had a special banking account, which was submitted periodically to a chartered accountant.

Shares.

Two boys had a dog named "Buff," which used to go with them on their ramblings. One day the boys went into the woods to have a picnic, and of course "Buff" accompanied them and shared their meal. Presently the dog ran away, but returned before long and deposited a big water-rat at the boys' feet, which he evidently intended as a contribution towards the picnic.

A Little Too Zealous.

"When at Brighton," writes a correspondent, "I was bathing off a boat at some distance from the shore. 'Tiger,' my dog, was watching proceedings with unusual interest, and when I dived he sprang in after me. I rose from my plunge, and the dog seized me very gently by the neck. Then, with his fore-paws on my shoulders, he kept me under water. We had a terrific struggle. The more I fought the more energetic he became, although he never attacked me savagely. I managed at last to reach the boat, and supported myself by the gunwale. We then came to terms. 'Tiger,' finding that I was not in danger, as he supposed, left me, and my difficulty was at an end."

A POLAR BEAR WATCHING AT A SEAL'S BREATHING-HOLE IN THE ICE.

From an Original Painting by F. T. Smith.

Photographs by Capt. Jackson.

LOONS WITH YOUNG MIGRATING SOUTH.

ARCTIC ANIMALS.

By Captain Frederick G. Jackson, F.Z.S.
(Leader of the Jackson-Harmsworth Polar Expedition.)

THERE is a popular impression that animal life is chiefly remarkable for its absence in the Polar Regions. This is perfectly true with regard to many vast frozen tracts within the Arctic Circle and the dreary wastes of floe-ice reaching towards the Pole. On the other hand, there are many more favoured localities literally teeming with life, to which the Little Auk, Guillimot, and Kittiwake return in the spring, after the long, death-like Arctic winter, to bask in the warming sunshine of the returning daylight and to bring forth their young.

The spots which birds frequent are usually southerly-facing rocks on a coast line, which rise above the glacier ice and stand sentinel-like at intervals overlooking the frozen sea beneath them. Here, as the darkness lightens and the first rosy blush of a returning sun appears over the desolate landscape after the four months of continuous darkness, the Dovekie first wings its flight from the more favoured lands of the south, followed in a few days by the Loon or Arctic Guillimot, Rotge or Little Auk, and later still by the Kittiwake.

The Polar Bear, Walrus and Seal are always with us, summer and winter, and depend only upon a limited amount of open water and the presence of food for their well-being. The bear least of all requires much water, for wherever the seal can find breathing space by keeping its blow-hole open, there also will the polar bear be found in search of his dinner. The walrus too will, in the localities he frequents, live summer and winter if the conditions, such as strong currents and high gales, favour the formation of thin ice.

I have been asked in this article to give a short account of the commoner Arctic animals which I came

IVORY GULL'S EGGS AND NEST.

KITTIWAKES AND LOONS NESTING ON CAPE FLORA.

across during my three years' sojourn in Franz Josef Land. I do not propose to deal with these in any scientific order, and as the Polar Bear is the most popular, I will begin by telling my readers a little about his ways.

As I find that there is some doubt on the matter, I may say at once that he is yellowish-white in colour all the year round, and does not change from a darker hue to white in the autumn. He is, strictly speaking, a carnivorous animal, and lives

Photograph by] STEALING THE PROVISIONS. *[Capt. Jackson.*

almost entirely upon seals. On the other hand, I have frequently found the stomachs of these bears crammed with vegetable matter—chiefly grass, which has been gathered from the sparsely-covered spots where the ice-sheet fails to reach. This bear is one of the largest of its family, and a large male will weigh as much as 900 lbs. His coat during the winter and early spring is very long and thick; and in the late spring it is

Photograph by] POLAR BEAR ON A BERG. *[Capt. Jackson.*

shed and replaced by one more suited to the warmer temperature of summer. The feet are very large and well adapted for travelling over snow, and between the pads thick hair grows to aid in keeping the feet warm and to prevent slipping upon smooth ice. The brain capacity is small, and I found, in a large number of bears whose brains I weighed, the weight not to exceed $16\frac{1}{4}$ ozs. The impression

Photograph by] A CHARACTERISTIC ATTITUDE. *[Johannes Madsen.*

given on seeing an unskinned bear's head is that it has a large brain-cavity, but on cleaning the skull it is seen that the appearance is caused by the huge muscles used for moving the jaws. The polar bear is "a bit of a fool" is the conclusion one arrives at on examining the head closely, but a terrible fellow to bite, which is quite true. The belief that the polar bear hibernates is an erroneous one. I have shot numbers of polar bears, both male and female, during the long Arctic winter.

Photo by Lewis Medland, F.Z.S.
A CAPTIVE WALRUS.
Taken at the London Zoo, where it remained only a few days

The female will lay up in a lair deeply buried in snow for many weeks, both before and after bringing forth young, and during that time will touch no food. As the time of gestation, as a rule, is during the months of darkness, this period of seclusion has been mistaken by some travellers for hibernation by both male and female. The lair is dumb-bell shaped and about twelve feet from end to end, with a narrow breathing-hole from the waist of the dumb-bell communicating with the outside air.

The cubs, rarely more than two in number, weigh about 16 lbs. at birth. The hair is whiter than in the adult, and naturally finer in texture. They show the badness of their kind at an early age, and are intractable, ill-tempered little creatures, on whom kindness has no softening influence. During one winter we had no less than three bear-cubs living in the hut at one time with ourselves. As time went on their uncouth behaviour increased, and they turned the place into a bedlam of noise—so much so that my party could get no sleep night or day, and if any of the men ventured across the room one of the little cubs was pretty sure to "go for" him. We fed them on condensed milk from an extemporised feeding-bottle, which they took to very readily.

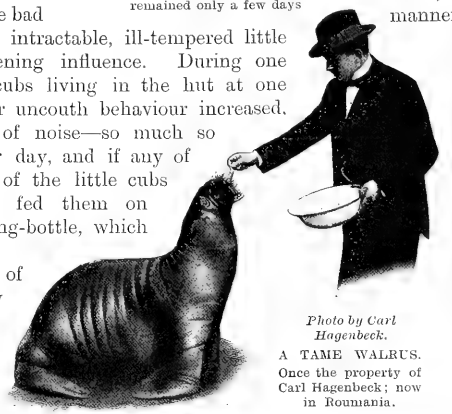


Photo by Carl Hagenbeck.
A TAME WALRUS.
Once the property of Carl Hagenbeck; now in Roumania.

The polar bear is the great provider of sport in the Arctic regions, and of supply to the larder. The terrible monotony of life there has often been relieved by the appearance of his great straw-coloured body as he cautiously approaches from leeward the ice-bound

Photographs by Capt. Jackson.
WALRUS IN THE WATER.

TWO WALRUSES ASLEEP ON FLOATING ICE.

ship or the lonely hut in those desolate wastes. His flesh, too, in a land where fresh meat is so all-important, is hailed with satisfaction by all but the most prejudiced. Bear-meat has been the chief stand-by of more than one expedition, and with plenty of it, or of any fresh meat, and proper care being exercised, scurvy—that curse of Polar expeditions—can be kept at bay.

One never knows, from a sporting point of view, how the polar bear will behave on being sighted. He may take to his heels at once, panic-stricken at the sight of a human being, or on the other hand, probably spurred on by curiosity—a marked characteristic of the species—may come rushing down to ascertain what this new kind of seal, as man possibly appears to him, may be.

Dogs, especially those of Arctic breeds, such as Esquimaux, Samoyad, or Ostiak, are of great help in hunting the bear, especially during the darkness of the winter months. Should the bear show an inclination to take to flight these dogs, by biting his heels and generally annoying him, will cause him to turn about and fight a rear-guard action, thus giving the sportsman time to come up and with a rifle-shot put an end to the hunt. Bears frequently came down to our hut at Cape Flora, and were added to the pot.

Sometimes, after a long chase, the bear will dash up the sloping side of a berg

Photograph by Capt. Jackson. GREENLAND HARP-SEAL

Lying near its hole on an ice-floe, twenty miles from open water.

or other position of vantage and there stand at bay, as in the photograph on page 158, until his human enemy appears and adds to his indignities by making him pose as a sitter for his photograph first before giving him the *coup de grâce* with the rifle. The photograph here referred to is one of a number taken by the author of polar bears on their native floes—the first ever so taken.

Next to the polar bear the Walrus probably claims the greatest amount of popular interest amongst Arctic animals, though to most his ponderous body and long white tusks are unfamiliar except in museums and pictures, for the walrus is exceedingly difficult to rear in captivity.

A full-grown bull walrus weighs about 2,000 lbs.; it has very heavy, strong tusks, and outweighs the female, whose tusks are much thinner and very considerably lighter. The skin, which in parts of the body, such as along the back, is as much as an inch and a half in thickness, is covered with short, sparse, coarse hair, brown in colour. The value of the walrus lies in the hide itself, the thick layer of blubber underlying the skin, and in a lesser degree in the ivory of the tusks.

In some parts of the Arctic, such as the islands of Spitzbergen and the neighbourhood, walruses have been found in great numbers—soon reduced by persistent hunting.

Proximity to land and in shallow water is the spot chosen by the walrus as its habitat. Here it brings forth its young, usually one at a birth, and is able to dredge on the bottom of the sea for its food, which consists largely of shell-fish. The chief uses of the formidable tusks are four: In the first place to scrape up the bottom to obtain food; secondly, when lying on its back in the water, by their aid the animal is able to knock holes through thin ice, and so clamber out; thirdly, as very formidable weapons of offence in fighting; and last of all, to enable the walrus to scramble out of the water upon ice or land, and as propelling agents in walking.

Photograph by E. J. Beck.

REINDEER.

The walrus is an animal of considerable amount of intelligence—far more so than the polar bear. He has a well-shaped head and a large brain-cavity. At our hut on Cape Flora, Franz Josef Land, we had two juvenile walruses, whose weight, although only a few weeks old, was nearly thirteen and a-half stones each. These two little animals soon got to know us, and one of them, although a bad walker, even tried to follow me about the plateau near the hut. We fed them on condensed milk, and for some time they did well, but eventually died on their way home to the Zoo.

Walruses, bulls especially, are animals that love a fight and will go a long way out of their course to have one. In the water they are most dangerous antagonists, and with their powerful tusks, enormous weight and great strength, will quickly reduce a boat to matchwood. On ice or land, owing to their want of mobility, they are harmless in dealing with an ordinarily active man with space to move about.

It is a common sight to see eight or ten walruses lying asleep on small detached pieces of floating ice, idly drifting with the tide. They then look much like large leeches, and the photograph on page 159 gives a good idea of their appearance. They are, too, quite at home in the water, and the photograph in question shows a young walrus raising his head above the water to look about him.

The appearance of small heaps of pebbles and shells on the ice-floes in the neighbourhood where walruses have been lying is somewhat puzzling at first. These stones have, however, been swallowed by these animals either accidentally in gathering up bivalves and other shell-fish from the bottom of the sea, or deliberately to aid digestion, and then ejected by the contraction of the stomach after that act has been performed.

There are several varieties of the Arctic Fox, and these differ in colouring. The creature

Photograph by J. Madsen.

WHITE POLAR WOLF.

is a thin, lithe-looking animal, somewhat smaller than his English relative. As everyone knows, the Arctic fox is one of those animals on whose coat the seasons effect a change in the matter of colour, altering as a rule from a darker hue to white or piebald in autumn, though I have seen these animals in the far north with coats quite dark even in the winter months. The most interesting characteristic of the Arctic fox is perhaps his habit of storing up a larder for use during the long winter months, when food is scarce.

Photograph by J. Madsen.
A FAMILY OF MUSK-OXEN.

The commonest of the Arctic Seals, of which there are many species, is the Greenland Harp-Seal, for whose capture scores of vessels annually leave the American, British, and Norwegian ports. A single vessel would take sometimes as many as 40,000 seals, which will give some idea of the immense destruction of life. The natural result has followed, namely, a very great reduction in their numbers. The Fur-Seal, the skin of which is used for ladies' jackets, comes only from Alaska and the islands off that coast. There was once a large fishery for fur-seals in the Antarctic regions, but indiscriminate slaughter almost exterminated them, and the survivors are now protected and slowly increasing in numbers.

Like the seals, Reindeer, the great draught animals of the sub-Arctic regions, have a very wide distribution. They are the mainstay of the Samoyads, who to a large extent live upon their flesh, and of course make much use of them as draught animals. The same remark, but in a lesser degree, holds good with regard to the Lapps. The Samoyads never drive less than two reindeer abreast, sometimes as many as seven or eight, whereas the Lapps only harness up one; but that one as a rule is much larger.

The reindeer is the only deer of which both the male and female have antlers. The Caribou of Northern America are varieties of reindeer. In parts of Spitzbergen, Nova Zembla, Siberia, and even in the dense forests near the shores of the White Sea, wild reindeer are still to be met with.

Photograph by J. Madsen.
A TAME MUSK-OX IN ICELAND.

With the remaining animals to be mentioned here I must deal very briefly, as the space at my disposal is limited.

The Wolf in Europe is met with chiefly in two varieties—the large wolf of Russia, which goes about as a rule singly, and a smaller variety which hunts in packs. The first is seldom dangerous, whereas the latter, owing to their

numbers, when pressed by hunger, may be. Wolf-skin is one of the warmest skins known, second probably only to reindeer-skin. Its high price, however, renders the use of reindeer-skin far more common.

Musk-Oxen now exist only in a few very remote spots in the Arctic regions. The Nares Expedition found them in Grinnell Land, Peary at the extreme north-east point of Greenland. They also exist in some numbers along the east coast of Greenland and along the shores of Arctic America. A bull weighs about 300 lbs., stands about 3 ft. 6 in. high, and is a dull brown in colour. They are easily killed, and when attacked commonly cluster together and form up with their heads towards the foe—a plan of defence which avails them little against the rifle. Nares records that one of his expedition even killed one with a knife, not having a gun handy.

The Scandinavian Elk would rapidly become extinct but for the protection afforded it by the Government of Norway and Sweden, where very stringent laws are in force for its preservation. Only during a few weeks in the year can it be hunted, and even then only a limited number may be killed in each district. The Moose is the American counterpart of the European elk. It is the largest of the deer, and is very difficult to stalk on account of its extreme wariness.

Photograph by J. Madsen.

YOUNG SCANDINAVIAN ELK.

The Arctic Hare is only white in winter, changing from its brown summer coat in the late autumn to white—the only remnant of colour remaining being the black tips to the ears. No one who has never seen Arctic hares in their winter coat can credit how extremely difficult they are to see on the snow, for unlike the polar bear, they are a pure white. They live in burrows in the snow during the winter, only coming out to feed.

The Ermine has a very wide distribution. The majority of ermine-skins which reach this country come from northern Russia, where these skins are little valued and sell as low as eight kopecks apiece, and when I travelled across the Great Tundra country to the south of Waigatz in 1893, I could have bought numbers at even a lower price of the Samoyads and Russian peasants. It is, in fact, a poor skin with short, thin hair. Its use for ages past by royal personages has apparently given it a value it does not deserve.

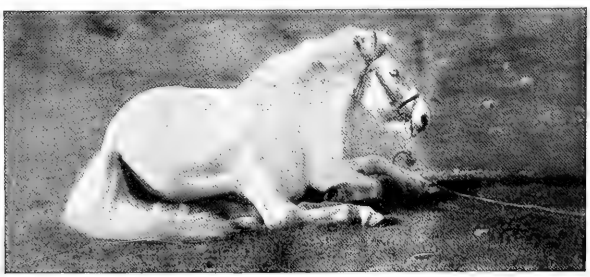
The last of the Arctic mammals that I shall mention are the members of the great Whale family. The most valuable and one of the largest of these monsters is the Greenland Right Whale, from which the whalebone of commerce is obtained. It has in addition deep layers of blubber under the skin twelve or fourteen or more inches in thickness in many parts of the body. The whalebone is obtained in the form of plates set close together in the mouth, and as much as twelve feet in length. On the inner edge is a hairy fringe which forms a kind of network and enables the whale when swimming with its mouth open to enclose its minute animal food, which the whalers call "rice food" owing to its resemblance to a grain of rice. At one

Photo by J. Madsen.
ERMINE.

time large fleets of ships used annually to leave the Scotch, English, and Norwegian ports to hunt the Greenland Right Whale; but these whales have been so reduced in numbers as to be hardly worth going after, and scarcely any whalers now hunt them. The Finners and the Bottle-Nose are also taken chiefly for the blubber, as the Bottle-Nose has no whalebone, and the Finners have only very short plates in the mouth.

Photo by J. Madsen.
POLAR HARE.

I have left no space to speak in detail even of the commoner Arctic birds. Of these, probably the most familiar to travellers within the Circle is the Loon or Arctic Guillimot, of which some photographs are given at the beginning of this article. This bird, together with the Little Auk and the Dovekie, is the first to break the long silence of the dark winter months. The Loon lays a single egg on the bare ledges of rock without any attempt at a nest. Towards the end of August the young birds make their descent to the sea by taking a jump from the high cliffs, opening their wings and so skimming downwards towards the sea. In this the old birds aid them, flying with them and holding up the youngsters by the tail. I have seen as many as three old birds helping a single young one. Kittiwakes are nearly as common in some spots on the Arctic as on the British coasts. They make a nest of dry grass, and usually build near the loons, but on a tier of rocks beneath them. Concerning Gulls I need say nothing, as these have already been dealt with in ANIMAL LIFE; and it only remains for me to mention the names of the Snow Bunting, the Skua, the Snowy Owl, the Turnstone, the Knot and the Brent Goose as some of the birds more commonly met with in the Arctic Regions.



Photograph by J. Madsen.
ICELAND HORSE.

ZOO NOTES.

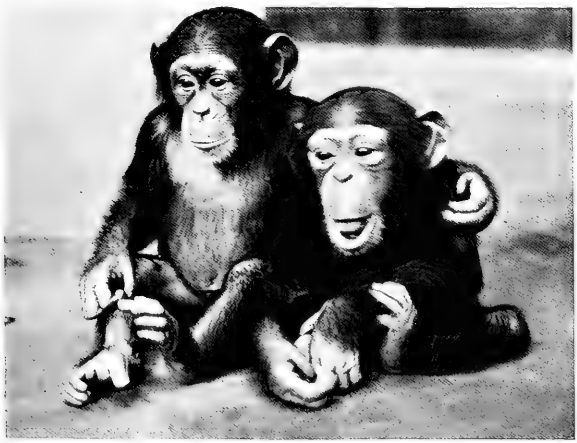
Photograph by W. P. Dando, F.Z.S.

WHITE-COLLARED MANGABEY.

Chimpanzees.

At the present moment the Ape House is well filled with Chimpanzees. Susan, one of the new arrivals, is shown on the left of the picture. She and Jimmy are the best of friends, but it is evident from the photograph that the former was the one who made the first advances. She is the only lady of her species at present in the Gardens, so Jimmy ought to be flattered by her attentions. The other less-favoured members of this chimpanzee "school" are a younger male, and three fair-sized ones named Micky, Pat, and John—a most unrivalled series. Unfortunately there is no room for the small specimens upstairs, so Jimmy, Susan, and the other child chimpanzee are at present secluded below.

All these chimpanzees are of the ordinary type, with light skins and hairy heads, whereas the late lamented Sally was bald and black.



Photograph by W. P. Dando, F.Z.S.

"JIMMY" AND "SUSAN."

Cherry-Crown Monkey.

A MONKEY of lower degree is the Cherry-Crown or White-Throated Mangabey (*Cercocebus albigularis*), which is noticeable for its handsome colour, the neck and under-surface being pure white, while the rest of the body is mostly slate-colour, and the top of the head of so rich a reddish-brown that the title of "Cherry-Crown" is quite appropriate. Like all the other mangabeys, this species has the upper eyelids white. There are only a few species of mangabeys, all

inhabiting West Africa; and, as is so often the case with West African animals, little is known about them.

Sumatran Civet.

The Sumatran Civet (*Viverra tangalunga*) is an example of the heavily-built ground-living civets of which the African Civet-Cat (*Viverra civetta*) is the type. The former has a wide range in the islands of the Eastern Archipelago, but its emigration in some cases may have been "assisted," as it is one of the species which are kept caged for their scented secretion, and so commonly carried about from place to place by the Malays. As an example of the curious way in which captive animals turn up in out-of-the-way places, the case may be mentioned of a white variety (not a true albino, for its eyes were dark) of one of the Tree-Civets (*Paradoxurus*) in the Calcutta Zoological Garden which had been brought from Fiji, of all places, by a Turkish trader in sham jewellery!

SUMATRAN CIVET.

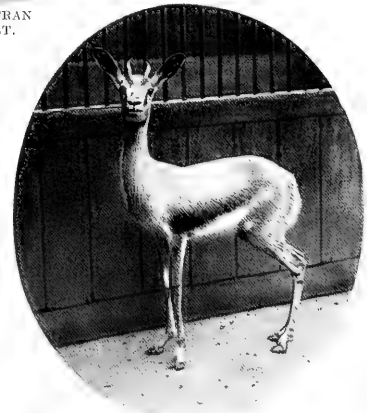
Nagor Antelope.

The Nagor Antelope of West Africa (*Cervicapra redunca*), although described by Buffon so long ago as 1764, remained little known for many years subsequently, especially in captivity. The London Gardens did not receive a specimen till 1890, this having been presented by Dr. Percy Randall. That specimen, however, is now dead, and another is depicted in the photograph.

Dorcas Gazelle.

As a contrast to the rare Nagor we may take the Dorcas Gazelle (*Gazella dorcas*), which is on the whole the most familiar of all antelopes, having been known even to some ancient Greek writers, such as Ælian, who used the same name, "dorcas," as was subsequently given to it by Linnæus. This animal is also the "roe" so frequently mentioned in scripture; and it is still, according to Canon Tristram, far the commonest large game animal in Palestine; that well-known naturalist has even seen a small troop feeding on the Mount of Olives, close

NAGOR ANTELOPE.



DORCAS GAZELLE.

Photographs by W. P. Dando, F.Z.S.

to the city of Jerusalem. Canon Tristram also mentions a very pretty sight he once enjoyed: "When ensconced out of sight in a storax bush, I watched a pair of gazelles with their kid, which the dam was suckling. Ever and anon both the soft-eyed parents would gambol with it as though fawns themselves." It seems a shame to hunt such beautiful and innocent creatures, especially when, as is often the custom with the Bedouin, both hawk and hound are pitted against the poor gazelle. Were it attacked only by the latter, it could hardly complain of the odds, for its speed is often too much even for the greyhound; but when confused by the attacks of the falcon, which of course more easily overhauls it, and then dashes at its face, it naturally is almost certain to fall a victim unless fortune has favoured it with an unusually long start. The tastes of the "children of the desert" evidently need educating in the matter of what constitutes fair sport.

Rüppell's Vulture.

Rüppell's Vulture, which is shown in two positions, is in form a typical representative of the "Goose-Vultures," as the Germans call those of the genus *Gyps*, no doubt on account of their remarkably long necks; English ornithologists know them as "Griffon Vultures." recognisable

Photo by W. P. Dando, F.Z.S.

RÜPPELL'S VULTURE.

The present species is easily by its plumage, which is unusually diversified by conspicuous pale edges to the feathers—most vultures, and griffons in particular, being very dull and uniform, not to say shabby, in colouring.

Rüppell's Vulture is an African species, and has a wide range, being found both in the north-east and southern portions of the continent, and extending to Ovampoland on the west coast.

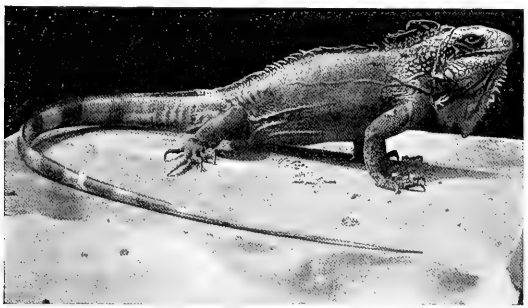
Photograph by W. P. Dando, F.Z.S.

RÜPPELL'S VULTURE.

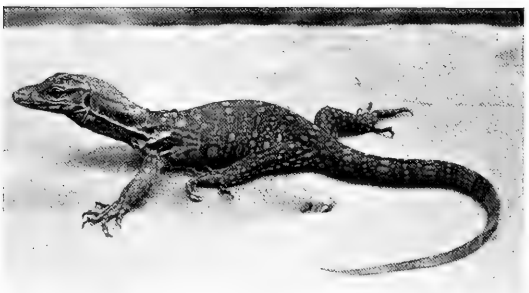
Iguana.

The photograph of the Iguana (*Iguana tuberculata*) gives an excellent idea of this reptile, which, though often said to be repulsive in appearance, is really extremely picturesque, its spiny crest and heavy dewlap giving it a most dignified appearance in conjunction with its large size; for this iguana is one of the largest of existing lizards, attaining a length of two yards, with

a weight approaching thirty pounds. This species inhabits the warmer parts of America, including the West Indies, and lives on trees overhanging water, into which it can jump whenever danger threatens. As the iguana does not always look before it leaps, there is some danger in human beings going up creeks frequented by it; for two stone of lizard dropping like the gentle dew from heaven is not to be lightly encountered if one wishes to keep one's bones intact. These iguanas



TUBERCULATED IGUANA.



Photographs by W. P. Dando, F.Z.S.

TWO-BANDED MONITOR.

are vegetable feeders, and are themselves esteemed as food in the countries they inhabit. A hideous piece of cruelty is sometimes perpetrated in bringing them to market, the tendons of the living reptile's toes being ripped out and employed to tie its feet to keep it quiet.

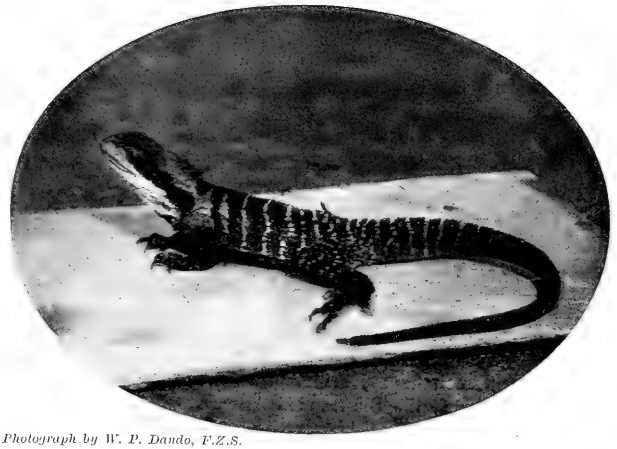
Two-Banded Monitor.

The Monitor shown in the accompanying illustration is a member of a group often called Iguanas—or more usually 'Guanas—in India and Australia. This name, however, is quite incorrect, as the true iguanas are nearly all American, and are besides lizards of very different appearance, as may easily be seen in the examples of both groups here shown. Monitors are confined to the warmer parts of the Old World, and resemble the larger iguanas in being of a much bigger size than most lizards. They are, however, very different in their feeding-habits, since they are carnivorous, and devour animals of considerable size, such as rats and chickens; they also prey upon the eggs of birds. Most monitors are more or less aquatic, living near the water and frequently entering it, in this again resembling the iguanas. They are unfortunate in their names, for the book-name "Monitor," or warner, is founded on a misconception; the Arabic word for lizard, "Waran," having been corrupted by early writers into "Warn," so that the reptile got a reputation for giving warnings which it did not deserve. Even when small, monitors may easily be distinguished from any other known lizards by their long necks, heads covered all over with small scales instead of large plates, and the long deeply-forked tongue, which is exactly like that of a snake.

Lesueur's Water-Lizard.

Aquatic Lizards, when we get away from the Monitors and the Iguanas, are rare, but Australia possesses one in the shape of Lesueur's Water-Lizard (*Physignathus lesueuri*). This species and its allies are fond of the water, and keep near it in thick vegetation. In appearance they distinctly recall the iguanas, but belong to a different family—the Agamas (*Agamidæ*). These agamas fill in the Old World much the same place as do the iguanas in the New, since each family comprises a great variety of types, and these different types often resemble

each other in a most remarkable way in structure or habit, or both. Thus, in each family there are vegetable and animal feeders, arboreal, terrestrial, and aquatic forms. None of the agamas, however, grow to the size of the large iguanas. They differ also in the mode of fixing of the teeth, which are set on the edge of the jaw-bones, while in the iguanas they are placed against the inside of the jaw-bone, this latter being the commonest mode of attachment of the teeth in lizards.

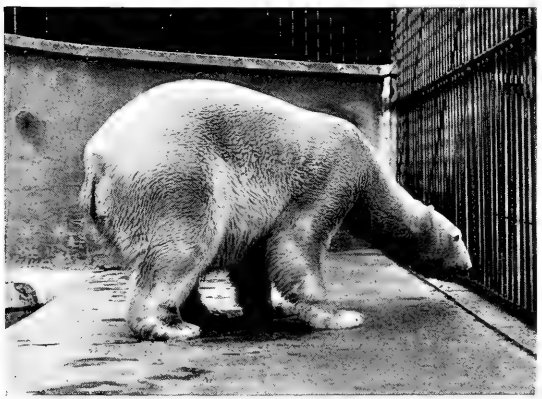


Photograph by W. P. Dando, F.Z.S.

LESUEUR'S WATER-LIZARD.

Polar Bears.

THE Zoological Society has sustained a sad loss in the death of "Sam," their only Polar Bear, who died quite suddenly on November 1st. A post-mortem examination made by Dr. P. Chalmers Mitchell and Dr. R. N. Salaman disclosed the fact that "Sam's" death was due to an aneurism of the aorta. It is thus some consolation to know that the cause of death was not a preventible one, while the fact of an aneurism occurring in a bear is of great pathological interest, since up to now the human subject only had been known to be so affected. "Sam," who had been just over eight years in the Gardens, was a very intelligent animal, and his habit of acquiring the umbrellas and sticks of the public has been much commented on in the press. It would never do for the Zoological Gardens to be long without so interesting and attractive an animal as the Polar bear, and it is therefore very satisfactory to find that "Sam's" successor entered upon its residence at the Gardens almost immediately, though it cannot be said quite to fill the place of the deceased, since it is at present a mere cub, as indeed was "Sam" when he first arrived from Spitzbergen. The new comer stands a fair chance of a long life in the Gardens, for polar bears do well in captivity, more than one of the Society's previous specimens having lived in Regent's Park for over thirty years. Cubs have also been produced in the Gardens, so that it is evident the constitution of this typically Arctic animal is quite adaptable to our temperate climate.



Photograph by W. P. Dando, F.Z.S.

THE POLAR BEAR THAT HAS LATELY DIED.

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

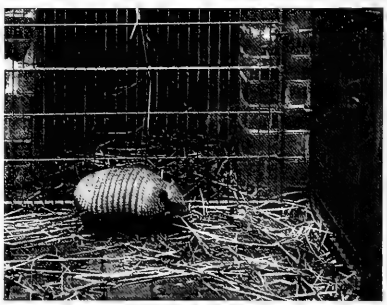
By P. Wellington Farmborough, f.z.s., f.e.s., etc.

XI. THE ARMADILLO.

I PRESUME few people have ever gone in for Armadillos as pets, and this is rather strange considering what curiously interesting animals they are. A few years ago they were very seldom imported, but of late a considerable number have from time to time made their appearance on the market. Armadillos are not by any means scarce in the countries of which they are natives, but owing to their extreme wariness they are most difficult to capture.

Any specimen of the armadillo that my readers will purchase is sure to be one of three species, viz., the Six-Banded Armadillo, the Three-Banded Armadillo, or the Hairy Armadillo. The distinguishing name of the first two species is derived from the number of transverse bands dividing the carapace, or rather forming the hinged joints by means of which the animal is enabled to roll itself up into a ball similar to the habit of the common hedgehog when annoyed or disturbed. The exact number of bands in the so-called "Six-Banded" species varies, some individuals even possessing eight. This species is common in Brazil and Paraguay, and is about twenty inches long, of which the tail takes up about five or six inches. The prettiest of all the family of armadillos is the "Pichiago," and at the same time it is the rarest; I have only seen one specimen alive, and that in one of the Continental Zoos. The carapace is a delicate pink colour, and the hairs whitish; it is a native of the extreme western portion of Argentina, being found only on the large cactus-covered sand-plains. The largest of the family is the Giant Armadillo, a native of Surinam and Brazil; this species is, in spite of its size, seldom seen, owing to the fact that it hides itself in the vastnesses of the enormous forest tracts of those countries. The colour is a very dark brown, with a band of white on the sides, the head and tail being very light-coloured; but it is very unlikely that any of my readers will find themselves burdened with the responsibility of keeping one of these animals.

The Six-Banded species is solitary by nature—as indeed are all armadillos—and flees to its burrow at the least suspicious sound that may attract its attention, and it will not emerge until it is satisfied that all signs of danger have disappeared. It is reputed to be able to move so quickly that a swift-footed man would have some difficulty in overtaking it. Owing to its quick-burrowing powers, more especially in places where the ground is at all soft or loose, an armadillo cannot be given even partial liberty except the floor be concreted or otherwise paved with some hard material, as it would have disappeared from sight before it could be recaptured if unobserved for a moment or so. If it be on hard ground through which there would be a difficulty in



ARMADILLO.
This photograph shows the bands well.

burrowing, the armadillo immediately rolls itself up into a ball at the first warning of danger. The Three-Banded Armadillo can roll itself up into a much tighter ball than the six-banded species—to such an extent that a dog or other carnivore is usually unable to grasp it in its teeth, which slip off the glassy surface of the carapace and allow the animated ball to roll away from its mouth. It is possibly owing to this, and to being more purely diurnal in its habits, that this species does not dwell in burrows as the other species do.

The Hairy Armadillo is found in Argentina, and to a very great extent is carnivorous in its tastes, usually preferring the putrid flesh of some dead animal Indeed on the plains it is noticed that the freshly-made burrows of this species are mostly in very close proximity to the carcase of some animal, so that they may be said to be, as it were, scavengers. It is stated that the carnivorous habits of this armadillo often lead to its destruction, as it sometimes partakes of the poisoned meat laid down for the benefit of stray dogs and foxes. It is used sometimes as an article of food, and is hunted with dogs for that purpose. As the carapace shields the body of the armadillo, the dogs seize it by one or other of the projecting parts, either the head or a foot, and hold it until the hunter comes up and kills the creature. It is stated that some very clever dogs put the snout under the carapace of the retreating armadillo and turn the latter upon its back—making it "turn-turtle," as it were—and then seize it by the tender under-parts of the abdomen, when, of course, the armadillo is speedily killed.

As the armadillos are very strong and have powerful limbs, the cage in which they are to be kept must be sufficiently large and strong enough to resist any attacks that may be made upon it, especially during the first few weeks of the animals' captivity. If the reader can go to the expense of a small dog-kennel with a wired run he is advised to do so, as such a structure is as good as can be got. If it be inconvenient to purchase one of these, a cage must be constructed; it should not, if it can be helped, be less than four or five feet in length by a yard high and deep. The front must be of what is technically known as "rod-iron," of about $\frac{1}{8}$" or $\frac{3}{16}$" in diameter. A door at both ends of the cage is necessary so as to allow the interior to be readily accessible at such times as it is needed to be cleaned out. Two troughs—the heavier the better—will be wanted, one for the water, the other for the food; heavy ones are advised, as armadillos seem to take the keenest delight in overturning the food-vessels; such a *contretemps* may be avoided if the troughs are fastened by some means to the cage. The floor is best covered with sand to the depth of an inch or two, and over this a layer of hay or straw; it will be found that the animal will push most of this up into one place and make a big bundle wherein it can burrow itself out of sight and away from prying fingers.

ARMADILLO.
Showing fore-legs and method of walking.

Armadillos are easily catered for, and although when wild are reported to be quite carnivorous, with the exception of the three-banded species, they may be fed on raw meat — beef for preference — shredded or minced finely, and mixed with bread and milk. The Three-Banded Armadillo is almost exclusively a vegetarian, and may be fed on fruit and green vegetables. At times, to relieve the monotony of the "beef *cum* bread and milk" diet, tripe may be substituted for the beef, or a dead sparrow or two may be given; a dead lizard

or a defunct snake is also relished; an egg, worms, and caterpillars are also freely taken, so that the "changes" may be rung pretty frequently to the advantage of the armadillo.

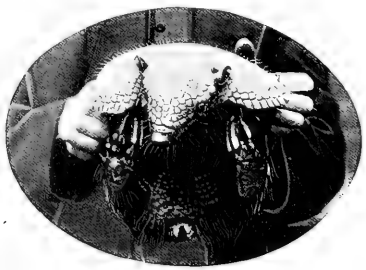
In captivity, armadillos become very lively towards the evening. This, owing to their nocturnal habits, might be expected, but in captivity they appear to lose more readily than other animals of a similar nature this trait of their habits, and to adapt themselves more generally to a diurnal existence. Owing to the carnivorous tastes of the armadillo the cage must be thoroughly and often cleansed, as otherwise it will quickly become offensive.

These animals are not very demonstrative in whatever affections they may have, but they get tame enough to respond to a whistle from their keeper, and to show certain signs of pleasure at his approach. They do not often bite—at least, the writer has never been bitten by one yet—but they can and do inflict very painful wounds with the long claws of the fore-limbs, particularly when lifted up. One of the photographs shows an armadillo held up to display the under-parts and the large claws with which, although primarily intended for burrowing purposes, they defend themselves.

There is no need to provide a special closed-off part of the cage for an armadillo, as the animal is just as content, if only it has a bundle of straw, to curl itself up in one corner of the cage. An armadillo usually sleeps on its back.

The number of young produced at a birth is two; these for some little time are quite blind and helpless, and are suckled for some weeks. Itinerant showmen occasionally exhibit the armadillo under the awe-inspiring title of "The Wonderful Hog in Armour."

It is a somewhat curious fact in connection with the classification of these animals that, although placed among the Edentates (a word signifying *toothless*), one of the species, viz., the Giant Armadillo—previously referred to—has a larger number of teeth than any other land mammal, possessing as it does at least *ninety* molars. Let us hope it does not suffer much with toothache. Armadillos for their size are very heavy, and it is usually a matter of surprise to the interested spectator when he is permitted to lift one and discovers the unexpected weight of the animal. This weight, combined with the muscular energy displayed, soon results in the armadillo being replaced in its cage.



Armadillo held up to show the soft under-parts and the powerful claws used in burrowing.

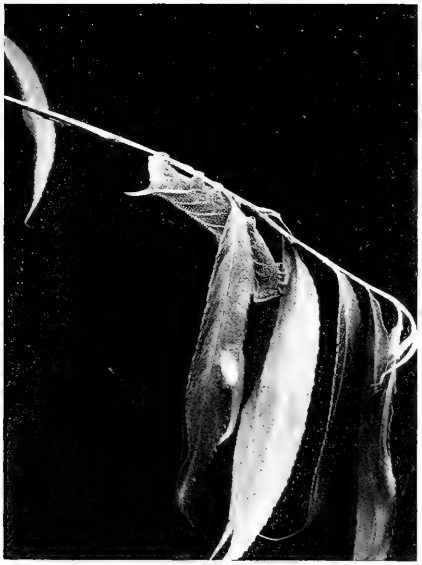


Fig. 1.

Fig 2.

THE LIFE-HISTORY OF THE LIME HAWK-MOTH.

Illustrated with Photographs taken from Life by FRED ENOCK, F.L.S., etc.

THERE is no doubt that to most entomologists the prime favourites among the British Lepidoptera are the "Hawk" Moths ("Sphinges"). Apart from being of large size, their elegant and well-proportioned wings, their long tongues and huge eyes, containing tens of thousands of facets, and last, but not least, their wonderfully-formed and complex antennæ, all help to make the unexpected sight of one "sitting" on a wall or tree-trunk send a thrill of intense pleasure through mind and body.

In Great Britain the Sphinges number sixteen—or seventeen if we include the doubtful Pine Hawk as indigenous.

Most entomologists worthy of the name are seldom without a pill-box for emergencies. It is astonishing in what unaccountable places good insects, either as regards rarity or variety, will turn up; but hawk-moths are so large that no pill-box will hold one. In such case the "top-hat" is very handy for conveying such captures home. Many are the uses to which I have at different times turned my own.

An acquaintance, a zealous "City man," as well as an enthusiastic entomologist, once caught a fine female "Ghost-Moth"—which was promptly transferred to his silk hat. On his way to business he was made aware that the "Ghost" was on the wing, having evidently mistaken the darkness of the inner regions of the hat for night! On arrival at the office my friend removed his hat, and to his astonishment found that his hair was full of minute eggs, to the number of some hundreds! It is the habit of the female Ghost-Moth to shoot its eggs from its ovipositor as it flies over the grass in the dusk of evening. No doubt the imprisoned specimen had been labouring under a wrong

impression; but my friend decided not to carry such moths in his hat again. Hawk-moths do not readily lay eggs in confinement. They take their name "Hawk" from their swift and powerful flight; and it is not often that they give a second chance when once missed by the entomologist. The only way is to steal a march upon them as they hover over some flower; or, better still, not to march at all, but take your stand, net in hand, close to some large clump of their favourite flowers, and there wait like a statue until a moving shadow seems to pass suddenly before you among the flowers; then if you strike quickly you may be fortunate in capturing the prize.

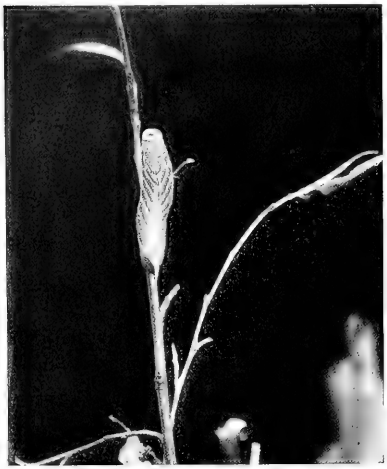


Fig. 3.

The Humming-Bird Hawk-Moth is not infrequently seen in the London parks in August and September, flitting from flower to flower of the Nicotiana. I have often watched it in my own garden darting rapidly from flower to flower of the white jessamine. The larvæ are found feeding upon the garden fuchsia.

The beautiful Privet Hawk is another member of this charming group found in London gardens, where the English privet is plentiful, but the larvæ do not relish the soot-laden leaves, preferring to go further afield. I have had a number sent to me from the country, very few of which have been able to digest our smoke and dust.

Fig. 4.

The hardiest of all, the Poplar Hawk, sometimes reaches more than four inches across the wings. These are not of so pointed a character as those of the Privet Moth, whose wings when at rest are roofed down close to the body, which is completely hidden. In the three species belonging to the genus *Smerinthus*, the outer margins of the wings are beautifully scalloped, both upper and lower wings being held half open away from the body, with the tips considerably raised. In this loose attitude the Poplar Hawk much resembles many things, from a dead leaf to the cross-bar underneath a street gas lamp—a favourite resting-place for this moth. The last specimen caught this year I found early one morning attached to this lever. Of course, when in such a situation, the capture necessitates "swarming" the lamp-post. The eggs are scattered in twos and threes generally on the underside of the leaves of various kinds of poplars. On hatching, the young larva "takes hold" of the thin leaf-stalk with its powerful claspers, the rest of its body being hidden underneath the leaf, and "come wind or tempest" the larva holds on like grim death, any attempt to pull it off its food being fatal.

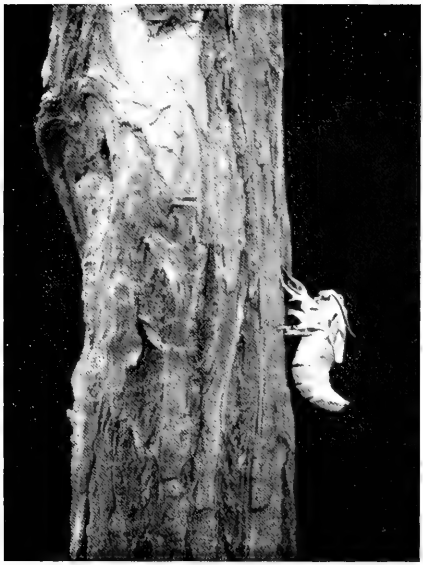


Fig. 5.

Fig. 6.

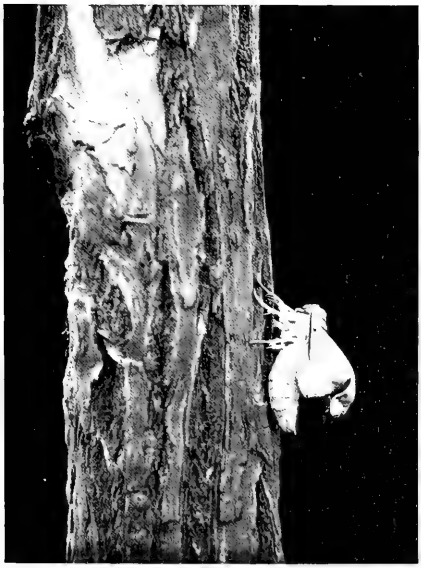


Fig. 7.

Fig. 8.

They do not wander far, but quietly feed upon the leaves one after another. Their presence in any poplar is made known by the pellets of frass upon the pavement. When full-fed, in August and September, they descend the trunks and often walk long distances before finding a convenient place in the soil in which to pupate.

The beautiful Eyed Hawk is not common about London, though occasionally found feeding upon apple trees in old-fashioned gardens such as those at Waterlow Park, where it is also to be seen upon willows, its favourite food, especially when these overhang water (Fig. 1). In such situations, their pale-green bodies, with seven whitish oblique stripes on each side, give them such wonderful protective resemblance that it requires a sharp eye to detect them, as they are nearly the same width as a willow-leaf, and, like the other hawk-moths, have a more or less pronounced horn on the last segment, the point bending over towards the tail. In all three species of *Smerinthus* the skin is rough and shagreened. The Poplar Hawk is yellowish green, with yellow stripes and horn; the margin of the head being also yellow. Sometimes the larvæ are ornamented with reddish markings. The Eyed Hawk is perhaps a little longer, but with the exception of the markings, colour of the oblique stripes, etc., being white, and the whole body covered with minute white spots giving it the shagreened appearance, the family resemblance is at once seen. In August last I found some larvæ feeding upon a willow overhanging the canal at Woking, and took a photograph of them. The larvæ were then boxed and transferred to my "larvarium," where they increased in length and girth until three inches long.

The pose of Sphinx larvæ is very striking (Fig. 2). They cannot be photographed at any moment, as one peculiarity is their extreme sensitiveness, the mere opening of a door being quite sufficient to disturb them from their sphinx-like attitude and put them on the quiver. But with the marvellous lenses now made both quivering and chattering do not prevent photographs being taken, as Figs. 3 and 4 will prove.

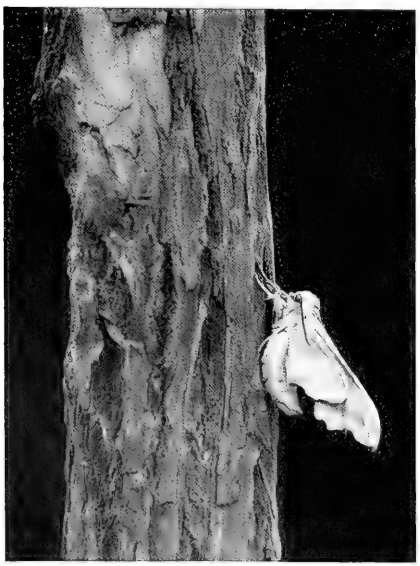


Fig 9.

When full-fed, the caterpillars soon lose their clear colour, the whitish-green changing to a sickly yellow, which tones better to the colour of the ground over which they travel until a suitable spot is found. Here the larva soon burrows beneath the surface to the depth of a few inches. By sheer muscular strength it then pushes the soil away from its body, which is twirled and twisted round and round, the rough shagreened surface acting like a rasp upon the soil. This becomes gradually rammed tighter and tighter until a beautiful smooth oval chamber is formed about half as long as the length of the full-fed caterpillar, which, now contracted, rests upon its back for some days until the pupa is evolved. The skin, splitting at the back of the head, is gradually sloughed off towards the tail. Safe in its earthen sepulchre, the pupa rests until the following year, when the perfect moth is ready to emerge, and, without injury to its multitude of many-coloured scales, forces its way upward with a power that is simply incomprehensible, arriving at the

surface as perfect as though it had not met with so much as a grain of sand to impede its progress.

Small wonder that after such a resurrection the hawk-moth appears greatly excited, walking or running over the rough ground until it reaches some elevated projection such as a tree-trunk, or anything up which it can climb sufficiently high to permit of the full development of its wings, which it has the power of retarding up to a certain point, generally long enough for the discovery of a convenient "pitch" away from the sharp eyes of the sparrows.

The most beautiful of the genus is without doubt the Lime Hawk, the upper wings of all shades of olive-green making it one of the most difficult animals to depict in its proper colours.

The larva of this beautiful moth is not common about London; and for anyone to attempt to gaze up into the branches of a tree in search of the creature is to court notice from every passer-by, as well as to be pestered with the most ridiculous questions. The entomologist knows the value of the adage, "It is the early *riser* who catches the worm."

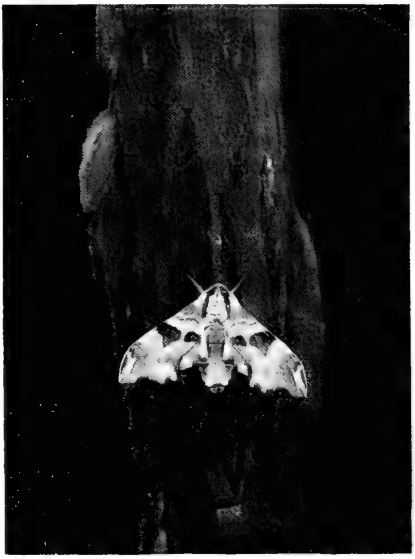


Fig. 10.

With the exception that all the markings are more or less of a blue-green colour, the larva of this beautiful moth is identical in form with the Poplar and Eyed Hawk. On emergence the moth is most active, dragging its long body over the ground and up some convenient stem, where it soon fixes its hold, moving from side to side to make sure it is a firm one. A quantity of fluid is first ejected, the body drawn up and curved as in Fig. 5; the head and antennæ are shaken out, the latter pressed to the side, with the points turned up. Now those minute wings, which look as though they had been—as they have—in a compressor, begin to swell out at the base, at the same time gradually rising, the outer margins falling over in the loose, flapping, sail-like manner (Fig. 6). The lower tip seems in a hurry to unfold first, and has almost done so in Fig. 7. The antennæ are now turned and rest outside, being quickly followed by the straightening of the upper wing until both are fairly well developed and stand face to face (Fig. 8). They remain some time in this position, becoming perfectly parallel to each other, the upper wings drooping until the front margin or costa is level with that of the lower (Fig. 9). An hour after emergence both pairs of wings separate (Fig. 10), the upper ones being kept at an angle of about 30 degrees from the body, and displaying all the beautiful olive-green tints to the fullest advantage.

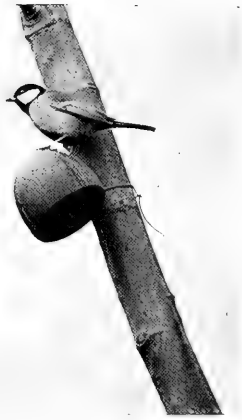
[Owing to the pressure on our space this month, the Editor regrets that the second and concluding part of Dr. Walter Kidd's article, "Traces of Animal Habits," has unavoidably been held over. For the same reason it has been found impossible to find room for our usual "Notes and Comments."]

GREAT TIT.

FEEDING THE BIRDS IN WINTER.

Written and Illustrated with Photographs by HERMANN LEA.

"Some haunt the rushy moor, the lonely woods;
Some bathe their silver plumage in the floods;
Some fly to man, his household gods implore,
And gather round his hospitable door;
Wait the known call, and find protection there
From all the lesser tyrants of the air."



GREAT TIT.

IT is with those birds last described by the poet that we have to do, and I want to try to induce all my readers to remember them and give them welcome in the hard winter weather. They will be very grateful for your trouble, and if you have a little patience they will get very tame, come when called or whistled or summoned by a bell, and in the spring they will pay for their winter food by singing you songs and doing some real hard work amongst the slugs and other uninvited insects. Moreover, they are interesting and amusing to watch on the long dark days when rain or snow keeps one indoors. Then again, it is an education for the children; for not only will they learn the names and habits of the different birds, they will also learn the lesson of kindness—a lesson which they will apply in after years to others besides birds. But we must act with due care; it is cruel kindness to feed and attract starving birds if we thus lure them to their deaths. Cats are their worst and natural enemies, and if cats also frequent our garden we must place the birds' food out of reach of a cat's spring. The best arrangement I have tried is a shallow box fixed on a pole about six feet high, and placed not too close to a tree or wall which the cat might use as a stepping-stone.

GREAT TIT.

As regards the best sorts of food, this will depend to a great extent on the species of birds which come to seek it, though it is wonderful how birds and other wild creatures, when hard pressed, will adapt themselves to food that is not natural to them. Those which suffer most keenly in the hard weather are the soft-billed insect-eating birds, such as blackbirds and thrushes; and in severe winters I have seen them dropping dead in numbers from the frozen hedges. They will eat a certain amount of bread, and even corn, but neither are natural to them, and we must try to supply food better suited to their tastes. Cocoa-nuts are one of the very best all-round substitutes, and very few of our pensioners will refuse them. I cut each nut in half, and either stand them in the box or hang them upside down by a string from some convenient branch;

this latter is the better plan as rain does not get in, but it is only the tits and nuthatches that seem at home hanging head downwards, and blackbirds—which are very partial to cocoa-nut, and thrive on it—do not get a chance. Apples and potatoes, either cooked or raw, also appeal to the soft-billed birds. Bread or corn will serve as a capital stand-by to several; while porridge, barley meal, scraps of pudding—in fact, scraps of all sorts—are relished. With a little foresight we can save from the garden many a dainty for winter food. Vegetable marrows, if allowed to ripen thoroughly and hung up in a dry place, will give many a meal from their seeds; the heads of sunflowers are excellent, as the seeds contain a large quantity of oil; small apples, too small to be gathered for storing, should be kept, likewise the small potatoes. Any number of plantains may be had for the picking, and if hung up in bundles will be much appreciated.

ROBIN AT COCOA-NUT.

COLE-TIT.

MARSH TIT.
Half a loaf is better than no bread.

There is another thing which the birds suffer from the want of—water. This is, of course, only in times of hard frost, and is an easily-supplied deficiency; two or three shallow pans placed on the lawn or gravel, not too close to bushes or other cover, meet the case; and it is wonderful how the birds delight in a cold tub when the sun happens to shine. I have had nearly twenty different species of birds as constant visitors to my boxes and water pans, though some of them only appear during the very hardest weather; of these about twelve remain and nest in the garden and orchard, so that, with the addition of about six different summer migrants, we have a good number of nests every year.

I have one particular little friend—a great tit—who regularly came for food all last winter, and afterwards brought up a large family in a bird-box which I placed on a tree in the garden. Nine hungry mouths take a deal of filling, so he still came to me for bread, cocoa-nut, or cheese, flying through the open window into the room, perching on the sideboard, or the chairs or table. I had but to whistle and he was there, pecking bread placed on the arm of a chair, or helping himself from the loaf on the breakfast table, and taking no notice of our voices or movements, nor of the dog which sprawls in the sunshine on the floor. He was here the winter before, too,—I know him by a distinctive spot on his breast—and though he did not build in the garden that spring, he had his nest somewhere near by, and brought his wife and family with him to feed in the winter. One of his last-year's children built in a box in the orchard, and if this sort of thing goes on we shall have a fairly large number of them in time.

As I have asked for pity and protection for free wild birds, so I must ask for sympathy with those that are caged. There

is scarcely any sight more painful than that of a wild bird either beating its feathers against the cage-bars or sitting an object of resigned melancholy. Obviously there is less cruelty in keeping birds which have been bred in captivity and have never known the feeling of freedom, but into this question we cannot enter here.

We walk the streets of a town and see windows containing hundreds of tiny cages, each with its prisoner; we see the cottage door in the country overhung with a roughly-made box, also containing its prisoner. And we ask ourselves—what can we do to help? It is a difficult problem. I have tried many different methods, and have come to the conclusion there is only one thing we can do—try to arouse a feeling of sympathy in the heart of the owner. It is no easy task to accomplish, but ever and again one heart may realise the anguish of the captive; and once we touch that chord of compassion the rest is easy, for the owner then will wish to set the prisoner free—will not rest until the captive is once more winging its way over its native field and wood.

There is a startling contrast between the wild bird at liberty and the wild bird caged; but we must enjoy the sight and sound of the former, and endure that of the latter ere we can properly realise the distinction. It cannot be adequately described on paper—it must be felt. I cannot believe that the man or woman who keeps a skylark in a cage has ever realised this difference. They can never have lain in a scented meadow on a May morning and abandoned themselves to the contemplation of Nature personified in a skylark; cannot have watched it circling up, up, up, till it is lost to sight in the blue dome of Heaven, nor have drunk in its glad free song. Would they could; for then no such bird would ever suffer at their hands.

MOORHEN'S NEST. HATCHING.

PRIZE ROUEN DRAKE AND DUCK.

From an Original Painting by HARRISON WEIR, drawn for "Our Poultry.

From a Drawing by Harrison Weir.

AYLESBURY DUCK AND DUCKLINGS.

TURKEYS, GEESE AND DUCKS.*

By W. P. Pycraft, A.L.S., F.Z.S.

IT has been said that the names of the greatest benefactors of the human race are unknown, and undoubtedly there is truth in this statement. Who, for instance, gave us the Turkeys, Geese and Ducks of our poultry-yards? We have no means of knowing, and never shall know. But of this much we can be certain: we are indebted to the donors for an inestimable blessing, for they have added to our resources by providing us with a certain supply of food, and have enabled us to celebrate our great feast of Christmastide becomingly!

Though the oldest of these birds is undoubtedly the goose, it has been surpassed in favour, at least in England, by the turkey. This bird is of American origin, being the descendant of the wild Mexican turkey. It appears to have been brought to Europe during the early part of the sixteenth century; at any rate there is little doubt that it was established in Europe by 1530.

Three distinct species of turkey are found in a wild state. The species known as the "American Turkey" is regarded as the king of American game-birds, and though becoming scarcer, is still eagerly hunted either with the rifle or with greyhounds. The Mexicans gravely assert that the coyotes catch turkeys by moving in circles under the roosting-tree till the birds get dizzy with watching them and fall down!

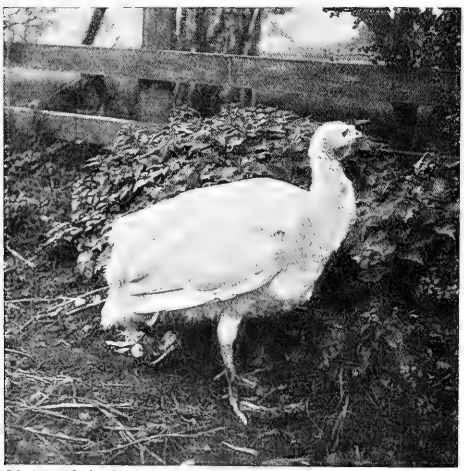
[*For the coloured plate and all the illustrations to this article (except that of the white turkey) the Editor is indebted to the author, artist and publishers of "Our Poultry," by Harrison Weir, a work which deserves world-wide recognition. The drawings here reproduced, and also the coloured plate, are all by Mr. Harrison Weir, who has made a life-long study of his subject.]

TOP-KNOT DUCK.

The turkey is a polygamist, fights furiously with rival males, and is apparently fully conscious of the great beauty of his dark metallic plumage. The effect of this is further enhanced by the bare crimson-coloured skin of the head and neck and the curious finger-like appendage which depends from the forehead. When endeavouring to win the regard of his harem the turkey inflates this appendage, while at the same time the vivid red of the bare skin becomes intensified. At this time, too, a certain peculiarly pompous air is assumed, the bird strutting about with its feathers set on end, the wings drooped, and the great wheel-shaped tail spread to its fullest extent. All this no doubt vastly impresses those for whom the display is made!

With the rearing of the family the cock will have nothing to do, nor will he take any share even in the brooding of the eggs. The young, like those of all young game-birds, rapidly acquire the power of flight, the wing-quills appearing within a few hours after birth.

There seems to be a certain fixity of character about the turkey, inasmuch as the breeder has only succeeded in producing about five strains, of which the American Bronze is perhaps the most celebrated, and the White the most beautiful. The most remarkable feature of these domesticated birds is their greatly increased weight. A cock of the American bronze breed may weigh as much as 45 lbs., whereas no wild turkey probably ever exceeds a weight of 30 lbs.



Photograph by Herbert Lazenby.

A WHITE TURKEY.

What is the origin of the name "Turkey" is a question frequently asked, but as yet no definite answer is forthcoming. Certainly the bird has nothing to do with Turkey, having come from the New World. Originally it would seem this word was used for the guinea-fowl; but the writers of the sixteenth and seventeenth centuries confounding these two, the name ultimately attached itself to the better-known bird, perhaps, suggests Professor Newton, because of its call-note, "*turk*," "*turk*," "*turk*."

That the domestic goose is descended from the wild Grey-Lag Goose, a bird of exceedingly wide range in the Old World, and once common in this country, there can be no doubt. In what quarter of its range it first became domesticated by man is unknown,

but there is evidence to show that this subjection began more than 2,000 years ago. Yet scarcely any other animal which has been tamed for so long a period, and bred so largely, has varied so little.

Of the three varieties which may be traced from the Grey-Lag, only the Toulouse and the Embden need be mentioned here. These differ one from another only in the matter of colour and weight, the former resembling the wild bird in colour, while the latter is white. The increased weight of the tame goose is astonishing, and shows what has been done by careful selection on the part of the breeder towards this end. Thus, while the weight of the wild goose does not exceed 10lbs., the variety known as the Toulouse Goose has been known to attain a weight of 30lbs—that is to say, as much as a swan!

At one time geese were bred in this country in enormous numbers for the sake of their feathers. Norfolk and Lincolnshire were especially celebrated in this respect;

CALL-DUCKS.

it being not uncommon for a breeder to keep a stock of 1,000 birds for breeding purposes. These were taken regularly to pasture like sheep, and the man who tended them was known as the "gooseherd" or "gozzerd." They were plucked no less than five times a year, an act of barbarism occasionally practised even now. Periodically the surplus stock of the large flocks to which we have just referred was sent to London or some other large market, the birds travelling on foot. Moving at about the rate of a mile an hour they would manage to cover as much as ten miles in a day.

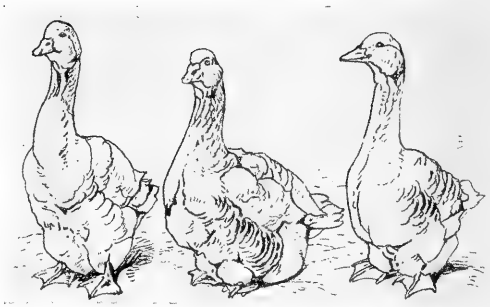
Geese appear to be very long-lived: an instance is recorded of one that lived 80 years, and was then killed on account of its mischievousness!

While the goose has proved to possess a singularly conservative character, the same is not true of its near ally the duck, inasmuch as, both in the matter of coloration

and structure, man has succeeded in producing from the Common Wild Duck or Mallard many striking varieties.

When the work of domestication first began is not known, but it has certainly extended over a very long period, since we find mention of ducks kept in netted enclosures eighteen centuries ago.

Of the seven or eight well-marked breeds of our show-pens, the Aylesbury and Rouen are the most highly esteemed. The former is a pure-white breed much in demand for table purposes. The latter resembles the wild duck in colour but far surpasses it in size, attaining a weight of from 6lbs. to 8lbs., whilst the wild duck does not exceed 3lbs. 8ozs. Even heavier is the Cayuga Duck, which is the opposite of the Aylesbury, being of a lustrous black colour throughout.



From a Drawing by Harrison Weir.

TOULOUSE GEESE.

The varieties which exhibit marked structural peculiarities are the Penguin and Hook-Billed Ducks. The former has a perfectly upright carriage, recalling that of the bird from which it takes its name, whilst in the latter the beak curves downwards in a most remarkable manner. In the breed known as the Tufted or Top-Knot Duck the head is surmounted by a large mop-shaped crest of feathers, and for some quite inexplicable reason the bones of the skull immediately under the crest are perforated by two large apertures.

The young of the duck, like those of the goose, differ conspicuously from those of the turkey. In the latter the wings are the first to become feathered, so that flight is possible within a few days after birth, whilst the body is still invested in its downy coat. With the duck, both wild and tame, the reverse is the case. The wings develop with extreme slowness; not only do the bones grow more slowly than the leg-bones, but the feathers do not appear till after the body feathers, so that the bird is more than half-grown before the development of the wings commences. This is explained by the very different habits of the birds in question. With the turkeys, as with the other game-birds, escape from carnivores and birds of prey depends on flight. With the ducks and geese, which are aquatic, escape is effected by hiding among the reeds.

In the matter of voice it is extremely interesting to note that, whilst in the turkey it is the male which is the principal spokesman of the family, with the ducks the oratory is undertaken by the female.

FOUR-MONTHS' GOSLINGS (COMMON GEESE).

ZOOLOGICAL PROGRESS IN 1903.

By R. Lydekker.

EVEN after the appearance of the volume of that invaluable publication the "Zoological Record" for the period in question, it would be a difficult task for one man to attempt to give an adequate and all-round account of the progress made in Zoology during any year. How much harder, then, must it be to make such an attempt when there are still nearly two months of the year to run, and many foreign publications of the earlier ones have not yet reached this country. Accordingly, all that can be attempted is to refer to some of the more important and interesting books and memoirs on zoological subjects published during the present year that have come under my personal notice.

Firstly, it must be mentioned that the year, so far as it has yet gone, has not been marked by any startling zoological discovery, such as the one which led to 1901 being called the "Okapi year" in the "Zoological Record." If any such title can be claimed for 1903, the term "Elephant year" would perhaps be the most appropriate. For it must undoubtedly be admitted that the memoir by Dr. C. W. Andrews "On the Evolution of the Proboscidea," issued in the "Transactions" of the Royal Society, is the most important publication of the year so far as not only mammals, but vertebrates in general are concerned. Although this paper is mainly palæontological, and therefore to a great extent beyond the scope of the present article, it may be mentioned that not only does the author demonstrate the descent of elephants and their extinct forerunners, the mastodons, from animals much more nearly akin to ordinary hoofed mammals, but he also shows how the trunk of modern elephants has been evolved, by a lengthening of the fore-part of the lower jaw and muzzle, followed by a shortening of the former with an increase in the length of the latter.

Among the higher mammals, considerable interest attaches to the description by Dr. P. Matschie, of Berlin (in the "Sitzungsberichte" of the Berlin Naturalists' Society), of an eastern representative of the gorilla; that ape having hitherto been known only from the west coast of Africa and its *hinterland*. The eastern form, which is named *Gorilla beringei*, was found on Mount Kirunga, between Lakes Albert Edward and Kiva, on the border between the Congo Free State and German East Africa.

Passing one stage lower in the mammalian class, attention may be briefly directed to Prof. Elliot Smith's valuable memoir on the structure of the brain of the lemurs published in the "Transactions" of the Linnæan Society, although the subject is too technical for fuller notice in this place. It may also be mentioned here, although out of its proper order, that Prof. Smith has published another memoir in the same journal dealing with certain peculiarities in the brain of reptiles.

Of more general interest are the investigations of Mr. L. E. Adams into the structure of the so-called "fortress" of the mole, that is to say, of the breeding-hillock, which appeared early in the year in the "Memoirs" of the Manchester Philosophical Society. Although his observations were to some extent forestalled by Mr. Alston, the author has shown the prevalent idea of the form of the runs in this fortress to be untrue.

During the year Mr. R. I. Pocock has made a further contribution to the subject of the use of the coloration of mammals, showing in this instance (in an article contributed to "Nature") that the white rump-patch and legs of many ungulates, such as the wild asses and quaggas, come into line with the white of the under-parts when the creatures are lying down, thus intensifying the protective effect of the latter. The present writer (in "The Field") has also pointed out that (in addition to those of the Arctic regions) it is only mammals inhabiting latitudes where there is an autumnal fall of the leaf that have a seasonal change of colour.

Early in the year Prof. C. Ewart, of Edinburgh, announced his belief that the callosities on the limbs of the horse and its allies represented the vestiges of foot-pads, like those found on the soles of the feet of dogs and civets. This view was controverted by the present writer in a paper published in the "Proceedings" of the Zoological Society, where it was suggested that the structures in question might prove to be vestiges of glands.

Although it would be of little interest to allude to the numerous descriptions of new species and races of mammals which have appeared during the year, since the great majority of these are nearly allied to previously known forms, an exception must be made in the case of a small antelope from West Africa described by Mr. W. E. de Winton in the journal last cited under the name of *Neotragus batesi*. From pigmy antelopes to giraffes is a sudden transition, but the writer cannot refrain from referring to the description of the local forms of the latter which appeared in this journal. The variation in the form of the antlers in the Scandinavian elk—in connection with the description last year of a new form of this animal from Eastern Siberia—has been discussed in the Zoological Society's "Proceedings." A third exception with regard to not noticing descriptions of new species must be made in the case of a jerboa from the Nan Shan Mountains of China, which has been described by Mr. C. A. Satunin ("Ann. Mus. St. Petersbourg," Vol. VII.) as the type of a new genus, under the name of *Cardiocranus paradoxus*.

The study of the whales and dolphins captured or seen during the Belgian Antarctic Expedition has led Dr. E. G. Racovitza (in the Report on the zoology of the voyage) to discuss the question whether whales sleep, and also the depths to which they are able to descend in the ocean. The former question he answers in the negative, while in regard to the latter he is of opinion that the depth to which these animals "sound" has been very greatly exaggerated. Certain Indian dolphins and porpoises, one of which is new to science, have been described by Mr. H. Ferguson and the present writer in the "Journal" of the Bombay Natural History Society.

Although some naturalists will not admit that the study of domesticated animals has anything to do with zoology, I am not of this opinion, and therefore refer in this place to Miss F. Simpson's beautiful "Book of the Cat," published by Cassell & Co.

In regard to works on the mammals of particular areas, reference may be made, in the first place, to Mr. J. L. Bonhote's account of the mammals of the Malay Peninsula, which forms the first part of the work entitled "Fasciculi Malayenses." Next on the list comes Sir Harry Johnston's work on British Mammals.

From mammal faunas the transition is easy to faunas in general, under which heading special reference must be made to the "Natural History of Sokotra," edited by Dr. H. O. Forbes, and published by the Liverpool Museums. The editor, together with Mr. W. R. Ogilvie-Grant, of the British Museum, spent some months on the islands of the Socotra group in the winter of 1898—99, during which time they made an extensive collection of its zoological and botanical products. These are described by various specialists in this volume. Brief reference must suffice for the first volume of Dr. Guppy's "Observations of a Naturalist in the Pacific," which deals with the zoology of the Solomon group.

In this place may be conveniently noticed the "First Report on Economic Zoology," published by order of the Trustees of the British Museum. This volume contains a perfect mine of information with regard to insect pests and the best means of checking their ravages. And it is satisfactory to learn that, in connection with the Board of Agriculture, reports on subjects of this nature are in future to form a recognised branch of the work of the Museum. But insect ravages by no means form the sole subject of this particular volume. It also contains, as an introduction, a classification of animals from the point of view of economic zoology, written by Prof. E. Ray Lankester.

Passing on to the second great group of vertebrates, the first work for notice is Mr. H. E. Dresser's two volumes entitled a "Manual of Palæarctic Birds," which form an important contribution to ornithology.

During the year there has also been issued the fourth volume of Dr. R. Bowdler Sharpe's invaluable "Hand-List of Birds in the British Museum." This work, which is to be completed in five volumes, gives the scientific name of every known species of bird, recent and extinct, with references to descriptions and figures. Another work of some importance in course of issue by the British Museum is the "Catalogue of Birds' Eggs," of which the third volume has appeared this year. This volume is the joint work of Mr. E. W. Oates and Captain Savile Reid. A great feature is formed by the exquisite coloured figures of eggs. Another illustrated ornithological work to which reference may be made is Dr. E. Goeldi's "Birds of Amazonia" *(Aves do Amazonica-stromme)*, published at Para, Brazil, of which the second part has appeared during the year.

Among works on the anatomy of birds, special mention must be made of Mr. W. P. Pycraft's memoir on the "Osteology of the Owls," published in the "Transactions" of the Linnæan Society.

Considerable interest attaches to Monsieur Grandidier's description (in the "Bulletin" of the Paris Museum of Natural History) of a new generic type of rail-like bird from Madagascar, which it is proposed to call *Monias benschi*. The beak is long and curved, and the general colour of the plumage of the back brown.

With regard to reptiles, certain important experiments have recently been made in Calcutta by Dr. L. Rogers on the effects of the venom of sea-snakes (*Hydrophiinæ*), of which an account has been published in the "Proceedings" of the Royal Society. The poison has much the same effects as that of the cobra, but is more fatal to fishes.

In the "Proceedings" of the Zoological Society Mr. G. A. Boulenger describes the female of a rare frog (*Ceratohyla bubalus*) from the Peruvian Andes, to the skin of the back of which nine eggs (each containing a young frog) were tightly adherent.

The publication of the volume of the "Cambridge Natural History" devoted to fishes and the lower chordate vertebrates will enable the amateur to obtain an excellent idea of the leading types of fish-life without the labour of consulting volumes like the British Museum "Catalogue"; Mr. G. A. Boulenger's name on the title-page being a sufficient guarantee of the accuracy of the work. Mention may also be made of an article by Mr. F. Tullberg, published in Vol. VIII. of the "Bihang" of the Swedish Academy, on the function of the so-called labyrinth of the internal ear of fishes, which is believed to receive impressions of the movements of the water, although it may also act as an organ of hearing. Reference in this place may be made to the issue during the year of several parts of the valuable account of Japanese fishes by Messrs. Jordan & Fowler, now in course of publication in the "Bulletin" of the U.S. National Museum. As the result of the Hopkins-Stanford expedition to the Galapagos Islands, no less than twenty-three new species of fishes (five of them representing new genera) have been obtained. They are described by Messrs. Heller and Snodgrass in the "Proceedings" of the Washington Academy of Sciences. An article in the "Decennial Publications" of the University of Chicago, by Mr. A. C. Eyeleshymer, on the early development of the bony pike forms an important contribution to embryology.

As regards molluscs, two discoveries are deserving of special mention. The first is that of a new species of *Pleurotomaria* in Japanese waters, making the fifth living specific representative of the genus. Pleurotomarias are large and handsomely-coloured trochus-like shells, with the characteristic slit in the edge of the mouth. For a long time they were known only in the fossil state, and are exceedingly common in the Oolitic and Cretaceous rocks; but living specimens have of late years been from time

to time dredged from deep waters. The second discovery relates to a peculiar habit of fresh-water limpets (*Ancylus*) inhabiting certain parts of the Chaco country of Argentina. In summer the streams and ponds dry up in these districts, and in order to withstand the drought the limpets grow a large plate, closing up the whole of the open lower part of the shell with the exception of a small round aperture over the lungs.

Passing on to insects, attention may first be directed to the "Catalogue of Tsetse Flies in the British Museum," by Mr. E. E. Austen, which is the first attempt to give a full and adequate account of these pests, by whose agency the dreaded nagana disease is communicated to cattle. Several species of these flies are now known to exist, most or all of which are illustrated in this volume. The British Museum has likewise issued during the year the third volume of the "Catalogue of Culicidæ (Mosquitoes and Gnats)," by Mr. F. V. Theobald, of which the two previous volumes appeared in 1901. Among other works on insects issued during the year, attention may be directed to the fourth volume of the British Museum "Catalogue of Lepidoptera Phalænæ," in which Sir George Hampson deals with the moths of the family *Noctuidæ*; to W. L. Distant's "Insecta Transvaaliensia," now in course of issue; to the account of the insects of Central America in the "Biologia Centrali-Americana"; and also to the "Lepidotera Indica," by Mr. T. Moore. We may also notice the continuation of the "Lepidoptera of the British Isles," by Mr. C. G. Barrett; in connection with which may be mentioned the more popular volume by Professor Hulme in the Woburn Library, entitled, "Butterflies and Moths of the Country Side." Reference may likewise be made to G. T. Bethune-Baker's revision of the butterflies of the family *Lycænidæ*, published in the "Transactions" of the Zoological Society. A contribution to animal coloration is made by W. L. Tower in the "Decennial Publications" of the University of Chicago, where beetles are taken as the text, from which the author proceeds to insects in general.

Of much interest is an account by Mr. A. Isuka of the periodical swarming of a certain species of worm in the estuaries of Japanese rivers, published in the "Journal" of the College of Science of Tokyo University. Although this worm (*Ceratocephale osawai*) belongs to a different family from the true "palolo" of the Pacific, it has been proposed to call it the Japanese palolo. The swarming takes place at flood tide when the moon is at or near the full, and lasts for several nights.

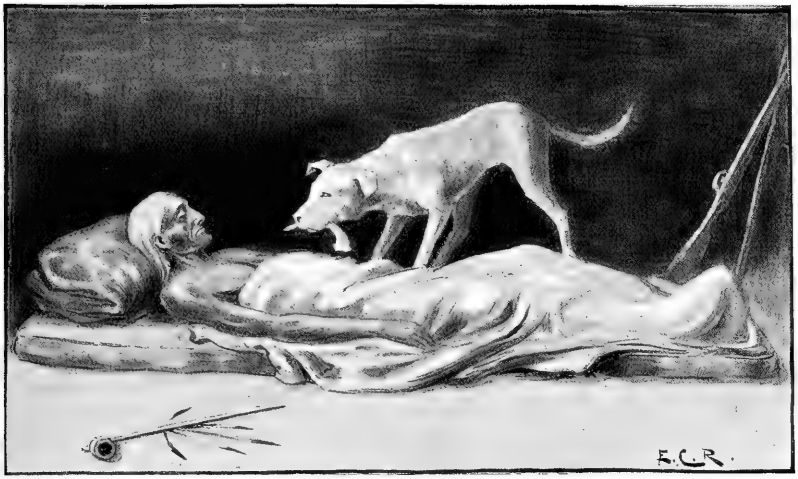
Much work has been accomplished on the invertebrate zoology of South Africa, Mr. R. Kirkpatrick, in "Marine Investigations," describing new sponges, and Mr. G. B. Sowerby new shells; while, in the "Annals" of the South African Museum, Mr. Distant contributes notes on the bugs of the country.

An important contribution to the study of the geographical distribution of animals is made in an article by Mr. R. I. Pocock, published in the "Proceedings" of the Zoological Society, dealing with a certain group of spiders. One conclusion arrived at by the author is that Madagascar is not entitled to rank as a "region" apart from the one formed by Africa south of the Sahara.

In Crustacea, reference may be made to the description of the lobsters, crayfishes, shrimps, etc., obtained during dredgings in the Indian seas by Major Alcock in "Illustrations of the Zoology of the Surveying Vessel 'Investigator.'"

Students of evolution should be interested in an article by Dr. G. H. Carpenter on the relationships of the groups of arthropods (insects, crustaceans, spiders, millepedes, etc.), published in the "Proceedings" of the Royal Irish Academy. It is concluded that these groups trace their ancestry to creatures allied to a "Nauplius."

This brief sketch may be closed by a reference to the second fasciculus of the first volume of Lankester's "Treatise on Zoology," containing, among other matter, a dissertation by Prof. Minchin on the *Sporozoa*, which include the malaria parasite.



THE SACHEM AND HIS DOG.

THE PSYCHICS OF DOGS.

By R. L. Garner.

I HAVE often heard it said that all honest men love dogs, and possibly some dishonest men also love them, but that is no discredit to that brave and noble animal, whose love and loyalty to man have been for ages the theme of song and story. The literature of centuries speaks kindly of the dog, and the many pretty incidents recounted to his credit would make a library of true and touching stories of canine intelligence and devotion. Such fidelity as that evinced by him can only emanate from a lofty source. Hunger and poverty may lessen his energy and cow his spirit; but even neglect and cruelty do not alienate his love for those whom he regards as friends. In all the annals of his race we find no record of malice where love was due, nor an instance of treachery where he owed allegiance.

Among the most savage and primitive races of mankind the dog has a warm spot in the heart of his master, and some of the most pathetic stories of mutual faith and affection between men and dogs are told among the American Indians.

Nearly forty years ago, in a rude little village crouched among the palmettos and tall canes on the bank of a small bayou in the back-lands of Louisiana, lived an old Sachem and his dog. The veteran chief was fortunate in being a pensioner of the government, as a part of a treaty consideration of more than a century ago, and on this income he and his faithful dog lived quite comfortably in the lonely village. They shared everything in common, and ate their meals together. Day after day they could be seen strolling along the banks of the bayou or gliding about over it in their small pirogue. So close and constant was the friendship between the two that it deeply impressed those who witnessed it, and people often queried what the survivor would do when one of them should be called hence.

The old man was not entirely friendless, for among his white neighbours there were many who were fond of him, and all treated him with uniform kindness: but

the barrier of race forbade anything merging upon social intimacy. At length the old chief decided to take his dog and a part of his household effects and go to the Teche, where he would find a few scattered remnants of some other tribes.

A short time before he was to leave he went to a white planter in whose friendship he had faith, and asked to have a private interview. The two men, with the dog following them, retired to a room and closed the door.

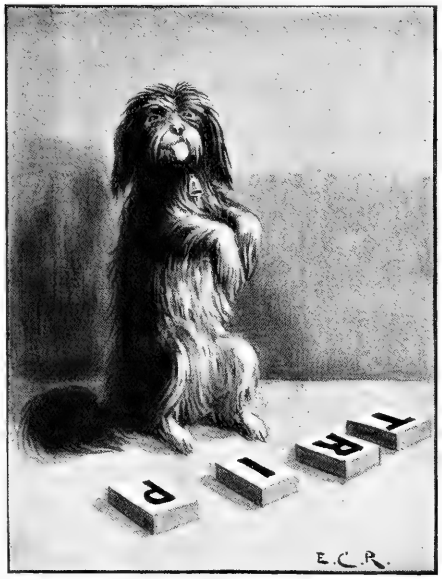
The Indian then said: "Mr. —— I have come to ask a favour of you; and while it may appear to you a small matter it is to me one of great concern. I have here a small sum of money which I have saved out of that given to me by the great white father (the government). I wish to leave it in your hands, and ask you to use it as I shall direct. I am now growing old. I have no children, and only this one friend to lean upon." As he spoke he laid his hand upon the head of the dog, and calmly continued: "He loves me as a good son loves his father. He is honest, and I love him as a son. He is also growing old, but he does not know that we must soon be separated. He may be the first to go, and in that event I shall come again and get the money if I need it; but if I should be the first to go, I ask you to send for my poor dog, who will then have no other friend to look to, and with this money care for him until he is ready to come to me. Treat him kindly and he will not forget. Pat him on the head sometimes, so he will think of me. If any money should be left when he is gone, it is yours as our next friend."

Deeply touched by the conduct of the Indian, the promise was cheerfully given, the programme reduced to writing, witnessed and sealed. The sum left as bounty for

"HASSIN" AND "CALIFF."

the dog was a hundred and nineteen dollars, which is about £24. The old man warmly thanked the planter, and in company with his canine friend departed.

Some days later, when the Indian was nearly ready to proceed upon his journey, both he and the dog were missing. It was naturally supposed that they had gone to the place intended. Three days passed by and no one had seen them. On the fourth day the dog was seen approaching the house of the planter. The man recognised his visitor, and met him in the yard. He caressed the animal, but could not induce him to go into the house. The dog returned the caresses by licking the hand of the planter, wagging his tail, and whining as if in pain; then turning away, and starting as if going to leave, barked and whined until the man grasped the idea that the dog desired him to follow. Obeying this impulse he mounted his horse, and the dog quickly led the way to the cabin. On entering it the man found the venerable Indian very ill. There he had lain helpless for three days, without food or medicine. By the side of the bed lay a beef bone with a bit of decaying meat hanging to it. This, as the old man declared, had been secured somewhere by the dog and brought in by him and placed upon the bed for his master to eat. He could not eat it, but would not wound the feelings of the dog by throwing it out of doors.



"TRIP."

The sick man was carefully nursed, but within a few weeks he passed away, and was buried on the bank of the bayou in front of his humble cabin. The dog was taken to the plantation, where a cosy kennel was prepared for him, but he rarely stayed in it. Day after day for weeks he returned to the old village and buried some food on the grave of his loving old master. During the remaining three years of his life he continued to visit the old house, and when he died he was decently buried by the side of the one whom he had loved and, in his simple way, had cared for with all the tenderness of human devotion.

With the money that was left, the kind-hearted executor bought and walled-in the little plot and recorded the deed in perpetual trust. Over their quiet resting-place was erected a marble slab, on which is inscribed:—"Here sleep the mortal remains of Te-wa-wa, the last sachem of the Teche, and his faithful dog, Loto. May all seasons spread flowers upon this spot hallowed by a love which all men should respect and all lovers emulate. 1871."

In the environs of Boston, Massachusetts, now live the descendants of the old colonial family of Pope. In the halcyon days of antebellum luxury, the senior Pope annually took his family abroad for a season. They did not spend all their time in the beaten tracks of ordinary tourists, but went into the bye-ways of travel and there learned the inner life of the people whom they visited.

On one of these journeys the children of the party were much pleased with the sagacity of a certain Egyptian donkey called "Hassin," and in Arabia they were

captivated by a certain dog, somewhat of the mastiff kind, whom they called "Califf." The dog and donkey were both purchased and taken to America.

By the time they reached their new home the two animals had become close friends, and after their arrival they were assigned contiguous quarters. They had already learned to distinguish the children of the family, and even the friends who played with them. No matter where either dog or donkey went, the other was always with it. If any stranger took liberties with "Hassin," the dog promptly interfered, and his size, if nothing else, commanded respect. If any stranger dog attempted to spar with "Califf," the donkey always took part by kicking and biting at the assailant. In brief, each of them always seemed to regard the other as his ward in peace and his ally in war. They evinced no jealousy of each other in receiving any kindness or caresses from their human friends, but the least indignity to the one was promptly resented by the other.

One autumn afternoon poor "Hassin" fell sick. Through the entire night he was writhing and groaning, and during the whole time "Califf" was by his side trying to soothe and comfort him. Time and again the dog rubbed his massive jaws along the sides and in the flanks of the suffering donkey. The next day the donkey was more quiet, but still prostrated, and all day long "Califf" remained by him, in mute sympathy with the distress of his boon companion.

In the course of a few days the donkey died, and was tenderly buried by the humane little group of children who had so often been borne upon his patient back. No one of that funeral train evinced more sincere and evident regret than did poor "Califf." When the cold earth was shovelled in upon the body of his friend the dog stood by with his head bowed over the brink of the grave, and so remained until it was filled and rounded up. Then, in the presence of all, he coiled himself upon the little mound and lay there until all had departed.

From that hour he began to decline; day after day he returned to the grave of "Hassin" and laid himself upon it. He was seldom induced to eat even the most tempting morsels of food, and never went about in quest of it. At last his rigid limbs were found stretched upon the ground above the remains of his late companion.

Missing link? Where is there a link left out between the minds of any two units in the whole chain of life? Unselfish love, such as bids defiance to all things else, drew him closer and closer to the object of his affection, until he was at last drawn into the vortex of his own devotion. And yet the vanity of man still claims a monopoly of all the attributes of heart and mind that guide and temper action!

In Troy, New York, there recently died a little dog named "Trip," the favourite pet of Dr. ——. "Trip" was not only blessed by having the shelter and comforts of the family home, but he had a cosy little home of his own within that of his kind master. This consisted of a diminutive house placed in one corner of the family room and furnished with a snug bed and warm bedding, just made and arranged to meet the wishes of the most fastidious dog, and every morning "Trip's" room was done up in the regular routine of household work, and again at night his bed was prepared for him to retire.

When "Trip's" bed was neglected until after the usual hour he always raised a row about it. He began by barking and whining, pulling at the skirt of the servant whose duty it was to attend to it; and when he failed to make her understand what he desired he ran into his little house, seized his bedding piece by piece, dragged it out, and scattered it about the room. He knew that it would then be put in order.

Like many other little people "Trip" occasionally stole away and mixed with companions of inferior social rank. His devoted mistress often scolded him for this Bohemian trait, but the dog was not able to forego his canine desire for rowdy company,

and rarely missed the chance of slipping out when the door was left ajar. In order to be warned of his stealthy movements the lady attached a small bell to his neck, and when the dog moved the bell betrayed him.

For a time "Trip" submitted to the restraint and, like a true philosopher as he proved to be, made no ado about it. But in his shaggy little pate there was something going on which in man is called reason, but in dogs is nameless, and by its aid the cunning little rogue several times made his escape without being observed. At length his scheme was found out, as most schemes are; but its cleverness was more to his credit than the crime of it was to his disgrace.

Realising the means by which his movements were discovered, he simply lay down upon his side, which caused the bell to drop to the side of his neck instead of hanging below it; then carefully bending his head to that side, pressing the gonion point of

"PONTO."

his jaw close to his shoulder, he clutched the bell in the curve of his neck, and thus silenced the tattling trinket. His long fluffy hair greatly aided in the feat, and having secured it in place, he silently glided down the stairs and around the corner until safely out of hearing.

Besides doing all the usual feats of trained dogs and resorting to all manner of clever devices in order to gain his end, "Trip" made a record which, so far as I am aware,* has not been equalled by any of his race, and that was in selecting and arranging in proper order the letters of his name.

From a pile of alphabet blocks he picked out at command, and without the aid of anyone, the letters T R I P and arranged them right side up. When the task

* See p. 174, Vol. I., Animal Life.—Ed.

was finished he sat himself erect in front of them to receive the caresses that were always bestowed upon him—after which he took up the blocks one by one and placed them back in the box where they were usually kept.

I am aware that certain dogs have been taught to obey certain signals, by the aid of which they perform feats which deceive the casual spectator and appear to be acts of intelligence when, in fact, they are the result of mere trickery; as a rule this is admitted by all trainers. But in the instance here related the dog had no signal given him except that the name of each letter was called out in the order required. I regard this as the most unique feat of abstract training that any dog has accomplished, and the high social and professional standing of the owners of "Trip" is a guarantee against any deception in the matter. I am personally indebted to them for the story.

Professor L——, who is now the professor of French in the English High School of Boston, Massachusetts, owned a fine setter and retriever. He often gave evidence of high intelligence and great affection.

On one occasion, Professor L—— and a friend were out shooting quail. A covey of birds flew across a field overgrown with bushes and bramble. In forcing their way through a long, dense thicket the professor got his watch-chain entangled, and a gold watch was jerked from it. The owner was not aware of it until they had gone far away from the spot, when he discovered the loose chain hanging to his waistcoat. Instantly he slapped his hand upon his pocket and realised his loss. At that moment the dog laid a dead bird at his feet, wagged his tail, and looked up at his master for approval. In his excitement he shook the chain, and said in French to the dog: "Ponto, I have lost my watch!"

The expression on the dog's face instantly changed to one of deep concern. He reared himself upon his master, pawed at his pocket, and smelt and examined the chain as if to assure himself of what was wrong. The professor again shook the chain at him and repeated the words quoted. The dog promptly turned and started back over the route they had come; but instead of following his own trail he cautiously pursued that of his master. Proceeding slowly, he kept his nose near the ground, or turned it from side to side. From time to time he lifted his head high in the air and sniffed, and then resumed his search. The men followed in silence. On reaching a certain clump of bushes and briars the dog crept under them, smelt the leaves on the ground, turned towards his master, and barked. This provoked the professor, who scolded the dog, because, as he explains, he had not been under those bushes nor within some feet of them. The dog again crawled under them, paused, looked back, and again turned toward his master, who, being so certain that the dog was misleading him, spoke to him in a harsh and threatening tone. The dog once more crept under the bushes and, thrusting his nose into a bunch of leaves, drew out the watch, brought it and gently laid it at the feet of his master, and then crouched down as if begging for mercy, because he feared that a blow would be the sequel of the scolding. I am glad to say the gentleman assured me that from that hour to the day of his death the dog never received from him another unkind word.

How often we wring the heart of some creature that loves us. Did you never look down into the soulful depths of the eyes of your dog? Few things are more painful to me than to see a faithful, loving dog crouching in fear at the feet of his master. Few things appeal to me more strongly than the unwavering fidelity of a dog.

I do not mean to dim the lustre of man's mental achievements or rebuke him for not having more respect for the dim glow of soul that lights the eye of every well-bred dog, but I insist that man does not lessen his own divinity by admitting that of the dog.

THE IDENTIFICATION OF BIRDS.

PART II.—PASSERINES.

By F. Finn, B.A., F.Z.S.

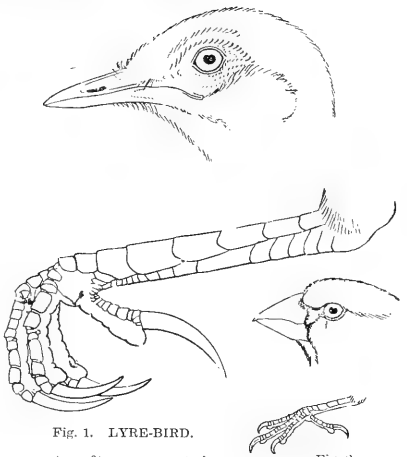


Fig. 1. LYRE-BIRD.

Fig. 2. HAWFINCH.

CONSIDERING the enormous number of species included in the *Passeridæ*, and the fact that they differ so little in anatomical characters that they are really only equivalent to one family, it is not surprising that they are difficult to subdivide. There is thus no royal road to their identification, for some of the groups merge into each other in so confusing a manner as to defy exact definition; yet, after a certain amount of practice and observation of the characters of typical examples of the various subdivisions of the family, even an unknown Passerine bird may be referred to its proper section with a fair amount of confidence, though exceptions must be expected.

The great agreement in anatomical characters presented by this huge group is paralleled by their similarity in foot-structure; one has only to compare the Lyre-Bird (Fig. 1) with the Hawfinch (Fig. 2) to see how similar they are in plan, although the two birds are about as different as any two Passerines can be. The dominance, so to speak, of the hind-toe, and the small number and large size of the scales covering the whole member, strike one at once. The most important detail to notice in the way of difference is the length of the shank in the one and its shortness in the other, and the fact that in the Lyre-Bird the backs of the shanks are covered with separate scales, and not with continuous horny plates as in the Hawfinch; the uniform plating at the back being the rule. These differences of the scaling of the shanks are important in classification; and the relative lengths are also useful means of distinction, though not always constant in any given group.

The bills of the two birds also mark a distinction which is very noticeable; the Lyre-Bird's being a fairly typical insect-eater's bill, slight in form and moderate in length, although the unusually forward position of the nostril is not a common character; while the Hawfinch's huge nut-cracker shows the seed-eater's beak in its most extreme form.

It will be noticed that the bill and foot of the Jackdaw, shown in the last article, are of a somewhat intermediate type, their owner being literally a jack-of-all-trades, and able to turn his bill and foot to almost any use, like the crow tribe in general.

In giving the scientific names of the Passerine groups, I shall use the termination *-idæ*, as in the real families dealt with in the last article. The reason for this is that ornithologists, although admitting the insignificance of the Passerine groups, from the point of view of the anatomists who make their classifications, yet somewhat inconsistently retain them as families, instead of reducing them to sub-family rank. (Sub-families are indicated by the termination *-inæ*.) It should be remarked, however, that uniform as these subdivisions of the Passerines appear anatomically and in their foot-structure, they are remarkably distinct in that they never interbreed—one never

hears of a "mule" between a Warbler and a Finch, or even a Wagtail and a Lark, although the most remote types in other families will cross; thus, we have Pheasants interbreeding with Grouse, and diving Ducks with the surface-feeding species.

The best way of making the Passerine groups intelligible seems to be to brigade them into larger divisions according to certain broad correspondences in form and habit, premising that this method of classification is only intended for convenience, and does not show the natural relationships. The smaller groups—the so-called families—are in themselves natural enough, though there is less perfect agreement about them than is the case with the real family groups previously considered.

In the present case it will also be advisable to go into a few details as to the geographical distribution of the various groups and their habits, as tending to render the work of identification easier. It will be noticed that the majority of the groups having separate scales at the back of the shank belong to South America, while all these birds with shanks scaled at the back, except the Larks, have the organ of voice differently and more imperfectly constructed. None are fine songsters, and they are often called "Songless Passerines."

BUSH-HAUNTING PASSERINE BIRDS

With short rounded wings and very strong feet; active in cover, but unable, or at least unwilling, to fly far; mainly insectivorous.

The Lyre-Birds (*Menuridæ*) are large pheasant-like creatures with very strong feet and nearly straight claws (see Fig. 1); they are the biggest of Passerine birds except some of the larger Crows, and inhabit Australia.

The Scrub-Birds (*Atrichiidæ*), also Australian, are small birds with rather long tails and very short wings; their shanks have separate scales on the back, by which they are separated from any other Passerine birds of similar shape found in Australia.

The Tapaculos (*Pteroptochidæ*) inhabit South America; they have very strong coarse feet, much like the Lyre-Bird's on a small scale, and fairly stout and short beaks with the nostrils overhung by a scale on the inner side. Their tails are rather short, and they are great skulkers, but very noisy. Their shanks have several scales up the back. This distinguishes them from the larger Wrens, to which they bear some resemblance in form and habits.

The Babblers (*Crateropodidæ*) (Fig. 3) are widely spread over the warm parts of the Old World. Except for their soft loose plumage, short wings, and coarser bill and feet, they much resemble the Thrushes and Warblers, but differ much in some habits, being exceedingly sociable and affectionate, and very noisy without usually shining much as songsters. The most familiar to European eyes is the pretty little cage-bird from China and the Himalayas commonly sold as the Peking Robin (*Liothrix luteus*); but it appears probable that the Bearded Reedling (*Panurus biarmicus*), a European and even British bird, is really an outlying member of this family, as is also the Wren Tit (*Chamæa fasciata*) of California. It is agreed that neither of these birds really are Tits. Babblers usually build open nests.

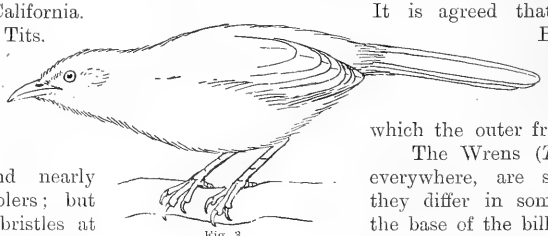


Fig. 3.
A BABBLER.

N.B.—The only three-toed Passerine bird (*Cholornis paradoxa*) in which the outer front-toe is missing is a Babbler.

The Wrens (*Troglodytidæ*), which are found nearly everywhere, are sometimes classed with the Babblers; but they differ in some points, notably in having no bristles at the base of the bill, in being much less sociable and much more generally gifted as

songsters, besides building domed nests. Many of the South American Wrens are birds of fair size, and some consider the American Mocking-Birds as related to them.

The Ant-Birds (*Formicariidæ*) of South America do not appear to restrict themselves specially to a diet of ants, although undoubtedly insectivorous. In general habits they seem to approach the Babblers of the Old World, as well as in form, but may be distinguished by the separate scaling of the back of the shank, the Babblers having this covered by a continuous plate in the usual way. They build open nests, and are even less melodious than the Babblers; their beak is usually stouter and more hooked than in those birds, and their plumage commonly barred across with light and dark.

PASSERINE BIRDS

With legs and wings both well developed, living mostly on open ground, where they run instead of hop, and perch little except at night, and sometimes not then.

The Larks (*Alaudidæ*) (Fig. 4), found nearly everywhere, are the most terrestrial of Passerine birds. Their shanks have separate scales up the back as well as the front, which will distinguish them from other families of similar habit. They dust themselves

Fig. 6. STARLING.

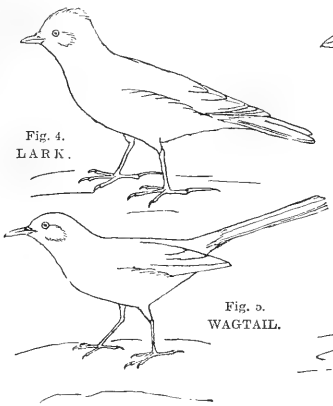


Fig. 4. LARK.

Fig. 5. WAGTAIL.

Fig. 7. PITTA.

instead of washing, build on the ground, seldom perch in the day and never at night. Their plumage is brown more or less streaked, and the young are spotted with buff. The bill varies, as does the claw of the hind-toe, which is most commonly long and straight.

The Pipits and Wagtails (*Motacillidæ*) have slender bills of moderate length, and the hind-claw long in some cases. The inner quills or tertiaries are exceptionally long, as is also the case in the Larks, which the Pipits resemble in the streaky brown plumage, although they can be distinguished by the back of the shanks not having separate scales. The Wagtails (Fig. 5), have the plumage black, grey, and white or olive-green and yellow. They build on or near the ground. Their tails are longer than in Larks.

The Starlings (*Sturnidæ*), found almost all over the Old World, have bills of an elongate-conical shape, with the mouth noticeably turned down at the corners, strong feet, and short tails (Fig. 6). The plumage of the adults is usually glossy. They build in holes in trees, etc., as a rule, and perch more than the members of the two preceding families, but usually feed on the ground. They fly with a steady, even flight, unlike the bounding action of most small Passerine birds.

N.B.—There are many Tree-Starlings which seldom come to the ground, and hop when they are there (such as the Hill-Mynahs (*Eulabes*) of the East), but the glossy plumage of these will distinguish them from most birds with which they might be confounded.

BUSH-HAUNTING PASSERINE BIRDS

With long legs and particularly short tails, insectivorous in habit.

The Pittas (Fig. 7) (*Pittidæ*), which are widely diffused through the warm regions of the Old World, have rather strong bills, and the back of the shanks with a smooth uniform covering. The latter point and their gay colouring will in most cases distinguish them from some short-tailed Ant-Birds (*Formicariidæ*). They are insectivorous, and build domed nests. They are often called Ant-Thrushes, but, unlike most of the families with smooth hinder shanks, differ anatomically from the thrushes.

The Wattled Pittas (*Philepittidæ*), of which there are only two species, are confined to Madagascar, where no true Pitta is found. They differ from the true Pittas by having separate scales at the back of the shank, while the males have a wattle over the eye. They keep more to the trees than the true Pittas, which mostly live on the ground. In this, as in the last and the next family, the vocal organ is of an inferior type.

The Dwarf Pittas (*Xenicidæ*) are tiny short-tailed birds, only found in New Zealand and Stephens Island. They are much smaller than the true Pittas (which are as large as Thrushes), and are often called Wrens. The Dwarf Pittas build in holes.

CLIMBING PASSERINE BIRDS

With long hind-toe and outer front toe, and the inner front toe reduced in size: of insectivorous habit.

The Creepers (*Certhiidæ*) are small birds ranging over most of the world except South America. Their bill is slender, and may be straight or curved. They spend their time climbing up trees, etc., place their nests in crevices, and are usually brown in colour.

The Nuthatches (*Sittidæ*) (Fig. 8) have straight and rather stout bills; their prevailing colour being blue-grey, or even blue. They are partly vegetable-feeders, and, unlike any other climbing birds, can climb downwards as well as up. Their nest is placed in a hole. They have much the same distribution as the Creepers, and are sometimes placed in the same family.

In the Wood-Hewers (*Dendrocolaptidæ*), which replace the Creepers and Nuthatches in South America, the climbing type of Passerine foot, with the long outer toe, reaches the highest perfection; the bill varying much in shape. They are often much bigger birds than Creepers or Nuthatches, and are brown in colour, often reddish, especially on the tail.

N.B.—This group contains many species, varying much in type; some are not climbers at all, but hop, and even run on the ground, like the Oven-Bird (Fig. 9). These forms have not the typical foot, but can be distinguished from Thrushes, Warblers, or other birds they seem to resemble, by having the shanks scaled at the back. The nesting-habits vary much, and are often most remarkable: as witness the Oven-Bird's curious clay structure, and the great stick-nest of the Lenatero (*Anumbius acuticaudatus*).

PASSERINE BIRDS

With distinctly short legs, usually flying more than they hop, and feeding on flying insects.

The Flycatchers (*Muscicapidæ*) are spread all over the Old World, and are, generally speaking, uniform in habits. They have flattish bills, well bristled at the

Fig. 8. NUTHATCH.

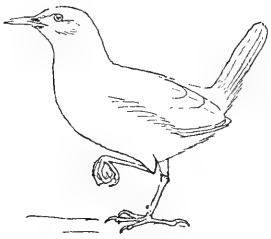


Fig. 9. OVEN-BIRD.

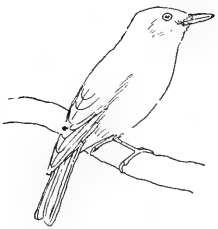


Fig. 10. FLYCATCHER.

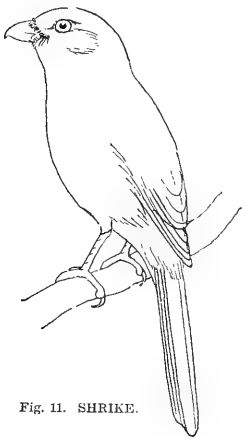


Fig. 11. SHRIKE.

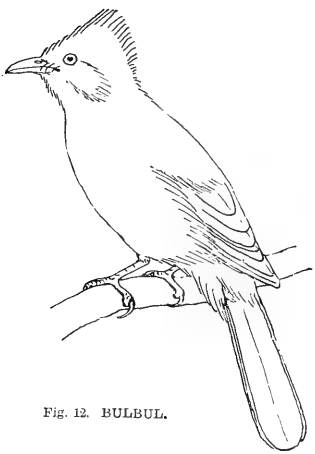


Fig. 12. BULBUL.

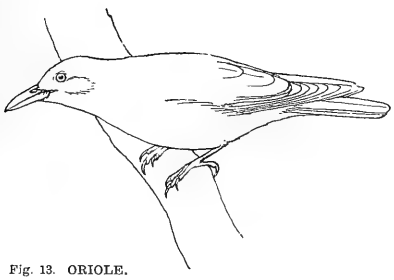


Fig. 13. ORIOLE.

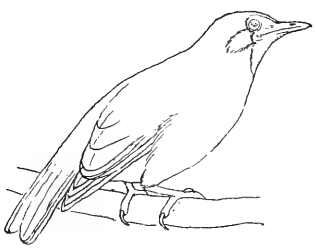


Fig. 14. BELL-BIRD.

root, and sit quietly on some favourite perch, making short sallies after insects at intervals (Fig. 10). Some have longer legs and move about more on their feet, and the group merges imperceptibly into the Robins. They usually build open nests, and are always small. The first plumage of the young is buff-spotted.

The Shrikes (*Laniidæ*), found almost everywhere except in South America, are strong-billed, large-headed insect-eaters, with, in typical cases, a decidedly hawk-like beak (Fig. 11). They are sedentary like the Flycatchers, but take larger prey, being bigger birds as a rule; often they feed on other birds or on small reptiles and mammals. The first plumage of the young is barred. The nest is open and placed in a bush or tree.

N.B.—The type is not constant in this family; some Shrikes, chiefly African, have the very short wings, strong feet, and general habits of Babblers, from most of which their strong bills separate them; others, as the familiar "Australian Magpies" (*Gymnorhina*), look and behave much like Crows, but differ by their exposed nostrils.

The Drongos (*Dicruridæ*) are much like the typical stout-billed Shrikes, but differ in their forked tails, plumage generally glossy black throughout (rarely grey) and in only having ten tail-feathers, whereas twelve is the usual number in Passerine birds. They are found almost throughout warm regions in the Old World, and make themselves conspicuous by their attacks on other birds, often in defence of their open nests high up in a tree.

The Tyrants (*Tyrannidæ*) are American, and especially South American, birds. In general habits they resemble Flycatchers or Shrikes, according to their size, which varies a great deal; many also, such as the well-known American King-Bird (*Tyrannus carolinensis*), domineer over other birds like the Drongos. From the Old-World groups which they resemble they may be distinguished by the scaling at the back of the shank. They are usually olive or grey in colour, and often have an orange or flame-coloured crest. In America they are often called Flycatchers, as are Bee-Eaters in India.

N.B.—This is another group showing many forms. Some species have legs of ordinary length and hop about, or search for food on the ground, but the peculiarity of the shank above alluded to will distinguish them from the Warblers and Chats of the Old World. Their nesting-habits vary a good deal.

SHORT-LEGGED BUT ACTIVE TREE-BIRDS

Feeding mostly on fruit.

The Bulbuls (*Pycnonotidæ*) are very characteristic of the warm parts of Asia and Africa. They have bills of medium size and tails inclined to length, and are often crested; frequently there is a patch of red or yellow under the tail. They are mainly fruit-eaters, and build open nests in bushes. Sometimes classed with the Babblers, they are certainly nearly related to them through some more or less intermediate forms, but in general habits they are very different, since they fly about much more and do not keep so much to cover (Fig. 12).

The Orioles (*Oriolidæ*) are birds with strong, fairly stout bills and rather long wings (Fig. 13). They are commonly coloured richly with yellow, red, or olive-green combined with black, and are rather large, equalling or exceeding a Thrush. They inhabit most of the Old World, and build beautiful hammock-like nests slung in the forks of branches; they keep very much to the trees, hardly ever coming to the ground.

The Waxwings (*Ampelidæ*) are a curious group containing only a few species, found in Europe, Asia, and America. They have a small bill with wide gape, most other birds so distinguished being particularly insectivorous, not mainly frugivorous as these are. Most of them are crested, and the best-known species, the Waxwing of the

northern parts of the world and the Cedar-Bird of North America, develop sealing-wax like appendages on the secondary wing-quills.

The Chatterers (*Cotingidæ*) form a group confined to America, and almost entirely to its southern portion. Their bill varies in form, but has a wide gape and is often small, although at times somewhat crow-like; their shanks are usually covered with numerous small scales behind. This group includes many very brilliant and many equally curious forms, such as the Cocks-of-the-Rock (*Rupicola*), the Umbrella-Birds (*Cephalopterus*), and the Bell-Birds (*Chasmorhynchus*) (Fig. 14). Some of these are large for Passerine birds, the Common Umbrella-Bird even equalling a Rook in size. Their nesting-habits vary, but their ways of life as a whole are little known. Some of the Broad-Bills (*Eurylaemidæ*) were formerly confounded with them, but the union of the outer toes is distinctive, as is their Oriental habitat.

AERIAL PASSERINES

With very long wings, constantly chasing insects on the wing.

The Swallows (*Hirundinidæ*) are spread all over the world. Their exceedingly small bills and feet and remarkable length of wing prevent confusion with any other Passerine birds (Fig. 15). They are often confounded with the non-Passerine Swifts (*Cypselidæ*), which are similar in form and habit, but the large hind-toe and coarsely-scaled shank of the Swallow, with its twelve tail-feathers against the Swift's ten, will differentiate them; moreover, Swallows often perch, while Swifts seldom do so. Their nesting-habits vary a good deal, but the nest is either a mud-built structure or placed in a hole, generally speaking.

N.B.—The Martins (*Chelidon*) differ from the rest of the group and all other Passerine birds by having the feet covered with down instead of scales.

The Wood-Swallows or Swallow-Shrikes (*Artamidæ*) of the warm parts of the world—chiefly India and Australia—have much of the Swallow's build, but are easily distinguishable by their much larger bills, which are fairly long and stout. They do not spend so much time on the wing as the true swallows, and their nests are of quite a different type, being built in the ordinary way. They are sometimes classed with the Shrikes, and seem to be related to those birds.

So far the wings and feet have given us distinctions, but now we come to some groups whose most striking feature is some peculiarity of the bill.

PASSERINE BIRDS

With slender, usually curved bills, haunting flowers for food, which consists of honey and insects.

The Sun-Birds (*Nectariniidæ*), ranging through Africa and Southern Asia to Australia, are for the most part small but very beautiful birds, the males with highly glossy metallic plumage. Their bills are minutely serrated along the edge, though a hand-lens is needed to see this properly. They are often confused with the Humming-Birds of America, but these have very short legs and feed on the wing, while the Sun-Birds have legs of ordinary length and hop. They used to be confused with the Creepers, but have not their shape of foot. The nest is usually hanging and roofed, with an entrance-hole at the side.

The Flower-Peckers (*Dicaeidæ*), with much the same distribution, are exceedingly tiny birds with shorter beaks than the Sun-Birds, but still curved and saw-edged. They also build hanging nests as a rule.

N.B.—Some of these birds have quite short, thick beaks, but their very small size—as a group they are the smallest birds in the Old World—distinguishes them easily as a rule.

The Sugar-Birds (*Cærebidæ*) of the West Indies and South America are small slender-billed species, often very brightly coloured, with apparently much the same habits as the Sun-Birds and Flower-Peckers of the Old World; they also build domed nests.

The Honey-eaters (*Meliphagidæ*) of the Australian region are usually birds of fair size, though this varies; their plumage is generally dull, and their bill slight and inclined to be long and curved, although usually shorter and stouter than in the Sun-Birds. Their nests are generally open ones of ordinary form.

The Mamos (*Drepanididæ*) are confined to the Sandwich Islands, and therefore not likely to be mistaken for other birds; they resemble Sun-Birds or Finches, which are not native to those islands, having either slender or stout bills, often in the former case much curved. Their tints are red, yellow, or green, not metallic, and they have a peculiar smell.

PASSERINE BIRDS

With bills of a markedly conical shape, usually chiefly vegetable-feeders, and especially seed-eaters.

The Finches (*Fringillidæ*) are found nearly all over the world, and are the most familiar of all birds in the persons of the Sparrow and Canary. Their bill is typically conical, and though seldom so stout as in the Hawfinch (Fig. 2), is never long or thin. Their legs or wings may be either long or short, and the tail also varies; the nostrils are not noticeable, being just where the forehead-feathering joins the base of the bill. The Buntings are included in this group. Finches usually make open nests, but a few build in holes, like the sparrows.

The Weavers (*Ploceidæ*), with which the Waxbills, Whydahs, and Nuns or Mannikins are classed, are the characteristic Finches of the warm parts of the Old World. They are usually shorter in wing and stouter in bill and feet than the true finches. Moreover, the bill tends to run up on to the forehead in a peak, and the nostrils are sometimes exposed. The nest is usually covered, and often pendent. But for all this, the *Ploceidæ* are usually spoken of as finches, and should not properly be separated.

The Tanagers (*Tanagridæ*) are American, and chiefly confined to the southern half of the New World. Their bills are more or less conical in form, and exhibit the nostrils exposed, but they vary in thickness of beak, some species being almost indistinguishable from thick-billed Finches, and others so slender in bill that they grade into the American Warblers (*Mniotiltidæ*). These birds are chiefly fruit-eaters, build open nests, and are often exceedingly brilliant and beautiful in colour.

The Troupials, or Hang-Nests (*Icteridæ*), are also an exclusively American family, but they are better represented than the Tanagers in the northern half of the continent, where they are often called, from their dark or yellow-pied plumage, "Blackbirds," or "Orioles," although they are by no means nearly related to those birds. Some are as big as crows, and they are usually larger than sparrows; their beak is noticeably conical, but varies much in length and thickness, some having it as stout as a sparrow's, like the "Bobolink" (*Dolichonyx oryzivorus*), and others as thin as a starling's, such as the Meadow-Lark (*Sturnella ludoviciana*). The beak has a marked tendency to run up on the forehead, and the feet are strong. The food is both vegetable and animal, and the nest varies. In America these birds seem to represent the Starlings and Weavers of the Old World, and perhaps unite those groups.

The Plant-Cutters (*Phytotomidæ*) of South America are vegetable-feeding birds much resembling Finches, but with the edges of the bill toothed and the back of the shank separately scaled with many small scales. They are very destructive to vegetation, and build open nests in bushes.

Fig. 15. SWALLOW.

PASSERINE BIRDS OF GENERALIZED STRUCTURE

With no very striking peculiarity; usually mixed feeders.

The Thrushes (*Turdidæ*), found all over the world, are so devoid of characteristic points that they are not at all easy to describe. They are well-proportioned birds with slight bills of no great length, and slender legs; both the wings and tail usually well developed, but not remarkably long (Fig. 16). The larger and more typical Thrushes feed a great deal on fruit as well as insects, &c., and often run as well as hop when on the ground; the smaller kinds, Robins, Chats, Redstarts, and the like, seldom progress except by hopping, and are much more exclusively insectivorous. Thrushes are never crested, and their plumage is hardly ever glossy, which distinguishes them from some thrush-like starlings. Unlike the Babblers, they never hold food in their feet, nor are they sociable like those birds. As a rule they have, when first fledged, a buff-spotted plumage, while the front of the shank is usually uniform and smooth like the back. This is not, however, the case with the "Hedge-Sparrows" or Accentors, which belong to this family, and have the buff-spotted young plumage. The Dippers or Water-Ouzels (*Cinclus*) are also Thrushes, and noteworthy as being the only swimmers and divers among the Passerines. The nest varies in this group, but is more often an open one. The Mocking-Birds (*Mimidæ*) of America are sometimes classed separately.

The Warblers (*Sylviidæ*) are practically small delicate Thrushes, of brown or olive-green colour as a rule, and devoid of the spotted young plumage. Moreover, the front of the shank is separately scaled as usual. They are mainly insectivorous, and do not come much to the ground; but some, like our Blackcap and Garden-Warbler, are also great fruit-eaters. This is an Old-World group, though one species invades North America. Their nests vary, being usually open, but sometimes domed; the well-known Tailor-Bird (*Orthotomus sutorius*) and others which sew leaves for a nest-bag belong to this group. The Gold-Crests (*Regulus*) are sometimes placed in a separate family.

The American Warblers (*Mniotiltidæ*) are likewise small delicately-shaped birds of usually tree-haunting and insectivorous habits, but they show gay and varied colours, and as they are only found in the New World, are the less likely to be confused with the true Warblers. They appear to grade into the Tanagers (*Tanagridæ*) on the one hand and the Sugar-Birds (*Cærebidæ*) on the other. Their nests are open and cup-shaped as a rule.

The Greenlets (*Vireonidæ*) are also small American tree-haunting insectivorous birds. Their plumage is green or olive, and their bills vary from slight to stout; they build open nests, and are sometimes classed with the Shrikes, which group the strong-billed types somewhat resemble in appearance.

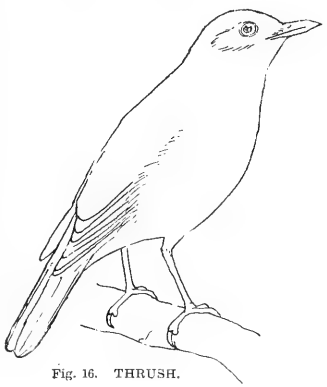


Fig. 16. THRUSH.

The Manakins (*Pipridæ*) are not to be confused with the "Mannikins" of bird-dealers, which, as mentioned above, are small Weaver-Finches. The present group includes small fruit-eating New World birds, mainly confined to South America, and haunting forests and bush. They have small beaks but wide gapes, the two outer front toes joined for half their length, and are very often gorgeously coloured. Their shanks are separately scaled behind.

The Tits (*Paridæ*), which are small tree-haunting birds found everywhere except in South America, have short strong bills, the nostrils covered with bristles, and strong feet (Fig. 17). They are mainly insectivorous, but many will eat vegetable food also, and they usually build in a hole and are remarkable for activity.

The Crows (*Corvidæ*) occur all over the world, the group including Magpies and Jays as well as the typical Crows. They have strong bills covered at the base with bristles concealing the nostrils, and powerful feet, which they use in holding down food. Their nests are usually open. As a group, they are the largest of Passerine birds, none being smaller than a Thrush, and the Ravens the largest of the family, as well as probably the most intelligent of all birds. It so happens that the best-known of all Crows to English people—the Rook—has no bristles at the base of the beak except when young, for it always gets bald about the face early in life; but no one will mistake a Rook for any other Passerine bird. The Choughs also, which have slender bills, are obviously Crows in every other respect.

The Birds of Paradise (*Paradiseidæ*) are really gaudily-dressed Crows, since in general size, form and habits they much resemble Jays; the feathering at the base of the bill, however, is velvety instead of bristly, and the body-plumage in the males is often wonderfully gorgeous in colour and elaborate in form, long plumes or tufts of plumes, which are purely ornamental, being frequent, especially on the head or flanks. The body plumage in many species is much like velvet in appearance and texture, or brilliantly metallic. These birds, which inhabit New Guinea and the adjacent countries, build simple open nests.

The Bower Birds (*Ptilonorhynchidæ*), inhabiting the Australian region, are closely allied to the Birds of Paradise, and much resemble large Thrushes in general form, but usually have a stouter bill, often closely feathered at the base. Their plumage is seldom gorgeous, but they are interesting for the remarkable "bowers" or playing-places which they build and decorate with various objects. The real nest is an ordinary cup-shaped structure. These birds feed chiefly on fruit, and the main interest in their habits lies in the bower-building instinct, whereby in this particular respect they are raised nearer to man than any other animals, since no other creature builds a house and decorates its precincts merely for social amusement.

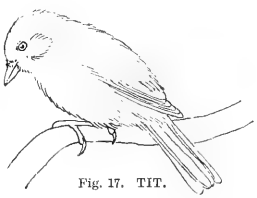
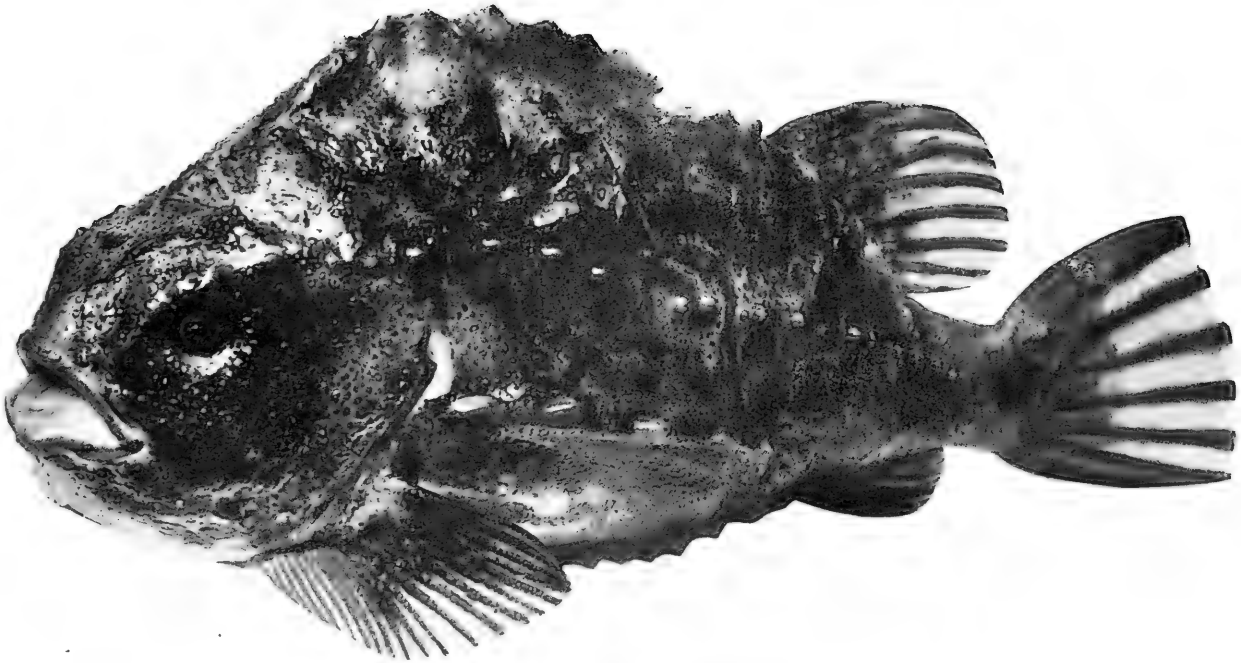


Fig. 17. TIT.

[Mr. Lydekker's series of four articles on "Animal Dentition" will be continued in our next number. This, the second, will treat of Reptiles.]



LUMPSUCKER (*Cyclopterus lumpus*).

Painted by FLORENA SETH. *From a Photograph by Reinhold Thiele.*

RUDDY SHELDRAKE.

HYBRID SHELDRAKE.

Photographs by W. P. Dando, F.Z.S.

HYBRID BIRDS.

I.—By Frank Finn, B.A., F.Z.S.

THE lover of birds may congratulate himself on the fact that his favourite class of animals has supplied more information to the student of the fascinating and difficult problems of hybridism than any other, birds being themselves more prone to hybridism than other creatures, and having been studied by so many observers both in the wild state and in confinement.

Wild hybrids are indeed rare, but they are of much more frequent occurrence than is generally supposed. They are most numerous among the species of the Grouse family; the cross between the Blackcock (*Lyrurus tetrix*) and the Capercailzie (*Tetrao urogallus*) occurs every year, and has even received a special name (*Rakkelhane*) from Scandinavian sportsmen. Many instances of crosses between the Blackcock and Red Grouse (*Lagopus scoticus*) have also been recorded; but, curiously enough, the latter bird and the Ptarmigan (*Lagopus mutus*), although so much more nearly related, appear never to interbreed. Various other grouse crosses have occurred, but for variety of hybrids the Grouse must give place to the Ducks. In this family at least two dozen distinct crosses have been observed, some of them several times, such as those between the Mallard (*Anas boscas*) and Pintail (*Dafila acuta*) and between the Smew (*Mergus albellus*) and Golden-Eye (*Clangula glaucion*). Wild hybrids between the small birds are much rarer, but several cases of the interbreeding of the Linnet and the Goldfinch with the Greenfinch are known. Generally speaking there is, however, little wild hybridism outside the game-birds and waterfowl, with the exception of a special class of cases now to be noticed.

This is when two species differing practically only in colour, as opposed to those I have mentioned above, where the form and size are also distinct, come into contact locally. In cases like these a great deal of interbreeding takes place, and, the hybrids breeding back to the parent stocks, the locality of meeting is populated by a collection of intermediates. This occurs where the Carrion Crow (*Corvus corone*) meets the Hooded Crow (*Corvus cornix*); where the European and Himalayan Goldfinches

(*Carduelis carduelis* and *C. caniceps*) encounter each other; and where the Blue Rollers of India and Burma (*Coracias indicus* and *C. affinis*) come into contact, to say nothing of many other cases.

It is a question, however, whether this can be called true hybridism, since it may reasonably be argued that species which have got no further in separation than a different plumage are not as yet fully distinct, but rather comparable to the colour-varieties in our domesticated birds. That the intermediate birds represent the ancestors of the two forms does not seem at all probable, because the evidence is in favour of colour-varieties appearing suddenly, and not by gradations from an intermediate type. Thus, there are two forms of the common Peacock, the typical *Pavo cristatus* and the black-winged *Pavo nigripennis*, but there has never been an intermediate ancestor to these, for we know for a fact that the black-winged form, like the albino one, arises quite suddenly from the ordinary bird. It may also be remarked that the free interbreeding of forms or species separated only by colour is a fatal blow to the common theory that colour-differences are "recognition-marks" by which birds of a feather are enabled to flock together.

The fertility of undoubted hybrids—between species where other points combine with colour to make a distinction admitted by everyone—is still very widely disbelieved. And there is some reason for the disbelief, since it appears to be the case that the commonest bird-hybrids, the "mules" between various British Finches and the Canary, are usually barren, though they will pair, lay, and sit in the most exemplary way, a hen "mule" being a notoriously good nurse for young canaries. Another common hybrid, that between the Fowl and Pheasant, is also well known to be sterile, as likewise are those between very distinct genera of pheasants. Nevertheless, fertile hybrids have been so often recorded in some cases that there is no possible doubt about them. A good typical instance is that of the hybrid between the Gold-Pheasant and Lady Amherst's Pheasant (*Chrysolophus pictus* and *C. Amherstiæ*). The details of plumage in these birds are quite different, apart from the very different coloration of gold and scarlet in the one and dark green and white in the other. The Amherst has a much larger tail, but a smaller crest, which grows only from the back of the head; his ruff is also fuller, and the feathers composing it are rounded instead of squared at the tips. The hens, also, though much alike at the first glance, can easily be told apart, the Amherst hen being bigger with a smaller head, and having a bare livid patch round the eye, and lead-coloured legs, while the gold-pheasant hen has dull yellow legs and the face feathered over.

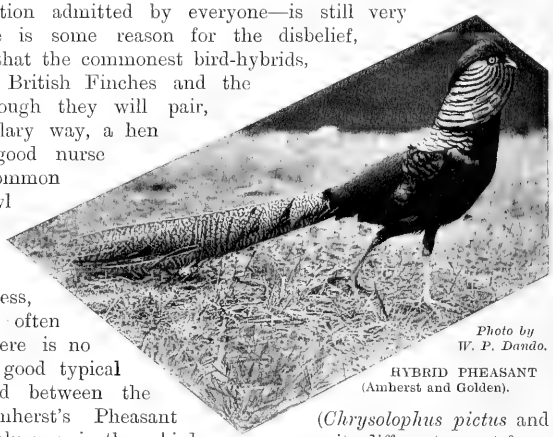


Photo by W. P. Dando.

HYBRID PHEASANT (Amherst and Golden).

Now the hybrids between these two very distinct birds are fertile every way, either between themselves or with the parent stocks. Indeed, when Amherst hens were scarce, which was the case for some time after the introduction of the species, it was a common practice to pair Amherst cocks with golden hens, and breed the hybrid hens with the Amherst again, till the strain became practically pure Amherst. The hybrid cock is a more beautiful bird than either pure species, combining the scarlet of the golden pheasant with the larger amount of deep green of the Amherst, and possessing a crest as full as that of the golden pheasant but of a flaming

orange, the red of the Amherst pheasant's crest and the yellow of the golden bird's being perfectly blended. He often has the pure white ruff of the Amherst, but sometimes, as in the present specimen, it is only of a pale gold.

On the other hand, the hybrid between the golden and common pheasants seems unfertile, the species being much more remote; nor can it fairly compare in beauty with either parent, although a handsome bird. At first sight its origin does not seem at all obvious, as the colours and markings of both parents have disappeared. The general hue is a rich golden auburn or chestnut, the tail being buff and the neck glossed with purple. The characteristic ruff of the golden pheasant almost disappears in the hybrid, as does also the hackle in fowl-and-pheasant hybrids.

There is in the Natural History Museum a most remarkable double hybrid pheasant, the offspring of a hybrid between Reeves' Pheasant (*Phasianus reevesi*) and the Common Pheasant (*P. colchicus*) crossed again with the Silver Pheasant (*Gennæus nycthemerus*), the latter species belonging to a quite distinct group of pheasants called the Kaleeges, while the Reeves' and Common are not by any means remarkably closely allied. This curiously-bred bird is very handsome, being white above, pencilled with black and brown, and a sort of plum-pudding mixture of black and brown beneath.

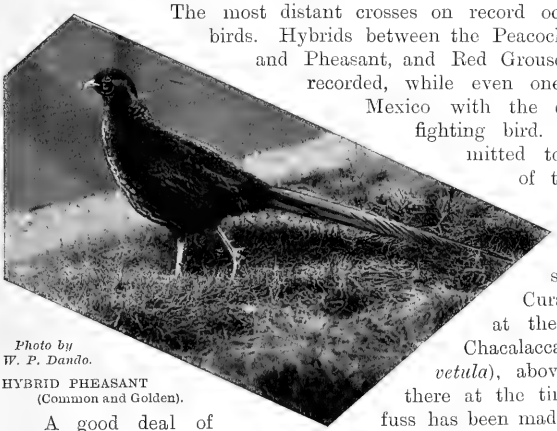


Photo by W. P. Dando.

HYBRID PHEASANT (Common and Golden).

The most distant crosses on record occur amongst these gallinaceous birds. Hybrids between the Peacock and Guinea-Fowl, Capercailzie and Pheasant, and Red Grouse and Bantam Fowl have been recorded, while even one of the Guans is crossed in Mexico with the domestic fowl and used as a fighting bird. The guans are always admitted to belong to a distinct family of the game-birds, having a large hind-toe like a pigeon, and spending a large part of their time in trees. Several species, with their allies the Curassows, are often to be seen at the Zoological Gardens, but this Chacalacca or Mexican Guan (*Ortalis vetula*), above alluded to, is not on view there at the time of writing.

A good deal of fuss has been made over the not uncommon cross between the Egyptian Goose (*Chenalopex ægyptiaca*) and the Ruddy Sheldrake (*Casarca rutila*) as being a very remote one. But this is not really the case; the Egyptian Goose is merely a large sheldrake, and is called a goose by the same right as a big buzzard is often promoted to the rank of an eagle. This hybrid, of which I have seen at least four specimens, is, however, very remarkable in its one-sided character. As may be seen by the accompanying illustrations, the Ruddy Sheldrake has proved strongly prepotent; indeed, were it not for its pink legs, slightly greater size and taller figure, and dull colour, the hybrid could scarcely be distinguished from a pure bird of that species, the very marked characteristics of the Egyptian Goose disappearing almost completely except in the legs. The specimen shown, from the Zoological Gardens, is a male. Its voice is a husky chatter as in the male Egyptian Goose, whose influence is here apparently dominant, since the male Ruddy Sheldrake has as strong a voice as the female. It used to have a mate of the same cross, but her eggs were always unfertile. This was also the case, as I am told by the bird-keeper at St. James's Park, with those of an Egyptian Goose which was mated to a similar male hybrid this year. This hybrid and a brother were bred on the St. James's Park lake not long ago, but the bird in the Zoo is a very old stager.

Although this particular hybrid would appear to be sterile, the Duck family has afforded several undoubted cases of fertile hybrids. That between the Pintail (*Dafila acuta*) and the domestic duck, the descendant of the Mallard, may be especially cited. In one instance ducklings were obtained from a pair of these hybrids, and more than once the hybrid has bred again with the pure pintail, the last instance being one recorded by Mr. J. F. B. Sharpe in the "Feathered World" for July last. In this case the hybrid duck laid eight eggs, all of which were fertile, and hatched seven ducklings, one egg having been cracked. She proved a particularly careful and intelligent mother, thus recalling the good repute of the mule canary as a nurse.

The fact that the Pintail and Mallard can produce a fertile cross shows that there is some other cause besides mutual sterility which keeps species distinct in the wild state, for, as I said above, the pintail-mallard hybrid is one of the best-known wild-bred hybrids, and yet the two species remain distinct on the whole.

Double hybrid ducks have occurred, as well as pheasants. M. G. Rogeron, of Angers, once bred a most remarkable one from a hybrid between Mallard and Gadwall (*Chaulelasmus streperus*) mated to a Pochard (*Nyroca ferina*), and more recently Mr. J. L. Bonhote has succeeded in raising ducks in which the blood of the pintail, mallard, and Indian spot-billed duck (*Anas pœcilorhyncha*) was combined.

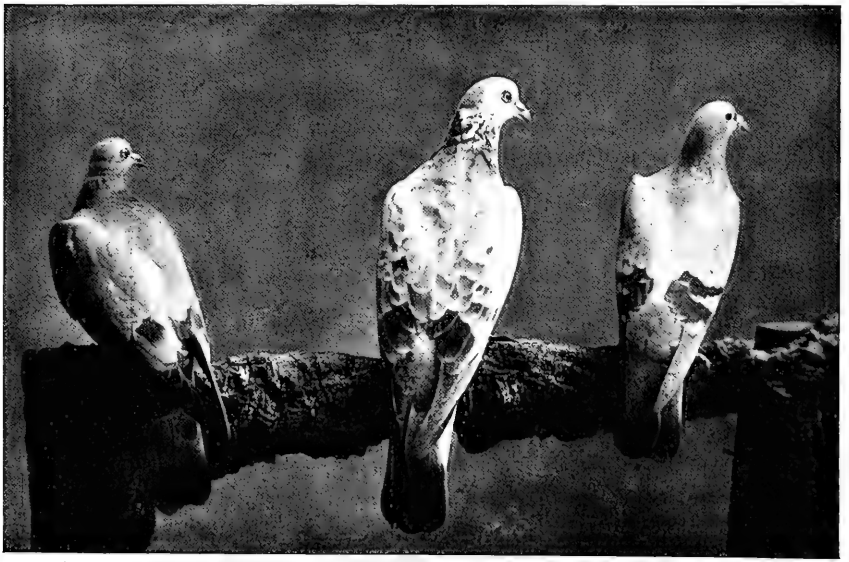
Turning now to some other groups, we find a fertile hybrid among the Parrakeets in the so-called Red-Mantled Parrakeet (*Platycercus erythropeplus*), which has produced young in confinement, and was shown, in the August number of the "Avicultural Magazine," to be merely a hybrid between the Rosella (*Platycercus eximius*) and Pennant's Parrakeet (*Platycercus elegans*). These two parrakeets are very distinct, Pennant's being a bigger bird than the rosella, and coloured red, purple-blue and black, with a distinct immature plumage of uniform olive-green, while the rosella's colour is very largely yellow in addition to the other hues, and it assumes almost perfect adult plumage from the nest.

Considering what free breeders are the various species of doves and pigeons, it might have been expected that much light would have been shed on this subject by that group; but this appears not to be the case. Wild hybrids among these birds are almost unknown, and even in domestication very remote crosses seem not to have occurred. The two domestic species, however, the common pigeon and the collared turtle-dove (*Turtur risorius*) not unfrequently produce hybrids; but these appear to be quite sterile, although ready enough to mate. Out of three of these I have seen, two exactly resembled common mongrel pigeons in colour, though showing in their shape their relationship to the dove. The third, however, was of a creamy-dun shade.

The different species of turtle-doves, though distinct enough in themselves, might reasonably be expected to produce fertile hybrids, and accordingly we find Miss R. Alderson, who has paid particular attention to doves, stating in the "Avicultural Magazine" for last January that a specimen bred by her between the domestic *Turtur risorius* and our native wild turtle-dove (*T. auritus*) bred (after she had parted with it) with a hybrid raised from the domestic dove and the necklaced turtle-dove of eastern Asia (*T. tigrinus*).

Lastly, it has been recently proved by Mr. P. St. M. Podmore that the female woodpigeon will produce a fertile hybrid with the domestic pigeon, the hybrid cock producing young with the domestic hen, although the cock woodpigeon will not do so. This singular discrepancy shows how difficult it is to say positively whether any hybrid is or is not fertile, and indicates the importance of extended experiments in this most promising field. It is unnecessary to add more on this subject here, as I understand that a note from Mr. Podmore himself, and some excellent photographs which he has placed at the Editor's disposal, will form the second part of this article.

PARENTS OF THE YOUNG RINGDOVE HYBRID
(*C. livia*) and (*C. palumbus* and *C. domesticus*).



YOUNG OF RINGDOVE HYBRID. RINGDOVE HYBRID COCK. BLUE ROCK HEN.

II.—By P. St. M. Podmore, M.A., F.R.G.S.

Note on the Fertility of Woodpigeon Hybrids.

THE Ringdove's swift flight and extraordinary powers of endurance suggested to my mind years ago the possibility of cross-breeding with long-distance Homers.

I made many fruitless attempts to breed hybrids with *C. palumbus* cock. At one time I had half-a-dozen pairs thus mated, but no eggs proved fertile.

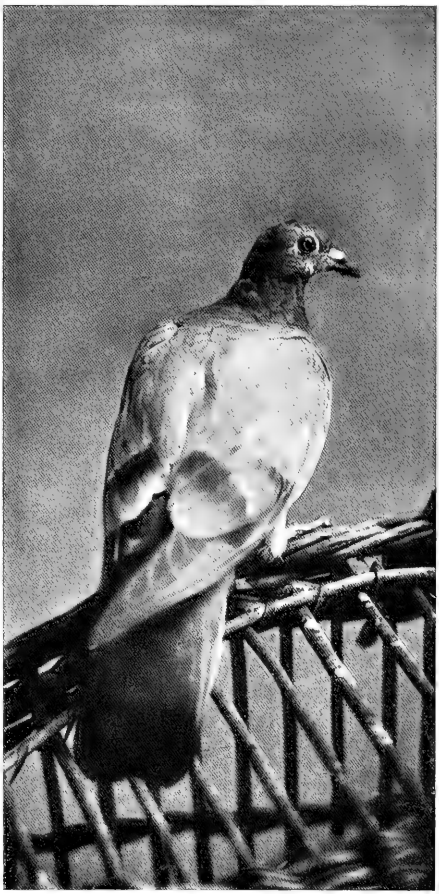
Professor A. Newton, writing to me on this subject, says: "The fruition of hybrids in zoology is exactly on 'all fours' with that of hybrids in botany. Between some species of animals, as the Equidæ, the hybrids appear to be absolutely sterile, and in the Bovidæ they are fertile. Just the same thing is observed (so botanists say) among plants. Again, among plants there are species in which it seems easy to get a hybrid between the male of A and the female of B, but the reciprocal cross between the male of B and the female of A is almost or quite impossible. I am told that 'fanciers' who breed mule birds find exactly the same thing."

The importance of genuine hybridisation is hardly less valuable to science than the discovery that associated the Colymboides with the Colymbidæ, and traced the first Columba to the lower Miocene beds of Allier and Puy de Dôme.

During the past fifteen years I have bred hybrids from *C. palumbus*, *C. œnas*, *C. turtur*, etc. From 1897 to 1899 I hatched fifty hybrids, but all died just before fledging.

On August 22nd, 1899, I wrote: "Eleven days appear to be the limit of life permitted to ringdove hybrids. The young invariably died on the eleventh or fifth day."

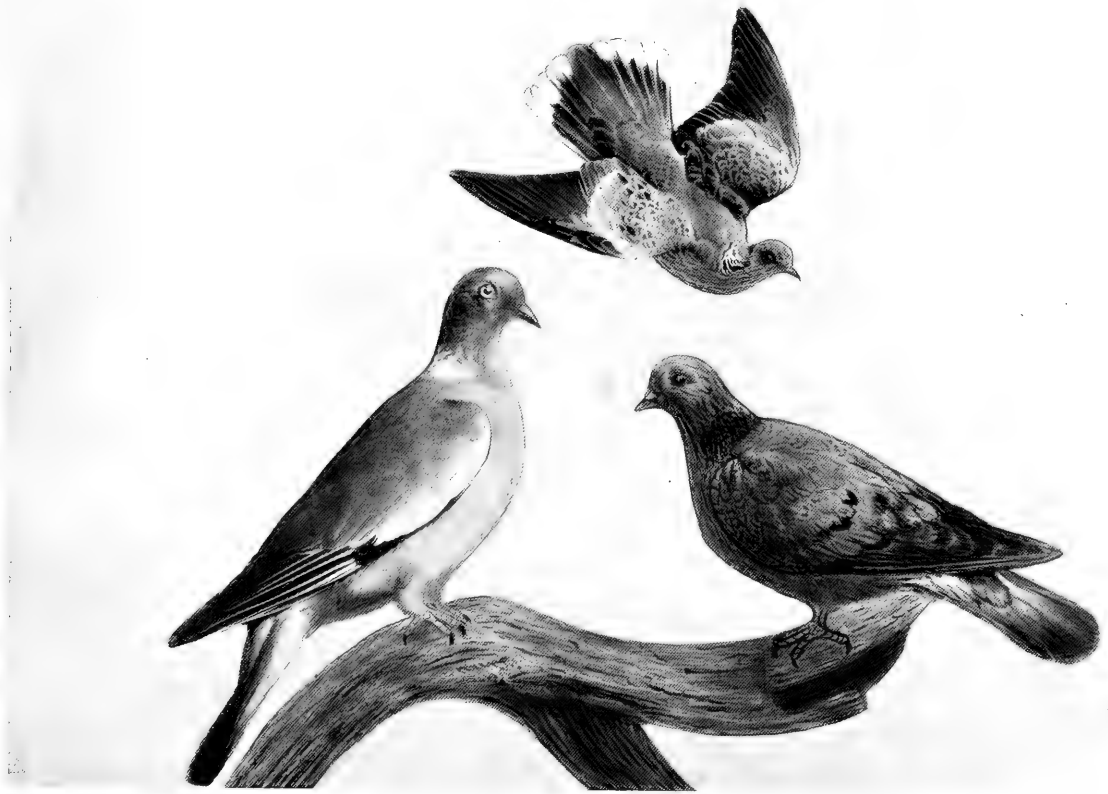
It was not until September, 1899, that I successfully reared a ringdove hybrid. This bird has proved remarkably strong and healthy. He has twice crossed the Atlantic and survived the extremes of heat and cold during exhibition.



YOUNG OF THE RINGDOVE HYBRID
(*C. palumbus* and *C. domesticus*) and (*C. livia*).

The ringdove hybrid, when six months old, paired to a hen Dragoon. The eggs were not fertile until May 22nd, 1902.

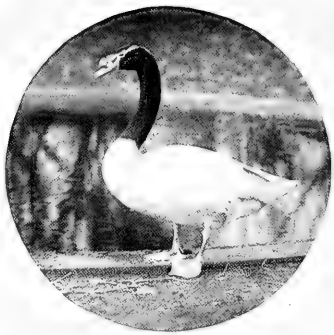
This year I have reared two fine birds from this strange crossing, and a glance at the illustrations will convince anyone of the success of my experiment. The birds are remarkable for the length of the flight feathers and strength of wing.



From a photograph by P. St. M. Podmore, F.Z.S.

SOME BRITISH WILD DOVES.

Ringdove (*Columba palumbus*), Turtle-Dove (*C. turtur*), and Stock-Dove (*C. œnas*).



Photographs by W. P. Dando, F.Z.S.

MOUNTAIN-WITCH. BLACK-NECKED SWAN

ZOO NOTES.

The Mountain-Witch Dove.

THIS curious species (*Geotrygon cristata*) is one of the most beautiful birds found in Jamaica, its native country, so far as coloration is concerned, being of a rich purple-maroon above, with grey cap and breast and cinnamon quills. In grace of form, however, like most of the highly-coloured doves, it is far inferior to our British Turtle-Dove (*Turtur auritus*), or to its caged relative, the Collared Dove (*T. risorius*). It is also rather ridiculous in appearance when on the move, as its tail gives a peculiar jerk with each step, as if connected in some way with the foot. It is rather a large bird for a dove, being about as big as the common pigeon. Although not by any means common in captivity, it may in future be better known, as it has bred in the Zoological Gardens. It would appear to require some animal food, as one of the Zoological Society's specimens was recently seen by the writer of this note to pick up and devour an earthworm about three inches long. The curious name of Mountain-Witch has apparently been given to it in Jamaica on account of its mountain habitat and peculiar note, which is said to recall the groans of a dying man. It is a ground bird, and prefers to run away rather than fly.

Photograph by W. P. Dando, F.Z.S.

COMMON OTTER.

The Black-Necked Swan.

QUITE unique among the Swans is this, the *Cygnus nigricollis* of ornithologists, which inhabits the

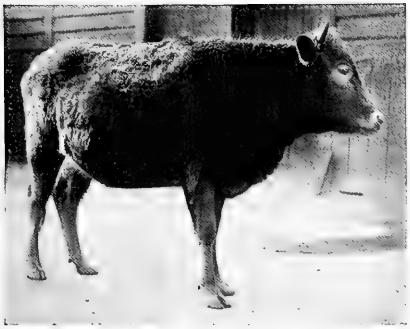


Photo by W. P. Dando, F.Z.S.

COREAN CATTLE.

southern parts of South America. In addition to the striking contrasts in the colour of its plumage, it is remarkable for the red knob on the bill and red skin of the face, the bill itself being blue-grey, and the legs and feet flesh-coloured. In possessing this knob on the bill it agrees with the common Tame or Mute Swan (*C. olor*), and these are the only swans thus ornamented. The Black-Necked Swan is, however, very much smaller than the more familiar species, and far inferior to it in stateliness, for it seems never to raise and display its wings in the graceful manner so characteristic of the other. This swan has long been introduced into Europe and elsewhere as an ornamental bird, but has not become common, although it will breed in captivity. It has often done so in the London Zoological Gardens, although none were hatched from the eggs laid there this year; and in the Melbourne Zoological Gardens in 1883 two cygnets of this species were hatched from one egg. Most remarkable to relate, both of these birds throve, but though at first they were about as big as a brother which had had an egg all to itself as usual, this latter soon forged ahead of them, and was in its seventh month as large as the parents; while of the twins one was much smaller, though showing some colour on the neck, and the other was a funny downy little creature looking about two months old, although apparently quite healthy.

As is usually the case with swans, the young of the black-necked species differ considerably in plumage from the adult, having a brown head and neck, and brown edging to the white body-feathers. In this it recalls the young of the Australian Black Swan (*Chenopsis atratus*), which has its first plumage so strongly mottled with dun tips to the feathers that it is more pale brown than black. The cygnets of the common, black, and black-necked species are all of the same type of colour when first hatched, being of a tint ranging from white to grey, the young of the black-necked being nearly pure white, while the white and black cygnets are not so different in their grey coats as would be expected.

The Otter.

THE Common Otters at the Zoological Gardens have had reason to congratulate themselves on the improvement of their quarters, their sleeping-box having been raised on posts so as not to be so near the water, whilst a sloped hollow log gives them access to it; in this way they have a better chance of keeping their bed dry. It is not without reason that the top of their enclosure is wired over, for the otter yields to no mammal in all-round activity, and besides being a professional swimmer is a fair runner and quite able to climb.

Photo by W. P. Dando, F.Z.S.

AMERICAN BISON.

It is to be hoped that the Indian Small-Clawed Otters, which at present are not very well off for accommodation, will in due course be given more suitable quarters.

Corean Cow.

Many people have looked with interest on the pair of Corean cattle placed on deposit at the Regent's Park Gardens by His Majesty the King early in 1903. The cow represented has since given birth to a calf, which was born just a month before the young bison noticed below, and, like that animal, is of the male sex. These Corean cattle are of the true *Bos taurus* type, like our European breeds, and show no resemblance to *Bos indicus*, the so-called "zebus" prevalent over so large a part of the East. Their colour is uniform chestnut, a hue which is found in both ordinary cattle and zebus. The Corean breed is stated to be reared in its native country for ploughing and other farm work, and for transport purposes; a bull will carry 450 to 600 lbs., while the load for the local pony is only 200 lbs. As the roads in Corea are too bad even for ox-carts as a rule, pack-animals are of the greatest importance, and hence it is, no doubt, that so fine a breed of native cattle has been kept up in that remote peninsula.

CURASSOW.

Photos by W. P. Dando, F.Z.S.

OSTRICH.

American Bison.

The Zoological Society are indebted to their President, his Grace the Duke of Bedford, for all the adult specimens of this now rare animal at present exhibited. These are three in number, a bull and two cows, which were presented on the 31st of May, 1902. On the 26th of the same month in the following year a bull-calf was born, which has thriven, and is now about half-grown. At first it was of a foxy-red colour, and much resembled a common calf in general form, though with a thicker coat; but it has now assumed the characteristic dark-brown pelage of the adult bison, and shows the typical shape to some extent. It is interesting to note, however, that it more resembles the European than the American species at this stage, the head not having yet acquired its disproportionate size, and the predominance of the fore- over the hind-quarter being less marked. These points are well shown in the photograph of the

adult American animal, which is much more developed with regard to bisontine characteristics than is the European species.

The Globose Curassow.

The handsome, somewhat turkey-like birds known as Curassows attract considerable attention at the Zoological Gardens owing to their tameness and striking appearance, although they are not brilliantly coloured. The bird represented (*Crax globicera*) is a female, and is mostly brown in colour, the male being black with a yellow rounded knob on the bill. The curassows are mostly South-American birds, and spend much of their time in trees, their hind-toe, unlike that of most game-birds, being well-developed, and giving them a good grip of the branches. They also build in trees, laying only a few eggs in a nest of sticks. The young perch at once, and move actively about aloft. They have seldom bred in captivity in England, but this may be because suitable accommodation has been wanting. However, even in their native country they are not good breeders, which is a pity, as their flesh is excellent and their tree-haunting habits enable them to procure food, in the form of various berries and fruits, not accessible to ordinary poultry. Specimens which had escaped from the menagerie of the late ex-king of Oude, near Calcutta, have, it is said, been seen wild in the Sunderbunds, and it would be useful to make a serious attempt to introduce these fine game-birds there.

Photo by W. P. Dando, F.Z.S.

SPOTTED CAVY.

Cape Ostrich.

The Ostrich shown is an example of the South African form of the species which lived some years at the Zoo, but is now dead. It is this race which is kept on the ostrich farms, and a very valuable account of its habits in this condition has been published by Mr. Cronwright Schreiner in the "Zoologist" for March, 1897. Having been occupied in ostrich-farming for nine years, Mr. Schreiner had opportunities of correcting many errors about the ostrich which had arisen even in scientific works. He points out, for instance, that it is a mistake to suppose that the bird uses its wings to aid it in running. Although when starting or when not doing its best the bird may run with them raised, when it is really going at its best pace the wings lie hardly above the back.

Paca.

The Spotted Cavy, as the Paca (*Cœlogenys paca*) is sometimes called, is one of the largest of rodents, measuring about two feet in length. In form, as the illustration shows, it is much like the familiar guinea-pig, or common cavy, being tailless and short on the legs. Together with that animal it is excellent eating, and is much hunted for food in South America. Like the agoutis, to which, rather than the cavies, it is related, it readily takes to water under such circumstances. The paca shows a very remarkable anatomical peculiarity in the expansion of its zygomatic arches—the arches of bone spanning the cheek in the skull—into huge bony chambers, the interior of which communicates by a small opening with the mouth. From this curious conformation the paca gets its generic name of *Cœlogenys* (hollow-cheek); but the use of the hollow appears to be at present unknown.

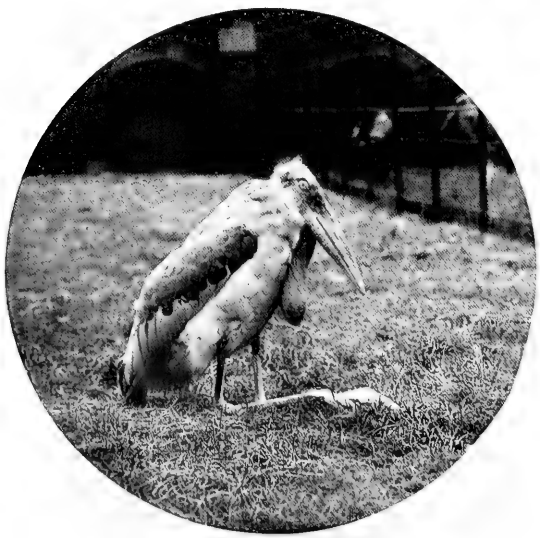
Another remarkable point about the paca is its coloration, of white spots on a dark ground, this being almost unique among rodents, though it crops up here and there

in other groups of mammals, noticeably in some of the carnivorous marsupials and in the fawns of deer.

The Indian Adjutant.

Known to the old writers as the "Gigantic Crane," this remarkable and repulsive-looking stork (*Leptoptilus argala*) has a wide range over southern Asia, and to a great extent resembles the vultures in its scavenging habits; in bygone years it was numerous in Calcutta, but of late only one specimen was to be seen. This at last fell a victim to someone who wantonly shot it. The act deservedly came in for much censure in the Calcutta papers, for the bird was well known and very tame. It was a ridiculous sight to see this great bird flapping solemnly along pursued by a mocking crowd of crows, his long legs extended behind and jerking with every stroke of the great wings. Athough one of the largest flying birds the adjutant can soar powerfully, and may at times be seen high in the air among the vultures,

Photos by W. P. Dando, F.Z.S
INDIAN ADJUTANT.



slowly sailing with his wings spread perfectly level and rigid. He appears to be the last bird to descend to a carcase, but when he arrives even the Indian King-Vulture (*Otogyps calvus*) has to make way for him. The bird in the photographs was for years an inhabitant of the Calcutta Zoological Gardens, whence it was sent to England in response to an urgent application for a specimen for Regent's Park. The sitting position is frequently assumed by these large storks.

The Sabre-Horned Oryx.

If the Heralds' College discover that Brown has a right to the

name of Plantaganet, or if he marry an heiress and desire to adopt her family name, or if finally he be created a peer and assume a territorial title, his friends have to put up with the inconvenience caused by the change, and accept the new name. If, however, Robinson were to discover that he ought to be called Brown, and that Brown must find a new name, say Black, for himself, all their acquaintance would protest against such a change. A precisely analogous "swopping" of names has been proposed in the case of the antelope represented in the photograph on page 218 and an allied Arabian species. Almost from time immemorial the figured species has been known as the White, or Sabre-Horned, Oryx (*Oryx leucoryx*), while the Arabian animal has been called *O. beatrix*. This, however, say the purists in nomenclature, will not do, the former name was originally given to the Arabian animal, to which it must be transferred, and the forgotten title *O. algazel* revived for the North African species. Common sense says that the latter has acquired a right to the name by which it has been so long known; and we are glad that it is thus designated by Captain Stanley Flower (to whom we are indebted for this and the photograph of the Addax) in the Zoological Gardens at Ghiza, near Cairo, now under his charge. The specimens at Ghiza were brought from Dongola, in Kordofan.

Photo by Capt. Stanley Flower.

YOUNG MALE ADDAX
In Ghiza Zoological Gardens.

The prevailing colour of the sabre-horned oryx is white, with parts of the face, the whole neck, and portions of the limbs rufous fawn. The general whiteness of the coat is doubtless to harmonise with the "shimmer" of the strong light reflected from the sands of its desert home. Why the rufous tint occurs in the particular parts of the body mentioned above it is not easy to understand; but it is practically certain that these dark areas are remnants of the ancestral colour of the species, which was probably not far removed from that of the more typical members of the group, such as the beisa and the gemsbuck, which inhabit less completely desert tracts. The whiteness of the sabre-horned oryx, as well as of the beatrix oryx of Arabia, is therefore evidently a special adaptation to a desert life. From the other members of its kind the present species, as indicated by its popular name, differs by the graceful sweep of its horns, which (as in the other members of this group) are present in both sexes. Those of the male are known to attain a length of 42 inches, although from 36 to 39 inches is a more general measurement for fine specimens. There is some doubt whether the species ranges into Syria and Palestine.

The Addax Antelope.

EVERY rule, it is said, is proved by exceptions, and the Addax Antelope of north Africa, and, apparently,

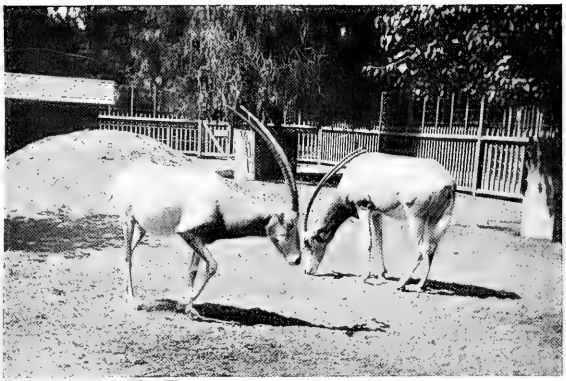


Photo by Capt. Stanley Flower.

WHITE, OR SABRE-HORNED, ORYX
In Ghiza Zoological Gardens.

Arabia, which is a near relative of the oryx group, differs from the great majority of tropical and sub-tropical mammals in exhibiting a marked seasonal change of colour, as is well shown by two photographs recently published by Mr. G. Renshaw in "The Zoologist." According to these photographs the summer coat is much lighter than the winter dress, although the dark patch on the forehead is retained at all seasons. This photograph of the Ghiza specimen was taken in the early part of October, when the animal, judging from the analogy of more northern species, should have assumed its winter dress; nevertheless it appears to be in the yellowish white summer livery. Perhaps, therefore, the seasonal change of colour becomes more marked in menagerie specimens, from which Mr. Renshaw's photographs were taken. Be this as it may, the retention of such a colour-change in this particular species is not very difficult to account for. In the first place, Canon Tristram definitely asserts that the addax is found in Arabia, although there do not appear to be any specimens in this country to support this statement. Whether, however, it occurs north of the tropic in that country, it certainly does so in southern Tunisia. Here it comes close to, if not within, the range of the fallow-deer, which is, of course, one of the species which undergo a marked colour-change. But this is not all, for remains assigned to a species of addax have recently been described from China, which appears to indicate that these animals are immigrants from the north into their present habitat, and consequently that they have not yet been able to get entirely rid of their seasonal colour-change. Confirmation of this is afforded by the length of the hair in the addax, which is unusually long for a tropical animal. It may be added that the darker colour of the head and neck, as compared with the body, is analogous to the colouring of the sabre-horned oryx.

On the other hand the broad, spreading hoofs of the addax, so admirably adapted for walking on loose sand, may be taken as an indication that the addax and its ancestors have long been desert-haunting animals.

The spiral twist of the horns of the addax at once serves to distinguish the animal from all the species of oryx. The longest pair of horns known measure a little over 39 inches along the curve; but all specimens between 35 and 38 inches may be considered good. The creature derives its scientific name of *Addax nasomaculatus* from the presence of a white chevron across the upper part of the nose, which terminates on each side in the white tuft of the tear-gland. According to Canon Tristram the name addax is derived from the word *adas*, or *akas*, used by the Arabs for this or some other antelope.

THE SEVENTEEN-YEAR CICADA.

By P. St. Michael Podmore, M.A., F.Z.S., etc.

THE Seventeen-Year Cicada is only to be found in the United States of America. It is remarkable as the longest-lived and most wonderfully distributed cicada to be found anywhere on the globe. It lives beneath the earth about seventeen years, nourishing itself upon the juices of the roots of forest and fruit trees until, being nearly ready to cast off its pupal skin to become winged, it bores a hole to the surface of the soil and comes forth. At this period of its existence it is a clumsy-looking horn-coloured object about an inch long, provided with curious claws like a crab. Should the weather be persistently rainy when these creatures begin to leave the surface, they construct tubular towers of clay above their holes, into which they retire until drier weather returns. Several weeks before the time for issuing forth they may be found beneath stones, rails, and other objects lying upon the ground, of which they have taken advantage for protection until the time for leaving their shell has arrived. When ready for the change they crawl to the side of a tree-trunk and grasp it tightly with their claws; the shell then splits along the back and the cicada draws itself out and remains suspended until the superfluous moisture has dried. Before the insect flies off it ascends by easy stages to a considerable height, as illustrated by the photograph.

SIX PHASES IN THE LIFE OF THE SEVENTEEN-YEAR CICADA.

A. The Cicada as it first appears after living seventeen years under the earth.
B. The empty shell of the Cicada.
C. Two hours after freedom from the shell.
D. Four hours after freedom.
E. Six hours after freedom.
F. Twelve hours after freedom.

From a Photograph by P. St. Michael Podmore, F.Z.S.

During the spring of 1902 I was the guest of Senator Coffin at Muirkirk, Maryland, U.S.A. Here the cicada appeared in millions, and during our rambles over his park, and with his kindly help, I was able to note the development of these insects from the first shaking of the surface earth until they had attained their full maturity and beauty.

The Cicada Septemdecim is a medium-sized black insect with large bright-red eyes, banded with red on the abdomen and with red and orange veins to the base and costal margin of both pairs of wings. The legs are short and stout, not fitted for leaping, and the fore-thighs quite thick. The most distinctive peculiarity, which has no parallel, appears in the organs of sound. These consist of two large parchment sacs, ribbed and gathered into numerous plaits, furnished with powerful muscles and situated in large cavities at the base of the abdomen. When in action the air is driven with great force against the ribbed surface, and vibrations are set up which produce the sound. These cicadas appear to delight in a chorus, the notes resembling *fa-rrho*. The male alone possesses the organs of sound perfectly developed. Sounds may be produced even after death by pulling the fibres of the musical apparatus on the side of the abdomen.

The noise of these wonderful insects is extraordinary, being so loud that it can be heard a mile away. We found it difficult to make ourselves heard under the forest trees unless we used a loud voice. The female deposits her eggs by ingeniously severing the thin bark of tender twigs and placing the eggs, as though in hiding, between the slit wood. In due course these ruined twigs decay and fall to the ground. The grub is shortly afterwards hatched, and immediately commences to burrow into the earth. For seventeen years it continues to dwell beneath the ground. These insects made their first recorded appearance in Maryland during the spring of 1749. Since that time they have reappeared every seventeen years.

The Seventeen-Year Cicadas do not attack the foliage or corn, but they seem to act as Nature's pruners. I could not help commenting upon the condition of the trees during my rides from Beltsville to Muirkirk. The season was early June, but the trees bordering the road had the appearance of late November. The central boughs were covered with the rich green of spring, but in every case the extending branches were withered and dead. The leaves of these boughs were dry and lifeless, causing a rustling autumn sound incongruous with the season of the year.

Most animals (and especially dogs) take great delight in eating the cicada, and many experiments have been made to encourage people to utilise this insect as an article of food. One gentleman introduced "cicada soup" as a novel dinner course, and several others described in the press the various tasty uses to which these creatures could be devoted. Few, however, were brave enough to follow these enthusiasts. The insect is doubtless wholesome and nutritious. Dogs, pigs, and poultry became so fat on Senator Coffin's estate during the abundant supply of cicada that it was found to be necessary to shut them off from the woods. They became even fastidious over their ordinary food, and frequently left it untouched. The palpable enjoyment of these feasters upon the tasty insect was very amusing, though hardly appetising if viewed before breakfast. The cicada, in its immature state, congregates in thick clusters. These clusters are frequently added to by the heavy flight of the millions that pass from tree to tree. I have seen a large knob of these clustered cicadas fall with a thud to the ground, and even the anxious watchers beneath have been obliged to pause amidst the surfeit of the abundance.

The first time I examined a living cicada I could not restrain a feeling of nausea and revulsion. It is doubtless the disgusting look of these insects that deters so many from testing their edible qualities. Their eyes, which are very prominent, are a bright fiery red, and give the insect an uncanny appearance both during the day and night.

ANIMAL DENTITION.*

By R. Lydekker.

II. REPTILES.

BIRDS, as we know them at the present day, are totally devoid of teeth, and do not therefore come within the purview of the present series of articles. Nevertheless, during periods relatively remote in the earth's history, when the Chalk of the Chiltern Hills and the still earlier Oolites of the Cotswolds were being deposited as mud or slime on the ocean bed, there flourished birds with a full armature of sharp and conical teeth in their beak-like jaws. These toothed birds of the Chalk period were in other respects similar in general structure to their modern representatives, but some at least of the Oolitic species retained the long lizard-like tails, carrying a pair of feathers at each joint, of their presumably reptilian ancestors. So far as can be determined, the teeth of these early birds were very similar to those of certain extinct reptiles, such as the flying pterodactyles, being implanted in distinct sockets, and probably replaced irregularly, after the manner of those of modern crocodiles.

Certain reptiles, such as the modern turtles and tortoises, together with some of the pterodactyles and a few other types long since extinct, have followed the same fashion as birds in discarding teeth in favour of horn-clad beaks. If, moreover, according to popular usage, frogs, toads, salamanders, newts, and the like (which, on account of their fish-like structure in the earlier stages of their existence, are classed by naturalists as a group apart) are regarded as reptiles, there will be certain kinds, such as most toads and some tree-frogs, that have neither teeth nor horny beaks. One true reptile comes indeed very near to this condition, so far at least as its mouth is concerned, in which there are only a very few almost, if not entirely, functionless teeth of small size. This is the curious egg-eating snake (*Dasypeltis scaber*) of South Africa, which, as its name implies, lives by swallowing the eggs of birds, when these are obtainable. For a small-mouthed animal to crush a large egg in its mouth would result in the loss of much of the succulent contents of the former. Accordingly, the snake is furnished with a crushing-apparatus in its throat. This apparatus is formed by bony spines from the underside of the neck-vertebræ projecting into the throat, where they are capped with enamel, and thus resemble teeth in appearance, as they do in function. If, however, we regard teeth as structures originally independent of the skeleton, it is evident that the so-called teeth of this remarkable snake do not properly come under that category.

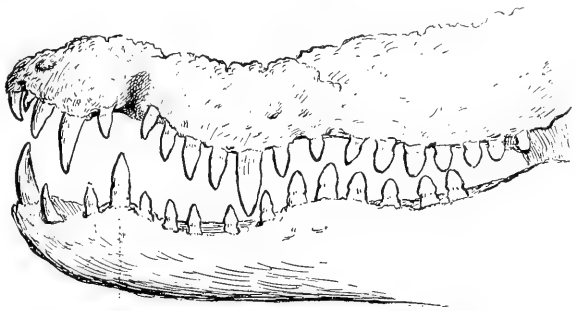


Fig. 1. The Open Jaws of a Crocodile, showing the Enlarged Fourth Lower Tooth (A)

Apart from the above-mentioned exceptions, all

* The first of these articles appeared on page 109 of this Volume.

modern true reptiles are furnished with teeth which, although structurally very similar to those of mammals, yet display important differences in other respects. One notable feature in which the dentition of reptiles as a whole differs from that of mammals is that the teeth, in place of being strictly confined to the margins of the two jaws, may be present on some of the bones of the palate, as in snakes and the monitor lizards. Then again, the teeth of modern reptiles, which are generally very numerous, differ from those of mammals in their mode of replacement and succession. In mammals, as we have seen in the preceding article of this series, there are never more than two sets of teeth developed, the number of each of which is, as a rule, definite and invariable. In existing reptiles, on the other hand, there is nothing of this definiteness and limitation, the new teeth replacing the old ones from beneath in an irregular manner throughout life, as is shown in the accompanying sketch of part of the jaw of a crocodile. Frequently, indeed, the imperfectly developed hollow crowns of quite a number of teeth, stacked like thimbles and destined to replace one another vertically, may be detected within the hollow of the jaw of a crocodile.

Fig. 2. Part of the Jaw of a Crocodile, to show Irregular Replacement of the Teeth.

Among existing reptiles, the teeth of crocodiles are peculiar on account of the circumstance that they are set in separate sockets. In lizards, on the other hand, the teeth (except, of course, those on the palate) are generally soldered either to the summits of the jaws or to the inner side of the raised outer wall of the same, although they are sometimes in an open groove. Much the same conditions obtain with regard to the marginal teeth of serpents.

Fig. 3. Jaws of a Crocodile.

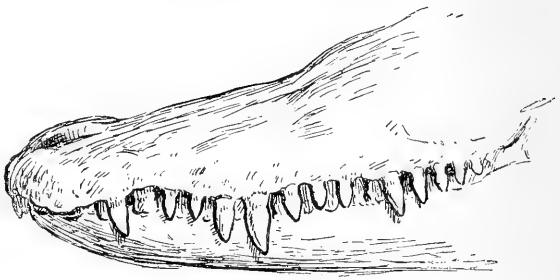


Fig. 4. Jaws of an Alligator.

Although in crocodiles some are larger than others, there is generally no division of the teeth in modern reptiles into groups corresponding to the incisors, tusks, and molars of mammals; neither do any of the lateral teeth ever develop two or more distinct roots. On the contrary, if we except the specially modified poison-fangs of the venomous serpents, most or all of the teeth of the great majority of reptiles of the present day are of the same general type and take the form of simple one-rooted cones, although their summits may be more or less compressed or depressed, while in some cases, as in the iguanas, the summits and fore-and-aft ridges may be serrated.

Compared with those of mammals, the teeth of modern reptiles are evidently of a much less advanced type, those of crocodiles being comparable, so far as form and

setting go, only with the dentition of dolphins, which, as we have already shown, is of a degenerate and retrograde type. In consequence, indeed, of the simple structure and general similarity in form of the individual teeth, the dentition of existing reptiles forms a far less interesting subject of study than that of mammals, and it will therefore be treated much more briefly on the present occasion. On the other hand, the dentition of many of the numerous extinct groups of reptiles displays greater variation, and therefore affords a more suitable subject for a popular article.

Fig. 5. Dentition of Monitor.

The teeth of crocodiles and alligators, in addition to their large size, conical form, and implantation in distinct sockets, are characterised by being confined to the margins of the jaws, and also by the circumstance that a certain number are much superior in size to the rest, these enlarged teeth occupying the highest points of the festoons into which the margins of the jaws are thrown. One of these enlarged teeth of the lower jaw—the fourth from the front—affords one of the easiest ways of distinguishing between crocodiles on the one hand and alligators and their near relatives the caimans of South America on the other. In a crocodile (Fig. 3) this large fourth lower tooth bites into a notch on the side of the upper jaw, and is thus visible externally when the mouth is closed; whereas in an alligator or a caiman the same tooth (Fig. 4) is received into a pit in the upper jaw, and is consequently concealed when the mouth is shut. Sometimes, indeed, the fourth lower tooth actually pierces the upper jaw of very old alligators. A further distinction between the dentition of the two groups is to be found in the circumstance that, in crocodiles, the teeth of the two jaws interlock, instead of the upper ones biting outside the lower ones; while the number of teeth, especially in the lower jaw, is much greater in crocodiles than in alligators and caimans, which have invariably only fifteen lower pairs. Of course, I expect to be told that I am wrong in this, and that Indian "alligators" do not conform to this definition. But then, in the scientific acceptation of the term, there are no alligators in India, the reptiles commonly thus miscalled being true crocodiles. As a matter of fact, alligators are represented only by one or two species in North America and a third in China, while caimans are confined to Central and South America; all the other existing members of the group being crocodiles or gharials.

As the teeth of the majority of lizards are of comparatively small size, they are not well adapted for illustration, and my remarks concerning them will consequently be brief. The largest of all lizards are the monitors of the Old World and Australia, and in these the teeth (Fig. 5) are simple laterally compressed and recurved cones, with broad, expanded bases fixed to the sides of the jaws, to which they may become welded. They are comparatively few in number, are limited to the margins of the jaws, and in their mode of succession much resemble those of crocodiles and alligators. Teeth of this type indicate, it need hardly be said, carnivorous habits on the part of their owners.

Fig. 6. Jaws of Giant Skink.

From their blunted summits it might seem probable that the teeth of the large Australian and Papuan broad-toothed skinks of the genus *Tiliqua* (Fig. 6) were adapted for a vegetable diet. This, however, does not appear to be really the case, since the smaller lizards of the same group are insectivorous, and it is therefore probable that the blunt teeth of the Australasian forms are used for crushing the hard coverings of

insects. These teeth, it may be added, are welded to the inner side of the raised outer parapet of the jaws, smaller teeth being present on some of the bones of the palate.

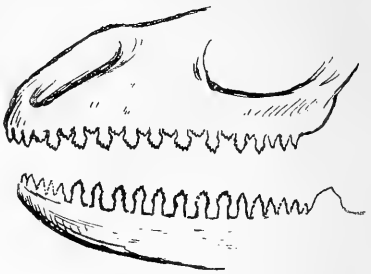


Fig. 7. Dentition of Iguana.

Herbivorous lizards are almost unknown save in the tropical portions of the New World, where they are represented by the numerous tribe of Iguanas, many of which attain bodily dimensions exceeded only by the monitors of the Eastern Hemisphere. In the more typical representatives of these lizards (Fig. 7) the front teeth are simple cones, but those on the sides of the jaws have laterally-compressed crowns and saw-like edges, those of the upper and lower jaws working against one another in a manner admirably calculated to masticate food. In the two remarkable iguanas inhabiting the Galapagos Islands, one of which is largely marine, while the other is exclusively terrestrial, all the teeth are laterally flattened, with their crowns surmounted by three small cusps. Very noteworthy is the dentition of the two beautifully-coloured species of poisonous lizards (*Heloderma*) from Central America, Mexico, and Arizona, one of which is commonly known as the Gila Monster. These lizards eject poison into the wounds made by their teeth in the same manner as venomous serpents, and their dentition corresponds very closely with that of the latter. The curved and fang-like teeth, which are very loosely attached to the jaws, are provided with grooves for the transmission of the venom, which, as in serpents, is a specially modified form of saliva, and there are also smaller teeth on the palate. As these poisonous lizards are certainly not the ancestors of snakes, it is quite evident that their poison-apparatus and specially modified teeth have been developed quite independently of those of the venomous serpents.

Fig. 8. Side view of Upper Dentition of a Poisonous Serpent.

The chief interest connected with the dentition of snakes is concentrated on that of the highly venomous species. It should, however, be mentioned at the outset that there is no sharp line of demarcation between harmless and poisonous forms, which are connected by almost imperceptible gradations. Ordinary harmless snakes have two rows of short and sharp teeth in the upper jaw (of which the inner series is attached to the bones of the palate), and a single row in the lower jaw. In certain species, all of which appear to be more or less noxious, one or more of the inner row of upper teeth, either in the front or back of the series, is enlarged and furnished with a groove or a central tube. In the more thoroughly venomous species, on the other hand (Fig. 8), the front of the upper jaw is armed with a pair of long tubular teeth, which, when at rest, lie nearly flat on the palate, but when in action are raised, by a special mechanical arrangement of the bones and muscles of the skull, into a nearly erect position. The secretions of the large poison-glands are forced through the open bases of the venom-teeth by muscular action when the snake opens its mouth to bite, and escape into the wound from the extremities of the tubes. The emission is so forcible that the venom may often be seen to spurt out from the fangs. Such delicate weapons are naturally very liable to injury; and in order that the snake may not be deprived of their

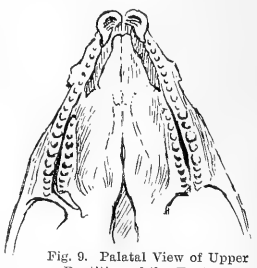


Fig. 9. Palatal View of Upper Dentition of the Tuatera.

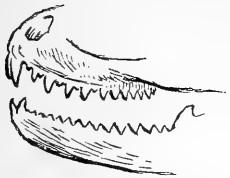


Fig. 10 Side View of Dentition of Tuatera.

use longer than possible, a number of successional teeth in various stages of development grow up behind each fang, and remain lying flat on the palate till their turn comes for functional employment. Such is the highest development of the poison-apparatus among venomous serpents, but there are many kinds in which this culminating stage has not been attained. In these the venom-teeth are not greatly larger than the rest, are grooved instead of tubular, and remain permanently erect instead of lying flat on the palate when not in use.

A dental development quite unlike that of any other living reptile occurs in the tuatera, a creature inhabiting two small islands off New Zealand and commonly regarded as a lizard, although its organisation is widely different from that of the reptiles properly so called. The dentition of the tuatera (Figs. 9 and 10) comprises a pair of chisel-like teeth in the front of each jaw, a double row of closely-packed small teeth, separated by a deep groove, on the sides of the upper jaw, and a single row of similar teeth on the summit of the sides of the lower jaw. When in use, the lateral series of lower teeth bite into the groove between the two corresponding rows of upper teeth, and in old individuals, when the teeth become much worn away, the edge of the lower jaw itself becomes highly polished and acts as a cutting-instrument. What may be the precise use of this unique type of dentition does not appear to have been hitherto explained. In captivity, tuateras are reported to devour meal-worms and other insects with avidity, but it is considered probable that in a state of nature vegetable substances form a considerable proportion of their diet.

The tuatera is, however, not only interesting on account of its remarkable dentition and other structural peculiarities, but likewise from the circumstance that it is the solitary survivor of a once numerous and widely-spread group of reptiles, some of the members of which display an ultra development of the same dental type. The best known of these is the pavement-toothed tuatera (*Hyperodapedon*), which attained a length of from five to six feet, and has left its remains in the older Secondary (Triassic) rocks of this country and India. In place of the double row of lateral upper teeth of the living tuatera, the pavement-toothed species (Fig. 11) has a number of such rows, so that nearly the whole palate is covered with a mosaic of blunt pyramidal teeth, between the outer and second rows of which worked the single row of lateral lower teeth and the sharp upper edge of the jaw itself. It is, of course, quite impossible to determine the

Fig. 11. Under Surface of Palate and Lower Jaw of Pavement-Toothed Tuatera.

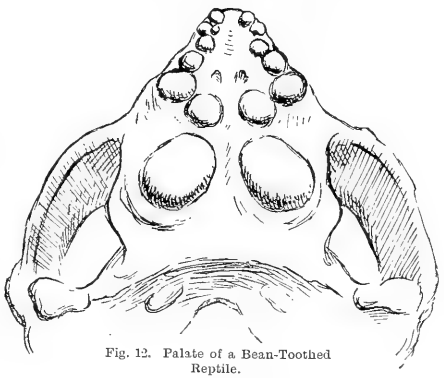


Fig. 12. Palate of a Bean-Toothed Reptile.

nature of the food this powerful dental armature was intended to crush, and it is therefore idle to conjecture whether the creature was carnivorous or herbivorous, although, from the fact of its having been terrestrial, or partially aquatic, it is perhaps more probable that it was a vegetarian.

Fig. 13. Side View of Dentition of a Carnivorous Mammal-like Reptile.

The type of dentition presented by the tuateras naturally leads on to that shown by another group of approximately contemporaneous creatures, which may be called bean-toothed reptiles, although it by no means follows that the two groups are in any way nearly related, despite the fact that they are both characterised by the short, broad, and triangular skull. The bean-toothed reptiles take their name from the presence of a small number of large flattened teeth covering nearly the whole of the palate, but replaced in the fore part of the jaws by teeth of a more ordinary type. In one kind (*Placodus*) the palatal teeth are squared; but in a second (*Cyamodus*), as shown in Fig. 12, they are more rounded, and present a striking resemblance to those large flat, brown Australian beans so frequently used as pocket match-boxes. There can be little doubt that teeth of this type were used for crushing either the shells of molluscs or the hard external coats of crabs and such-like creatures.

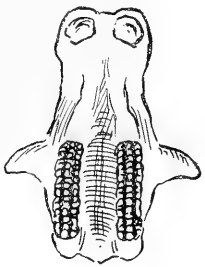


Fig. 14. Palatal View of Upper Dentition of *Tritylodon*.

The bean-toothed reptiles are near relatives of certain other extinct groups which claim special attention on account of the curious resemblance presented by their dentition (as well as parts of the skeleton) to that of mammals. In this case the resemblance is not an instance of parallelism in development, but appears to indicate an intimate family relationship between the two groups, the mammal-like reptiles, as they are called, having almost certainly been the actual ancestors of mammals. In the species of which the dentition is figured (Fig. 13), it will be observed that the teeth are few in number, and differentiated into incisors, tusks, and molars after the mammalian fashion, with the upper tusk biting behind the lower one. The hinder molars, or cheek-teeth, have, moreover, their crowns of a more complex type than those of the front teeth, and it is far from improbable that in some instances these teeth may have been inserted by two or more roots. Whether any of these carnivorous mammal-like reptiles had a single definite replacement of baby teeth by those of the adult series is not yet definitely ascertained, although it is quite possible that this may have been the case.

Fig. 15. Dentition of *Dicynodon*.

Fig. 16. Enlarged Segment of a Transverse Section of a Tooth of a Labyrinthodont.

Such a single replacement must, however, almost certainly have occurred in a very remarkable herbivorous member of the same group scientifically known as *Tritylodon*. In this reptile the molars (Fig. 14) have broad longitudinally-ridged crowns, and are inserted by double or treble roots, and the front of the upper jaw carries a pair of large tusks, but whether there were small incisors between them is not known. So mammal-like, indeed, is the whole dentition that the creature was for a long time regarded as a mammal, and it was only when certain characteristically reptilian bones were ascertained to be present in the skull that it was relegated to a lower grade in the animal kingdom. In reality it probably forms a connecting link between mammals and reptiles, with a certain claim to be included in both classes.

Quite unique in the class are the curious single-tusked extinct reptiles known as dicynodons, which were near allies of the carnivorous mammal-like forms. In these, as shown in Fig. 15, the upper jaws were furnished with a single pair of enormous downwardly-directed tusks, but with this exception both jaws were destitute of teeth and probably encased in horn, from which we may infer that these reptiles were probably herbivorous. In the same (Triassic) strata occur remains of other reptiles similar in all respects to the dicynodons, but without upper tusks. They have been regarded as indicating a distinct genus, but it is far from improbable that they are female dicynodons. If so, the tusks may have been offensive weapons used in combat between rival males. Some of the dicynodons were huge creatures, with skulls as large as those of crocodiles, although shorter and higher.

Many other remarkable types of dentition are presented by the mammal-like reptiles and their kindred, but if I were to allude to these this article would be spun out to an inordinate length. From the lower types of these reptiles there are some indications of a transition towards the still earlier and more primitive creatures known as Labyrinthodonts, or primeval salamanders, some of which had a skull nearly a yard in length. The most striking peculiarity in the dentition of the typical members of this group is to be found in the complicated internal structure of their teeth, from which they derive their technical title. As shown in Fig. 16, a section of a tooth displays a number of irregular canals radiating in a "dendritic" manner from a central pulp-cavity. A very similar type of tooth-structure occurs in certain extinct fishes, but the object of such a complicated arrangement is quite unknown.

This very sketchy account of reptilian dentition must be brought to a close by a brief reference to the teeth of the largest of all known reptiles, the extinct dinosaurs, some of which walked on all fours and attained a length of fully sixty feet, while others stalked about on their hind legs like gigantic kangaroos, towering some twenty feet above the ground. Some, by no means the largest of these creatures, such as the megalosaur, were evidently carnivorous, as is proved by their powerful dental armature of compressed and recurved teeth with sharp and serrated edges (Fig. 17). Others again, as typified by the well-known iguanodon of the Weald of Kent and Sussex, were as clearly herbivorous, the crowns of the

Fig. 17. Teeth of the Megalosaur.

curiously-formed teeth (Fig. 18) being often worn down almost to the roots. The iguanodon was one of the bipedal forms, and its huge three-toed footprints are occasionally met with in the Wealden sandstones at Hastings. Whether another type of dinosaur tooth (Fig. 19), which has been found in the corresponding strata of the Isle of Wight and elsewhere, also indicates herbivorous habits is not quite so certain. These teeth, whose owner has been named the hoplosaur, are of a curious spatula-like shape quite unparalleled by any existing type. Certainly they do not belong to a flesh-eating animal, but their owners may either have subsisted on invertebrate animals, or, more probably, on the rank and lush vegetation of lakes, that did not require the mastication necessary for the palm and cycad leaves which not improbably formed the diet of the iguanodon. The latter creature, it may be mentioned, takes its name from a fancied resemblance between its huge teeth and those of the (comparatively) diminutive iguana of the present day.

The hoplosaur and its allies were remarkable for their relatively small heads and long necks, and it has been suggested that they spent much of their time with their bodies submerged in the water of lakes or rivers while they cropped the herbage from the banks.

The great marine swimming reptiles of the chalk, oolites, and lias—the ichthyosaurs and plesiosaurs—had their long and powerful jaws armed with a formidable series of sharply-pointed teeth, which were generally conical and fluted, although smooth and compressed with cutting-edges in one of the largest ichthyosaurs, and triangular in those short-necked plesiosaurs known as pliosaurs. In the ichthyosaurs the teeth were set in a groove, but in the plesiosaurs each had a separate socket. These creatures were evidently carnivorous, and preyed largely on the hard-scaled fishes of their time. They were, in fact, the sperm-whales and killer-whales of early epochs of the earth's history, when, both on land and sea, reptiles played the part now performed by mammals.

Fig. 18. Tooth of the Iguanodon.

Fig. 19. Tooth of the Hoplosaur.

Although brief reference has been made to the extinct labyrinthodonts, which belong to the same great group, I have not thought it worth while to discuss the teeth of modern frogs and salamanders, since they display few features of general interest.

NOTE.

We have been requested to give a complete list of the articles which have appeared in the series entitled "Uncommon Pets," and as the one in this number completes the first twelve, we take this opportunity of giving the issue of Animal Life in which each will be found:—

Article		Vol.	No.	Page
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,, II.	The Raccoon	I.	VII.	238
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UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough, f.z.s., f.e.s., etc.

XII. THE LYNX.

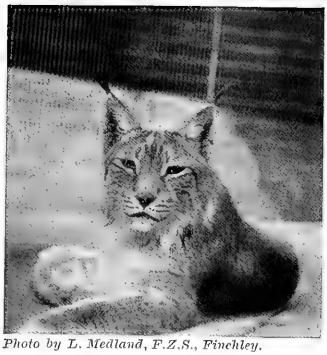


Photo by L. Medland, F.Z.S., Finchley.

ISABELLINE LYNX.

SEVERAL species of the smaller cats make remarkably handsome pets, and many of them can be so tamed as to allow of their having partial liberty, as for example the Eyra, the Ocelot and the Pampas Cat. Most of these exotic species are possessed of beautifully tinted fur, and would create quite a sensation if exhibited at the Cat Shows. There is no reason why they should not be if entered in the Foreign or Special Classes.

So closely allied to these animals are the Lynxes that, before dealing individually with some of the smaller foreign cats, I will confine myself in this article to more general remarks on the care of wild cats in general, and the lynxes in particular. Of these the most interesting species is the Caracal (*F. caracal*). It is a slender animal of a rufous-fawn colour. When caught young it is easily tamed, and forms a nice pet, but if caught later it is rather treacherous, and spits and snarls at the approach of any person. It is more restless than the other species of cats, and whether tame or wild in disposition is constantly pacing up and down its cage. It is somewhat strange that this animal, unlike most cats, does not appear to be more lively towards evening, and on several occasions various examples have been noticed to be asleep at night during the time that other foreign cats were awake and remarkably lively. Beef as food should be strictly avoided, and live fowls, pigeons, and rabbits seem a *sine quâ non* with the caracal. Irregular or overfeeding are conducive to diarrhœa and dysentery, so that it is necessary to watch closely the dietary. Caracals suffer occasionally from tumours, from which, according to the writer's experience, they rarely recover. A specimen in his possession had a large one form over the left eye, which was partly alleviated by frequent lancing, but owing to the increasing frequency with which the pus re-formed the animal was chloroformed, and drowned whilst unconscious.

True lynxes are rather troublesome to keep in good health and condition. One most important thing is never to let these animals remain in the direct rays of sunshine; another, regularly and carefully to bath them with soap and water every morning, and afterwards thoroughly dry with a towel. If this daily bath be omitted the lynx will never be in good condition. Although it soon gets accustomed to the bath it greatly dislikes being sprinkled with cold water.

A lynx can hardly be recommended as a pet if it is to be a resident in a suburb where one's neighbours are fussy, as it is not by any means a quiet animal at night-time. There is very little trouble with regard to its feeding, as the staple diet will be a pound and a half of boiled beef every morning and evening, and one pint of milk in

the morning only. Drinking-water must always be handy, but must not be kept inside the cage, as it would get spilt and thus render the cage uncomfortable. A shallow earthen pan, filled with dry earth, should be kept in one corner of the animal's cage, and it will generally be found that the lynx will make use of it. Young lynxes are very easily tamed, so that they may be permitted to run about without any fear of losing them, and may be handled just like a dog. When allowed their freedom in this manner they are most inquisitive animals, and the frequency and persistency with which they sniff any strange person or object frequently becomes embarrassingly troublesome. Domestic cats, however, cannot be allowed loose in a house wherein a young lynx, or for the matter of that any other foreign wild cat, is kept. Some lynxes, especially the tamer ones, are very liable to die of excessive obesity. Caracals have been bred in captivity, but only very rarely.

The cages for the foreign small cats must be large, with the fronts most securely fastened in, as all cats, and most especially wild cats, have a habit of suddenly springing forward, whenever annoyed, on to the wire fronts of the cages, with the result that, if the front be not firmly put in and properly fixed, it comes bodily away, thus releasing the animal at an inopportune moment of savage annoyance into the room wherein its cage may be situated. The best front for a cage for the foreign wild cats is one made of $\frac{3}{8}$-in. rod or bar iron, with cross-bars every foot or eighteen inches. If galvanised wire netting be used, it must be the very strongest obtainable used double, and placed so that the meshes do not coincide. When placing the second layer of netting over the first, care must be taken to put it on in a regular and even manner in order to make the meshes of an even size, otherwise the appearance of the front will be slovenly and displeasing to the eye. A retiring-compartment must be placed in one corner of the cage for the cat to shield itself from observation. This should be filled with the best sweet hay and provided with a door capable of being opened and closed from the outside of the large cage. This will be found a great convenience whenever it is found necessary to clean out the cage, as the animal can be driven into the sleeping box or compartment, the door closed, and the scrubbing-out of the cage or such other necessary cleaning operation commenced. Cats—wild ones, that is—unless kept in scrupulously clean cages, are very odoriferous animals; if, however, their cages are well scrubbed out with boiling water and disinfectant soap, the strong and to some people offensive smell is kept under. All the cats are extremely impatient of dampness, and they must not be let out of their sleeeping-box until the floor of the main compartment has become thoroughly dry. The floor should be plentifully strewn with sawdust, this acting in the two-fold nature of absorbent and deodorant.

All "wild" cats must be kept in cages, although some may be allowed partial freedom temporarily. The practice of allowing these pets to play about the house at will is dangerous, as, whilst readily agreeing that many of them can be tamed to an astonishing degree, there are moments when their natural ferocity becomes uncontrolled, with disastrous results to any living creature, either in the way of domestic live stock or even the owner, which might cross their path at these inopportune moments. These cats, when put out, generally attack the head and face, so that every person who goes in for foreign cat-keeping must exercise every care and precaution against any accidents similar to that hinted at; even an ocelot,—which is one of the quietest—if not kept in strict subjection, would clear out a poultry-yard and kill the house dogs in about five minutes if it got its unobserved liberty during that time.

TRACES OF ANIMAL HABITS.

By Walter Kidd, m.d. f.z.s.

PART II.

IN the first part of this article the traces referred to were in every instance areas of hair in which the normal direction was reversed or much diverted. In the cases of the Sloth, Anteater, Baboon and Man, which were considered, the traces left indicate the attitudes in which these four species chiefly sit or lie. Many other animals and other parts of the body might be alluded to, such as the bilateral reversed area of hair on the chest of a smooth-coated domestic dog (also found in most carnivores), or that on the ventral surface of the abdomen in the inguinal region, or the curious small reversed patch over the tuberosities of the ischium, the two former being produced by the favourite attitude of lying, and the last by the attitude of sitting in which the dog so frequently indulges. But enough has been brought forward by way of illustration of this subject, which has been more fully dealt with elsewhere.

We have now to consider a different class of change in the direction of an animal's hair connected with muscular activity—with the active rather than the passive habits of animals. These changes take the form: First, of a simple whorl or radiating arrangement of hair; second, of a whorl from which a feather-shaped expansion proceeds *against* the direction of the adjoining streams of hair and loses itself in them; third, a whorl and feathering terminated abruptly by a transverse ridge or crest standing up like a barrier against the further progress of the feathering. These three varieties of hair-slope may be seen extremely well on most domestic horses. Whorls, featherings and crests may be spoken of as one phenomenon, for every simple whorl is in process of change into a whorl with a feathering, and this into a whorl, feathering and crest. They are obviously related very closely with the muscular development in general, and the locomotive activity in particular, of the animals presenting them. As their survival-value is *nil* they do not come under the influence of Natural Selection. They do not even constitute a hinterland of the great empire of selection, but live under laws of their own. It may be well to add also that they have no connection with artificial selection, for they occur with great frequency in wild as well as domesticated animals. These varied and rather graceful features found adorning the hairy garments of so many animals look at first sight like the *gores*, *gussets*, and similar mysteries of female tailoring designed to make the garments fit the wearer's body more neatly. But this simple sartorial view will not meet the case. The only view of them which seems tenable is that they bear definite relation to the

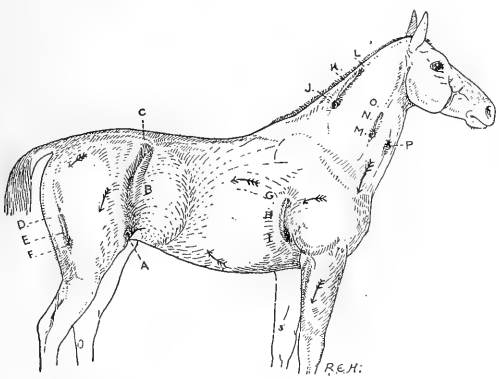
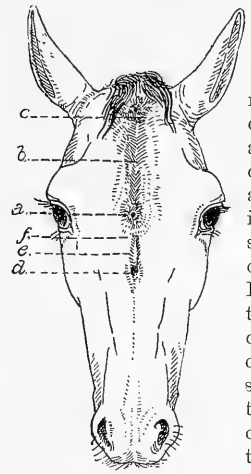
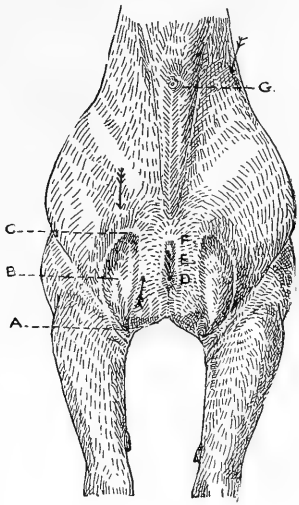


Fig. 1. HORSE, SIDE VIEW.

different forms and habits of their possessors, and when thus considered they furnish marked indications as to certain very constant muscular actions of an animal's life, and especially those which subserve locomotion; indeed, in another account which I have given of them, I ventured to call certain of them "animal pedometers," because of their close connection with the range and constancy of the locomotive lives of animals. They are found chiefly among ungulates, and of these the domestic horse is in the proud position of exhibiting a greater number of these registers of locomotive activity than any other animal, wild or domesticated. A horse displays on its coat constantly three and very commonly five more of these whorls, featherings and crests. In this case, as in others, the greater includes the less, and no animal is to be found carrying about such badges on its coat which have not their corresponding arrangement on the skin of a domestic horse. So, for a type-study of this part of our subject, the friend and servant of man is most valuable. He is to us almost as useful, in our humble matters, as the lancelet of revered memory to the zoological teacher in his class-room. The curious fact that the horse possesses so many of these phenomena would require from the uncompromising selectionist some highly transcendental explanations, if indeed he thought this small waste-land of the territory of science worth claiming. But let us once adopt the working hypothesis that the facts in question are produced by very-often-repeated muscular movements, and soon we find the observed phenomena fall into line, and order takes the place of chaos. The domestic horse, it must always be remembered, is essentially *a locomotive,* though not made of iron, steel and brass. Other wild ungulates, especially other Equidæ, may be as fleet of foot; indeed the kiang and onager are said to outpace a very fast horse. But these wild members of the Equidæ are not such fools as to spend a large part of their lives running about on behalf of man. They can gallop like a racehorse when occasion requires, but rapid locomotion is to them a matter of casual need, often a very imperious one while it lasts, for their own safety. It is not, however, imposed upon them by the will of a superior being, who is very inferior in his own locomotive powers—indeed he has on that account learnt how to make the muscles of other animals work at the bidding of his superior brain.





Figs. 2 and 3.

This contrast between a domestic horse and a wild member of the Equidæ is graphically illustrated by the observation, first, of a common horse's skin, and then of that of a zebra. Yet these two equines are so alike, except for their coloration, that if both were skinned no one but a trained anatomist could distinguish the carcases of the two animals. And yet what different evidence do they not give by their hair-slope as to their locomotive lives. The horse shows three constantly and five very commonly of these registers of work done, in the shape of whorls, featherings and crests, whereas zebras show on their whole body

only one constantly, and that is on the forehead, and one occasionally, in Burchell's zebra, at the root of the neck. In addition to their scanty number, those the zebra does show are small and insignificant. Yet the zebras are fleet of foot, but they trot and gallop when they choose or when they need it, and not when an overlord requires it. These two states of life are very different affairs, and show themselves on the skins of the two creatures—on one positively, and on the other negatively. The zebra bears, for all to see, its marks of freedom—the domestic horse its badges of servitude to man. One is the "ceorl" and the other the "villein" of the equine family.

The regions where the horse exhibits whorls, featherings and crests, and where many other hair-clad mammals have one or another of these fairly developed, are the muzzle, the forehead, the neck in three different parts, the chest, the axilla or hollow behind the shoulder, the inguinal and the gluteal, which is the rarest place of all for one of these features. They are all figured in the accompanying diagrams of a horse, and no verbal description of them is needed here; but certain other animals which present them may be shortly alluded to.

The Kiang (Fig. 4) may be first mentioned as showing some of those registers of activity with which the domestic horse is so well supplied. This Asiatic wild ass is exceptionally fleet of foot, so much so that even a well-mounted rider cannot overtake it. From this fact it is evident that for certain private reasons best known to itself it has to utilise very largely its locomotive powers in the course of its wild life in the uplands of Tibet. In accordance with our principle of interpretation of whorls, featherings and crests, we find on its hairy coat decided evidence of great locomotive powers, and practice of these, in a well-developed inguinal and a less marked axillary whorl, feathering and crest. It shows, of course, also the almost invariable frontal whorl. From this evidence alone a pretty correct estimation of the speed of this animal would be arrived at without any direct observation and record of its habits of life.

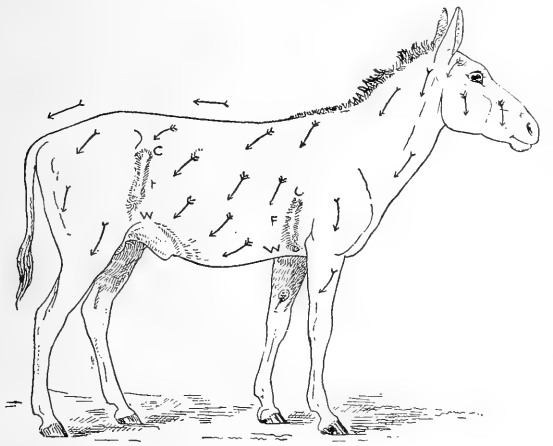


Fig. 4. KIANG.

Besides the habits of locomotion, other active muscular habits are reflected on the hairy coats of mammals, and a few of these may be given here.

The Lion (Fig. 5) presents two very marked and constant peculiarities. First, it shows a bilateral whorl, feathering and crest at the root of the neck just above the great muscles of the shoulder, and this is evidently connected with the large and constant use made of the strong fore-limbs by these great carnivores. This is also seen in the tiger, leopard and jaguar, and I have seen two instances (out of a very large number examined) in domestic dogs of the dachshund type with very strong fore-limbs. The second hair-mark borne by the lion, as to its active habits, is a large nearly oval patch of reversed hair, which when examined is found to be a whorl with an unusually wide feathering, terminated by a crest, situated in the centre of the back. This is

peculiar to this species of the Felidæ; indeed, I have only come across anything at all like it in one or two smaller carnivores. It is, however, represented frequently in Bovidæ. In the lion this reversal of the hair-streams of the back must bear a direct relation to the habit, so constantly exercised by this fierce creature, of bristling up the hair of its back. One may see the same feature displayed in a temporary manner by a domestic dog in a pugnacious mood when ruffling up its hair on its neck and back, so that a picture of the larger process in the lion is easily observed. It is no exaggeration to say that these "crests," as we may term them, of certain old families in the lower animal world describe more truly the tendencies of the race than most of the crests and mottoes of ancient human families.

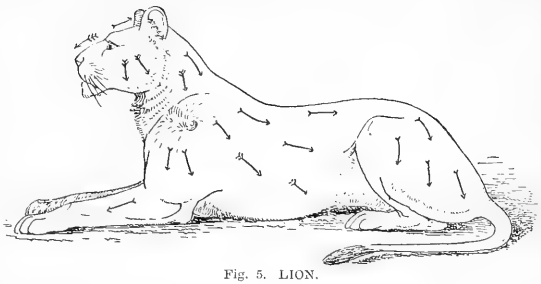


Fig. 5. LION.

Oryx Beisa (Fig. 6). — This antelope also shows one very interesting register of frequent activity. Looking at the back of the animal from above, one may see at the level of the sacrum a whorl from which a long feathering proceeds forwards, right against the adjoining streams of the trunk, up to the level of the horns, where it terminates in a crest, thus meeting the normal backward stream of the neck. This, like the corresponding area in the lion, may also be associated with the constantly-repeated action of the fly-shaker muscle, indicating some of the annoyances to which the animal is subject, and which it thus somewhat mitigates.

Most Giraffes (Figs. 7 and 8) possess two interesting marks on their coats, and besides these they frequently show small whorls, featherings and crests between the bases of the external ears and the horns. The two points alluded to are, first, a bilateral whorl, feathering and crest, situated in most giraffes at a point which observation shows to be a critical one in the movements of the great neck, and which would be shown to be "critical" in some way or other by the presence of this whorl, even if observation did not bear it out. This is the level of the seventh cervical vertebra, where the neck shows a preponderance of the movements of flexion, extension, and lateral bending and rotation. The second point of interest is that in the mane, near to the level of the withers, there is a meeting of two streams, the normal backward slope of the mane meeting at an angle a forward slope of the posterior portion. One has only to see the attitudes assumed by a giraffe in the act of drinking or browsing off the ground to learn how this forward turn of the hair of the mane is produced.

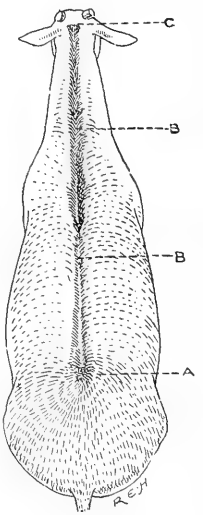


Fig. 6. ORYX BEISA.

The study of reversed areas of hair and whorls, featherings and crests, as evidence of passive habits of animals on the one hand, and of active habits on the other, may be pursued much further than has been done here. One finds that not only the presence of these phenomena, but their persistence and size, gives very good approximate knowledge of the habits of a certain family, and even of different breeds of domesticated animals.

It may be useful to point out the nature of the material

Fig. 7. GIRAFFE

in which these records are made. Hair is a living, growing, and plastic tissue. The individual hairs grow at the bottom of their follicles, and the shaft is constantly being pushed by the force of growth in that direction which offers the least resistance to its onward course. In most regions of an animal's body the hairs find no resistance and lie in the primitive direction, the point being worn down by friction or its length regulated by the requirements of the pelage of the individual animal, in which case the hairs are shed and soon replaced by others. This growth takes place approximately at the rate of half-an-inch a month, so that if an animal's hairy covering were adapted to maintaining its full growth, every year would show six inches added to the length of the hairs. But even so small a matter as the length of a hair is adjusted to the requirements of its possessor, and Nature takes care to wear down the hairs at the point while they are growing in the follicle, or the whole hair is shed, the process differing at different seasons and in different animals. Those regions where resistance to this primitive flow of hair is found are the seats of many of the reversed areas, whorls, featherings and crests, a few of which have been described.

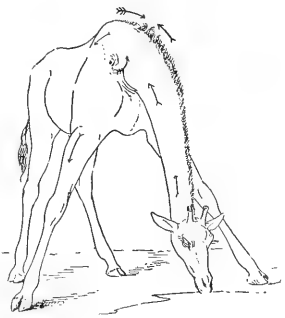


Fig. 8. GIRAFFE.

Note.—Part I. of this article will be found on page 152 of this Volume.

A NEW BOOK.

This is not the first occasion on which we have spoken in praise of Mr. W. J. Long's work, and we hope it will not be the last. We said once that in our opinion he was, as a naturalist author, second only to Mr. Seton (Thompson), but on reading his last book issued by his publishers (Messrs. Ginn), "A Little Brother to the Bear," we are inclined to revise this statement and say that Mr. Long has climbed to the very top of the tree, or rather, of that branch which, though tried and tried successfully by many, he and Mr. Seton have retained apart and above from all other competitors. To an infinite amount of patience in watching the ways of the wild, Mr. Long brings a most charming style in describing what he has seen, and in these pen-portraits he is ably seconded by Mr. Copeland, as artist, whose numerous illustrations are a great acquisition to the book. However, it is the print, not the pictures, which is the chief feature of the book, and from it one can learn more about the animals it deals with than one is able to from most books on zoology. We heartily commend the book to all our readers.

OUR COLOURED PLATE.

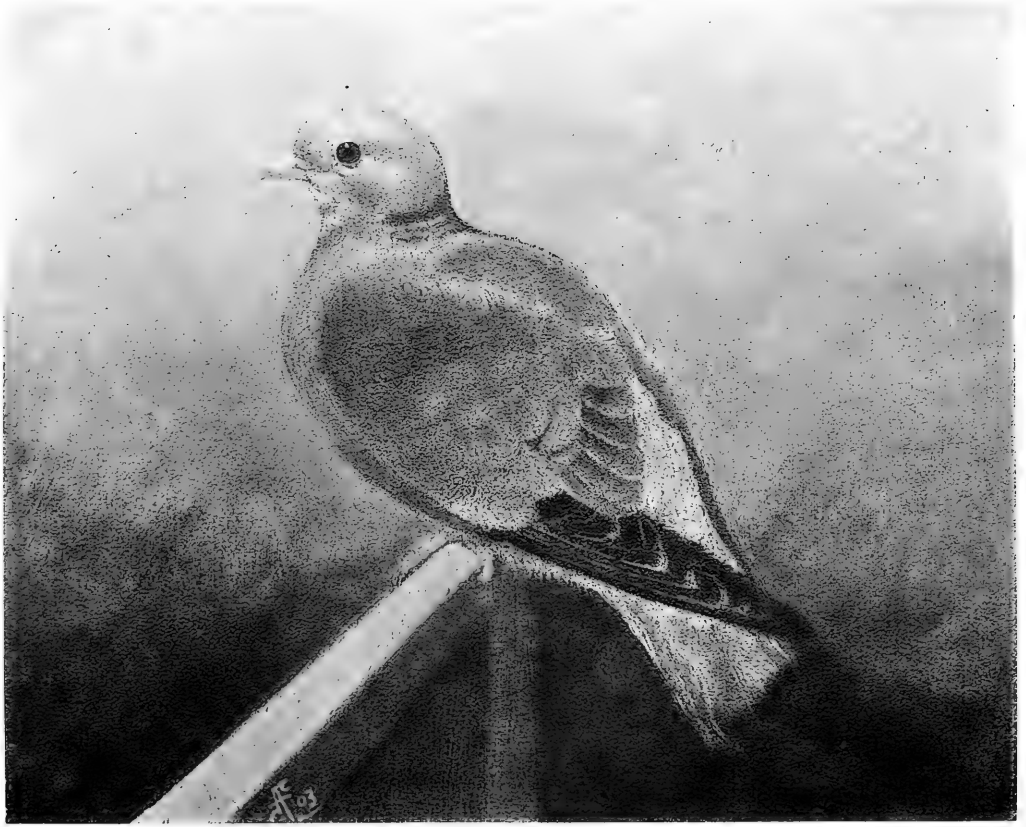
[The following is extracted from the advance proofs of Mr. F. G. Aflalo's volume on Salt Water Fishes in the "Woburn Library of Natural History," from which book the frontispiece is also reproduced by permission of the publishers.]

THE Lumpsucker (*Cyclopterus lumpus*) is perhaps the most hideous and repulsive fish in our seas. The coarse head and thick-set body are enveloped in a loose, slimy skin covered with warty tubercles. There are numerous teeth in the jaws, but none on the tongue or vomer. The female is the larger, having been captured weighing over 15 lbs., and is generally blue in colour, the prevailing hue in the male being red. They are known on the Scotch coasts as the cock and hen paidle.

It is not to be expected, seeing that the greenness of its bones prejudices people against so excellent a food-fish as the gar-fish, that a fish with the appearance of the lumpsucker should be in great demand as human food. In England the fish is little eaten, if at all. In some parts of Scotland it is eaten by the natives; in others, it is considered fit for the pigs only.

Its natural enemies are, however, many and dangerous, for seals devour it in estuaries, sharks prey on it in deeper water, and crows, rooks, and gulls attack it when guarding the eggs above low-water mark. The eggs, which are heavy and sink in the water, are deposited in early spring, and lie in masses among the rocks. McIntosh points out an interesting case of protective colouring, due in part to reflection, for when such a mass of eggs is only partly covered under a rocky ledge, the eggs thus immersed are of a faint lilac hue, while those more exposed are straw-coloured. From the point of view of the species, it is to be regretted that the male lumpsucker has not a little less devotion and the female a little more judgment, for the eggs are frequently deposited on the foreshore in situations so exposed that not alone the eggs, but also their untiring guardians, are devoured by birds or rats. Many anecdotes have been related of the courage with which the male mounts guard over the eggs. It is related that one was once found lying on its side in a hot June sun in water so shallow that one side of the body and gill-covers was exposed to the air. It has also been observed that when a storm has scattered masses of these eggs, and driven the sentinels from their posts, numbers of distracted males are to be seen hunting everywhere, in the succeeding calm, for their lost treasures.

Day quotes someone who observed the young adhering to the male immediately after leaving the egg, and being carried off by him to the greater security of the deeper water, but later authorities have doubted this story. It is now, indeed, generally recognised that the larval lumpsucker keeps close to the shore for some time, seeking safety among the stones and weed-roots. The imperfect little lumpsuckers are far more rapid and active than the adult, their tail-fin propelling them effectually, and even their heavy hindquarters, a hindrance to progress in later life, lending at that stage an impetus to their movements. Their colouring in these early days is somewhat remarkable, the head being light brown, with a pale blue band, the body yellow, and the base of the dorsal fins being marked by blue spots. The rough tubercles, so conspicuous in the adult, do not develop until the young measure about $\frac{3}{5}$-in., or three times the length at which they emerge from the egg. At that stage, too, the eye is proportionately much larger than in the full-grown fish.



STOCK-DOVE (*Columba œnas*).

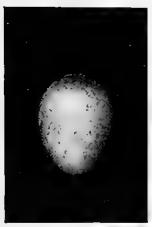
From an Original Painting by The Hon. Alice Foljambe.

NIGHTJAR. SWIFT. HOUSE-SPARROW. CORN-BUNTING. SWALLOW. WOODPECKER.

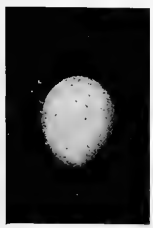
SOME INSTANCES OF COLOUR-PROTECTION IN BIRDS' EGGS.

By C. H. Topham.

SKYLARK.



CUCKOO.



GREY WAGTAIL.

TO the casual observer the many and varied colours of birds' eggs are meaningless, and do not suggest anything beyond their curious beauty; yet probably every one of these varied and numerous shades serves a definite purpose in nature, principally as a means of concealment from the many enemies to which a bird at this early stage of its existence is exposed, in the same way that it is protected later on in life, when all birds assume such colours, where necessary, as may best conceal them from their still greater army of foes; *e.g.*, as a general rule, all our feathered friends that spend the winter with us wear dull, dusky, or neutral liveries, so that they escape ready discovery while among the bare branches of our deciduous trees, which harmonise perfectly with their plumage. If this were not the case, hawks and other birds of prey would work sad havoc among our gentler winter residents. The reason that the under-surface of the bodies of such birds is lighter in colour than their backs is very apparent, for little danger threatens them from beneath, and the branches themselves offer a natural protection from this quarter.

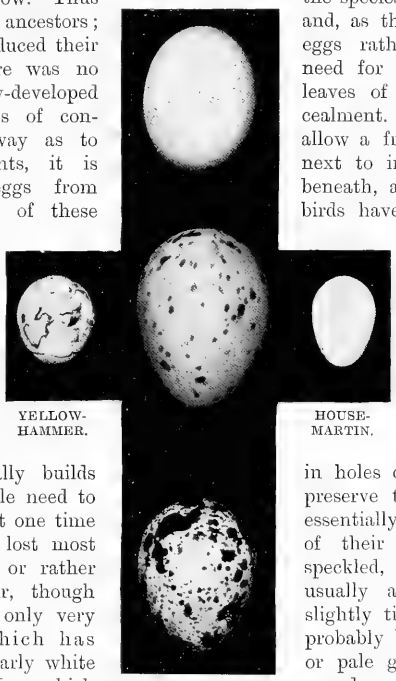
The principal constitutent of which an egg-shell is composed is carbonate of lime (limestone), which in a pure state is a whitish substance: thus the interior of the shell of all eggs is white, or only slightly tinted. It is probable that the original colour of all eggs was white (a statement which is confirmed by the fact that all birds which lay their eggs in holes or build covered-in nests, *i.e.*, those that have retained this habit for some considerable time, lay white or pale eggs).

Of the class of birds which build and deposit their eggs in holes may be mentioned the Owls, Woodpeckers, Tree-Creepers, Wryneck, Kingfisher, Sandmartin, and Puffin, as well as several other sea-birds; and of the birds which build covered-in nests may be mentioned the Dippers, whose eggs are pure white, the Wrens and some Tits, the eggs of which are usually spotted with pale colours dispersed over a white or pale base, but are frequently pure white or slightly marked with neutral tints.

The Swift, building in holes of old masonry, lays a chalk-white egg; the House-Martin, building a nest encased with mud and having one small hole for entrance and exit, lays a white egg; while its cousin the Swallow, building a less protected nest, lays eggs more or less spotted with blackish-purple and shades of red, which harmonise well with the feathers composing the lining of the nest.

The eggs of the House-Sparrow so exactly resemble the lining-feathers of the nest that, should an unbidden guest visit it and tear a portion of the structure away, the eggs would not easily be discovered.

It may occur to the reader that it is strange the eggs of pigeons should be white, although some of these birds build in exposed trees. The explanation of this is as follows: Possibly the original pigeons all built in holes in trees and rocks, as a number of species do now. Thus the species that build in trees have originated from such ancestors; and, as the first arboreal members of the tribe usually produced their eggs rather late in the season (as they do now), there was no need for them to be protectively coloured, since the fully-developed leaves of the trees above formed a more effectual means of concealment. And, by constructing the nest in such a way as to allow a free passage of light from above at various points, it is next to impossible to detect the presence of white eggs from beneath, and this is probably the reason why the eggs of these birds have remained as white as those of the first pigeons, which produced white eggs in accordance with their habit of frequenting dark holes where colours would serve no practical purpose.



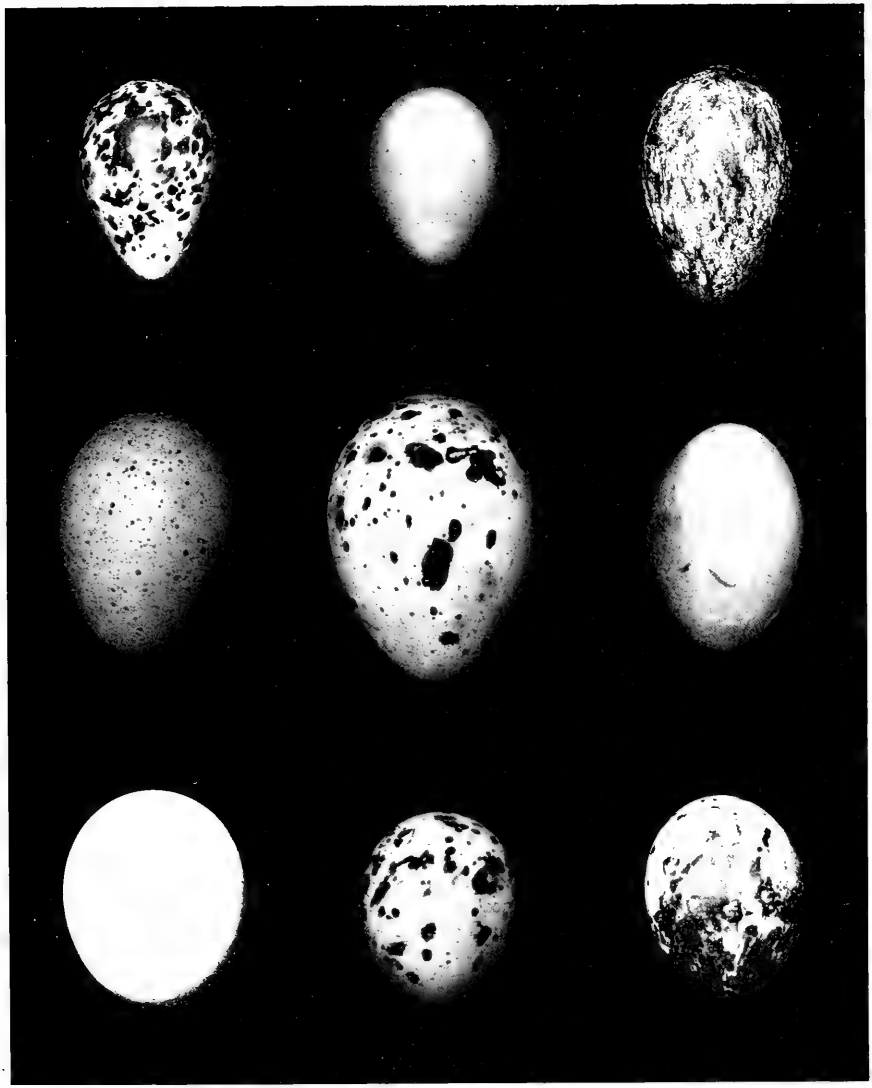
YELLOW-HAMMER. HOUSE-MARTIN. TURTLE-DOVE. CORN CRAKE. QUAIL.

Most of the Crow tribe lay their eggs in the spring or early summer—hence the predominant shades of green, which match well with their young-leafy surroundings and thus escape discovery from above, the point from which danger principally threatens.

The Jackdaw usually builds in holes of trees, walls or rocks, and as there is now little need to preserve those green tints which were in all probability at one time essentially useful to the welfare of its eggs, they have lost most of their green shades and are rather sparsely spotted, or rather speckled, with black and grey, while the ground-colour, though usually a pale bluish-green, is often quite white, or only very slightly tinted.

The Starling, which has probably built in holes for a considerable time, lays a nearly white or pale greenish-blue egg.

The eggs of the Jay, which are deposited in a nest of sticks among the branches of woodland trees, are almost identical with their surroundings. Some individuals of the Blackbird build in hollows in the banks of ditches, etc., a habit which they probably retain through life, and in this case the eggs are so similar to the earth and rootlets among which the nest is placed that I once searched for a considerable time where I knew a nest to exist, and had to abandon the idea of finding it until the bird began to sit. In this instance the old bird always left the nest before danger was at close quarters, as the eggs were practically invisible when left to take care of themselves. The eggs of such blackbirds are occasionally so similar to those of the jay that they are sometimes sold as such.



COMMON SNIPE.	COMMON PARTRIDGE.	RAVEN.
COOT	BLACK GUILLIMOT.	EARED GREBE.
TAWNY OWL.	COMMON TERN.	SPARROW-HAWK

The eggs of most of the Hawks so exactly resemble the lining of the nest that I have actually looked into the nest of one of this tribe (the Kestrel Hawk) from a neighbouring bough, and did not detect the presence of six eggs which were discovered upon nearer inspection.

Eggs of those birds which lay early in the year are usually tinted and spotted with delicate shades of blue, green, or a combination of these hues, a fact that renders them difficult to discover by enemies from above, as their pale shades mingle admirably with the pale greens of young vegetation. The Thrush, Blackbird, Hedge-Sparrow and Rook are illustrations of this type of coloration.

Most of the Finches, Flycatchers, and Warblers build nests that are in themselves protective to the eggs; *e.g.*, the Spotted Flycatcher and Chaffinch so bedeck the outside of their nests with lichens, etc., as to be hardly distinguishable from the bark of the tree or hedge in which they are situated. As an illustration of the protection afforded by the nest, I once found a chaffinch's nest, containing five young birds, built on a rather exposed branch of a tree that was also tenanted by Kestrel Hawks with a prosperous family of four, while there were no other nests anywhere in the vicinity. Among the finches, the eggs usually match the lining of the nest, but as the nest in this class of bird is always more or less hidden among dense herbage, deviations from this rule are frequent.

The whole army of warblers lay eggs that correspond with their surroundings, and the protective colouring of those of the Nightingale is so effectual that they are seldom destroyed, although from the position of the nest one would expect weasels, rats, and mice to work sad havoc among the progeny of this beautiful songster.

The eggs of the Cuckoo are usually so remarkably like those in the nest in which the bird chooses to deposit them that they even escape detection by the unfortunate foster parents.

Perhaps the most beautiful illustration of the protective coloration of eggs is furnished by those species that build or lay upon the ground. Naturally great variety is present among the eggs of these "ground-builders." Thus, the eggs of the Nightjar, Corn-Bunting, and Yellowhammer are so spotted and streaked as to resemble pebbles, and many a fruitless search have I had for the eggs of the latter where I had good reason to believe they existed.

GUILLIMOT.

The eggs of the Pheasant, Partridge, Grouse, Lapwing, Snipe, Quail, Skylark, Meadow-Pippet, etc., etc., harmonise perfectly with their surroundings.

The plumage of some of these birds is of such a protective nature that the parent will only leave the nest in time of very great danger, and is often then passed over as a bunch of dried leaves might have been.

The eggs of the Grebes, rather inconveniently, are pure white. But in this case, when danger threatens to overtake them, the parent covers them up with the leaves and rushes of which the nest is composed; this feat having been accomplished, the old bird quietly dives away from the nest, which looks like an innocent heap of dried rushes. When the eggs are a few days old they become so stained with the decaying vegetation, among which they are deposited, that they assume the same tint, and are then frequently left uncovered.

NOTES AND COMMENTS.

JACKDAW.

Two Cases of Albinism.

THE first of the birds here depicted is not an albino in the usually accepted sense of the word, that is, as a freak of nature, for Mr. Herbert Lazenby, who took the photograph in the zoological collection of the Rev. B. Hemsworth at Monk Frepton, Yorks, informs us that the jackdaw came from Austria, and belongs to a true white breed. The second picture is of a young magpie (a little over a year old), and is from a photograph by Mr. J. T. Newman, of Berkhampstead.

MAGPIE.

A Strange Friendship.

IT is not often that a lamb and a cat become firm friends, but the pair shown in the photograph certainly look very good friends indeed, seated comfortably before the fire in the kitchen of a farmhouse. "I was informed," writes Mr. Lazenby, "that the two were quite inseparable, playing and sleeping together. The photograph was a rather difficult one to obtain as a wood fire was burning at the time, but they looked so cosy together that I made the attempt and was rewarded with a fairly good picture."

Snakes.

MR. H. B. SMITH, who sends us the snake photographs reproduced on page 243, writes: "The Adder was making its way through the undergrowth of a hedge in a small copse, but with the persuasion of a stick I induced it to remain still long enough to have its photograph taken. This was effected with an exposure of two seconds. Of course, the operation entailed some amount of care and pains, as a viper is no plaything. While being arranged for its portrait it repeatedly bit the stick and hissed with enraged fury. The copse where it was found has long been known as a haunt of all kinds of snakes, and many a tale is current of people being bitten by

them. One story is told of a dog that was bitten in the tongue, which became so swollen that it had almost choked the poor animal, when the owner snatched the adder, and, as he informed me, hung it in front of the fire, caught the fat dripping from it, and applied it to the dog's tongue. Instantly the dog was cured, suffering no more ill effects. The fat of the adder is said to be a certain cure for its bite. How true this story is I do not know. Measuring the adder when dead I found its length to be exactly twenty-one inches, and its greatest diameter three-quarters of an inch. The striking feature of this species is the V-shaped mark on its head, from which its name is taken. The colouring on the back was black and dirty white; underneath it was pure black. On the whole the photograph gives one a glimpse of nature which few have an opportunity of seeing. The photograph of a grass snake is given to show the distinctive markings in the two species."

A STRANGE FRIENDSHIP.

A Regimental Pet.

Battery Q.-M. Sergt. F. Shepherd writes to us with regard to a paragraph on page 39 of this volume, in which reference was made to a particularly savage Blesbok at the Zoo, an animal, it was remarked, which is rarely seen in our Gardens. Our correspondent, who kindly sends the accompanying picture, says that the blesbok there shown has been in his battery since March, 1900, when it was captured on a drive near Meyerton, Transvaal, after its mother had been shot. It is now about three and a half years old, quite docile, playful, and very intelligent. It has been quartered in England for about a year, and the climate seems to suit it.

A Prolific Mare.

In the letter which he sent with the photograph reproduced on page 244, Mr. G. H. Parsons says: "I am sending you a photograph, for publication in Animal Life, of a remarkable Shire Mare which might interest your readers. She is a dark-brown mare, owned by Mr. John Lawton, Flash Farm, Barthomley, Cheshire, and is in her thirtieth year, while the filly foal by her side is the twenty-fourth foal she has bred. This is one of the most remarkable instances of longevity and prolificacy in a mare that I have ever met with, and it is also worthy of note that the mare has been doing light farm work up to quite recently. The filly is a daughter of Mr. A. Nicholson's celebrated stallion 'Sandycroft Sort,' and judging from her looks she bids fair to worthily uphold the record of her illustrious dam."

The Origin of the Thoroughbred.

An anonymous but valued correspondent, whose opinion we appreciate very highly, has sent us the following note for publication: "It is generally believed by zoologists that the ordinary horses of Western Europe—the 'cold-blooded' breeds, as they are called by the Germans—are descended from the fossil horse, whose remains are so common in the prehistoric and other superficial deposits of both this country and the Continent. These prehistoric horses, as we know both from their fossilised remains and from the rude drawings left by their prehistoric masters, were, for the most part at any rate, rather small or medium-sized animals with large hairy heads and shaggy manes and tails. They appear, in fact, to have been very like the now extinct tarpan of the Kirghiz steppes, and also resembled in some degree the wild ponies of Mongolia.

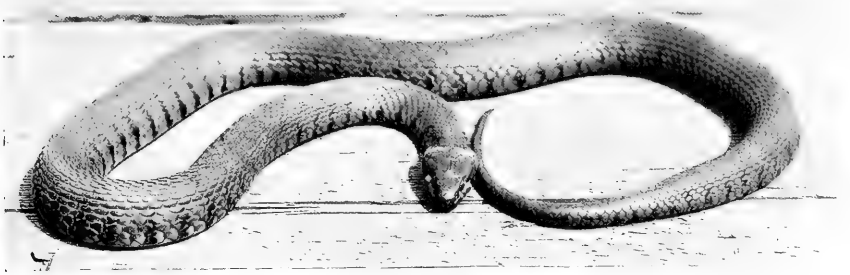
"The blood-horse, or thoroughbred, on the other hand, is believed to be the descendant of breeds introduced into Europe from the East, not improbably by way of Greece and Italy. This, however, by no means implies that it may not also have been derived from a prehistoric horse; being the result of a domestication of a species which may have taken place in Asia at a much earlier date than in Europe.

"The above, as already said, are the almost universally accepted ideas as to the origin of 'cold-blooded' and 'blood' horses. In a recent issue of the 'Proceedings' of the Cambridge Philosophical Society, Prof. Ridgeway has, however, propounded a theory as to the ancestry of the thoroughbred which, to put it mildly, is decidedly startling. Arguing in the first place, from certain premises which need not be discussed here, that the thoroughbred could not have been evolved in Arabia or any other part of Asia, the Professor comes to the conclusion that its real home was North Africa. There are, however (at any rate at the present day), no wild horses (*sensu strictu*) in that or any part of Africa; and it is accordingly suggested that the barb was derived either from Grévy's zebra (*Equus grevyi*) of North-East Africa, or, as is more likely, from some very closely allied species now extinct, which, like Przevalski's horse, may have had callosities on the hind as well as on the front limbs.

"This theory, it is urged, receives support from the occurrence of striping like that of Grévy's zebra in some of Prof. Ewart's hybrids. And also from the circumstance that 'authorities like Captain Hayes have pointed out the great similarity in form between Burchell's and the Somaliland zebras to a well-bred horse, *i.e.*, a horse that has barb blood in him.'

"With regard to the first argument, I have nothing to say;—it may be taken for what it is worth. As to the second, Burchell's zebra is essentially a quagga, and how much resemblance there is between the latter and a horse I will leave my readers to decide. With regard to Grévy's zebra, it seems

ADDER.



GRASS SNAKE.

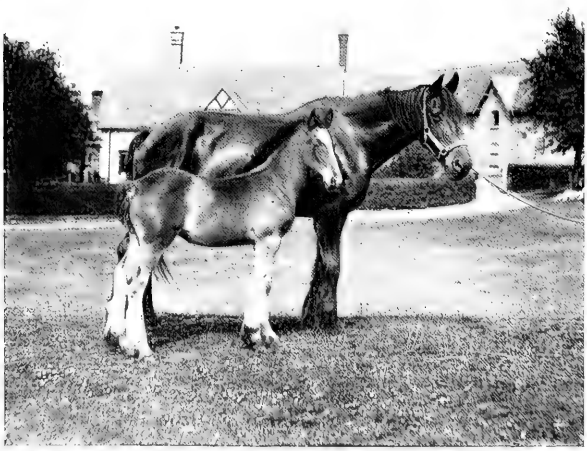
A REGIMENTAL PET.

inconceivable how anybody can say that an animal with the huge spreading ears of that species can in any way resemble a horse, which has the narrowest and most pointed ears and the smallest head of any member of the family. Moreover, Grévy's zebra, in common with all the other striped species and the asses, differs from the horse not only in the narrowness of all its hoofs, but also in the circumstance that the front pair are not broader than the hind ones.

"But (putting aside the difficulty with regard to the chestnuts) this is by no means all. It is admitted by Prof. Ridgeway that the ordinary horses of Europe are descended from the prehistoric race, which we know from the aforesaid drawings was an unstriped animal, agreeing in all essential respects with an ordinary badly bred horse. And yet we are told that the thoroughbred traces its descent to a species closely allied to the Somali zebra, with its striped hide, broad ears, and narrow hoofs! If such were really the case, could the barb by any possibility have acquired its close general resemblance to the ordinary under-bred horse?

"The new theory is so improbable and so contrary to all the known facts that, had it not been proposed by a writer with the title of Professor, and appeared in a journal of high scientific repute, it would, I submit, have been unworthy of notice. As it is, unless contradicted, it is only too likely to obtain credence among those unable to judge it on its merits.

"One other point in Prof. Ridgeway's article demands brief mention. It is there stated that the prehistoric



THE YOUNGEST OF TWENTY-FOUR.

horse was only about ten hands high; that is to say, the height of an average Shetland pony. Has the Professor, it may be asked, ever seen the series of cannon-bones of fossil horses from Ilford and Brighton in the collection of the British Museum (Natural History)? If not, they may be commended to his attention, as they certainly did not belong to animals of only ten hands in height.

"Since the Professor wrote, a suggestion has been made that the blood-horse may trace its origin to an extinct Indian species."

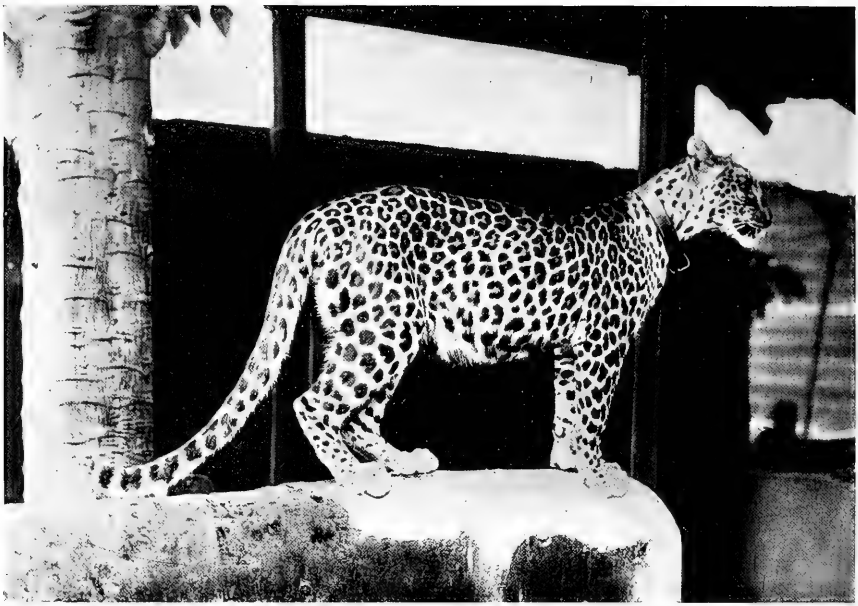
For our own part we should like to say that, while we hold no brief either for the Professor or his critic, we shall of course be willing to hear both sides of the argument, and if Professor Ridgeway wishes to publish any answer to the above criticism he will find a reasonable space at his disposal in these columns.

An Egyptian Zoo.

We have received from Ghiza a copy of the Guide to the Zoological Gardens there. More than once we have reproduced photographs of the animals which thrive under Captain Flower's care, and hope from time to time to have other opportunities of giving further illustrations of the inmates at the Ghiza Gardens.

Photograph by Herbert Lazenby, York.

"When the trees are leafless
And the fields are bare."



THE STORY OF A TAME LEOPARD.

By Mary F. A. Tench.

"MOUNG GYE" (which is the Burmese for "Mr. Big") was probably the only tame leopard that ever grew to maturity without losing his sense of domesticity. Many native princes own so-called tame leopards—as a matter of fact they are cheetahs, and between a brow-beaten cheetah and a docile leopard there is a wide difference. Mr. J. Lockwood Kipling, in his well-known book, gives an interesting (if painful) account of how the cheetah is snared and trained. The animal is caught by means of sinews arranged round the trees where he comes to whet his claws. He is then made fast by ropes to a strong iron cot-bedstead, and with a hood drawn over his head is taken to his captor's home to be starved and bullied. He is forced to walk up and down the village street, strongly chained. Rushes as of assault are made on him, staves are brandished in his face, bells are rung close to his ears, old women yell at him by the hour, and so the once free wild creature, with its supple grace, becomes the humble servant of the rajah, having no liberty except for the few minutes during a hunting-party when it is unleashed in order to do to death a still wilder and much more harmless animal, the buck.

But "look on this picture and on that!" Quite different was the tameness of "Moung Gye," who grew up in and about the house of his master and mistress just as a puppy or a kitten might do, having been brought to them as a present by a Burman headman when he was still a tiny creature with eyes not yet open. At first they refused the strange gift, since they already had a much "be-animaled"

household, owning amongst other pets a small barking deer, with which a leopard was scarcely likely to live in the bond of friendship. But a piteous little mew from the basket melted their hearts; they could not, they absolutely could not send the poor wee creature away to die! So he was fed from a baby's bottle, and lived, flourished, and won his way into the hearts of all who were brought into contact with the playful, affectionate young creature. "Moung Gye" was a model of virtue. He was far less mischievous than an average puppy; indeed in all his life only three misdemeanours were recorded against him. On one occasion he caught a hen which was being chased by the dogs—and surely the bad example set him and his own youth were mitigating circumstances; on another he killed a pariah dog that had tried to steal his breakfast, and over the entry of this crime even the recording angel might have shed an obliterating tear; and on yet another he found his way into his master's dressing-room, making hay generally, and eating a hole in his sleeping-suit. Not a very terrible list after all when one remembers the amount of wreckage of which a little child with the face of a pictured seraph, or a puppy about as big as a good-sized rat is capable.

With all the other pets of the household he was on the most amicable terms. He would stand upright and pat the ponies on their hind-quarters with amiable condescension, playing with their tails in a friendly manner; would stroke an antelope—added to the "happy family" since his own arrival—on the nose; would cuddle to his breast the various batches of young puppies, allowing them to pull him about at their own sweet will by ears and tail and feet. Until he was too big to do so he would lie on his mistress's lap purring with pleasure when she stroked or played with him, and showed almost a dog's delight whenever she returned to the bungalow after a short absence.

Later, when his master was moved from Thayetmyo to Toungao, the damper climate disagreed with the young leopard, which sickened with jaundice and died.

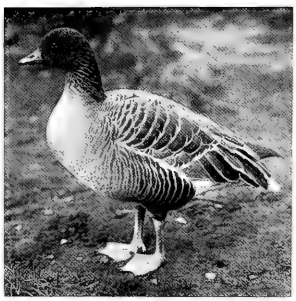
"MOUNG GYE" AND HIS FRIENDS.

ZOO NOTES.

SPUR-WINGED GOOSE.

The Spur-Winged Goose.

ALTHOUGH called the Spur-Winged Goose, the handsome bird (*Plectropterus gambensis*) illustrated under that title is not a true goose, but is more nearly related to the Muscovy Duck, which it resembles in its glossy dark-green and white plumage, and in the fact that the male is much larger than the female, to say nothing of the form of the beak, which is not goose-like. The most remarkable point about the bird is its possession of a pair of strong spurs, situated on the pinion-joint of the wings, and not seen while these are closed. These weapons can be used with great effect; a bird belonging to a dealer in Calcutta cut a man's chest open with a blow, and another which was in our London Zoological Gardens some years ago laid up a gardener for a fortnight, having struck him on the knee with the spur.



PINK-FOOTED GOOSE.

The spur-wing has also been found by the well-known waterfowl amateur, Miss Rose Hubbard, to be mischievous with smaller species, taking up a small duck bodily in its bill and running off with it when chased. For these reasons the spur-wing is not popular with waterfowl-keepers, and is not usually to be seen outside zoological gardens. It has been, however, brought to England for many years, and was introduced here even before 1678. Specimens have also been shot in England at large, but these must have been escaped birds, for naturally the bird does not range north of the Sahara, its home being Africa south of that desert, where it takes the place of the true geese, which are not found in the region it inhabits.

Photos by W. P. Dando, F.Z.S.

PLUMED GROUND-DOVE.

A very singular peculiarity of the species consists in the fact that its plumage does not show that complete regularity of marking usually seen in wild birds, but rather recalls that of a pied domestic variety in the disposition of the white areas and their lack of exact definition. In this the spur-winged goose is almost unique among birds, and recalls a compatriot, the African Hunting-Dog (*Lycaon pictus*) among mammals.

The only other birds of the duck family which bear spurs on their wings are the little Torrent-Ducks (*Merganetta*) of the Andes, which are totally different in appearance and habits.

Photograph by W. P. Dando, F.Z.S.

"SUSAN."

Pink-Footed Goose.

This bird (*Anser brachyrhynchus*) is a good example of the true or typical geese, and even in the photograph a great contrast to the stilty and glossy spur-wing. It has also the respectable demeanour on which all genuine geese pride themselves. It shows, however, a remarkable inconstancy in the coloration of the feet and the tip of the bill. These parts should be pink, as the bird's name implies, but both in captivity and in a wild state specimens may occur with them bright orange, as in the Bean Goose (*Anser fabalis*). This species, however, may be distinguished by its darker plumage and larger bill, this organ being noticeably small in the pink-footed species.

Plumed Ground-Dove.

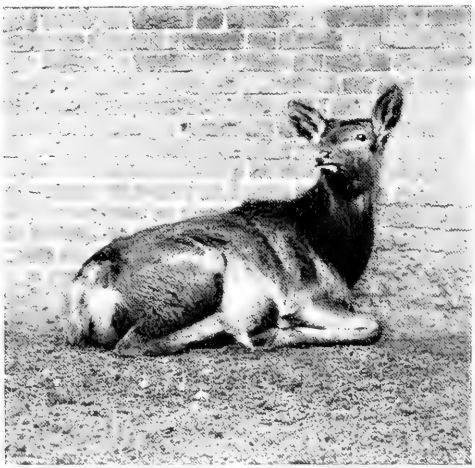
Australia is the home of a curious group of partridge-like pigeons which live entirely on the ground, and of these the species figured (*Lophophaps plumifera*) is the prettiest example, its long lapwing-like crest giving it a very striking appearance. Its plumage is very elegant, being a fine blending of cinnamon with black and French-grey, and set off by scarlet patches round the eyes. These birds seem to do well at the Zoo, where they keep entirely to the floor of the Western Aviary, and when running show much the same action as partridges. In fact, this dove seems to consider itself a partridge, since the present writer has seen an odd specimen, confined in a compartment with partridges, cuddling up to those birds as they sat in a bunch as if it were one of the family!

Like partridges, also, these birds nest on the ground, but, like the pigeon family, to which they belong, lay only two eggs. These are of the usual white, and there seems no reason to suppose that the young, when hatched, are less helpless than young pigeons generally.

"Susan" again.

THERE is some excuse for the presentation of another photograph of "Susan," whom we saw so affectionately cuddling "Jimmy" in a recent issue, for the poor little lady member of the chimpanzee group is now dead.

She was not at all a bad-looking specimen as child chimpanzees go, and might possibly have made her mark had she lived longer. In addition to the famous "Sally," there has been of late years another chimpanzee at the Gardens which showed marked originality, at any rate in one point. This was a quite young female of the ordinary light-skinned type like "Susan," well-known in her day as "Daisy." She used habitually to walk on her hind legs, and this of her own accord, such an approach to human progression, although normal in the gibbons, being most exceptional among anthropoid apes, which usually go on their knuckles as well as their feet.



Photograph by W. P. Dando, F.Z.S.

FEMALE MANCHURIAN WAPITI.

Manchurian Wapiti.

THE fine deer known scientifically as *Cervus xanthopygus* is one of the group of North Asiatic stags which represent the better-known wapiti of North America (*Cervus canadensis*), of which they are now considered to be but sub-species. The wapiti group bear a general resemblance to the familiar Red Deer (*Cervus elaphus*) and its allies, but are larger and finer animals, with the tail much shorter, and a marked difference in the antlers in the stags. The wapiti and its races are among the finest of existing deer, combining great size with beauty of form and a large development of many-tined antlers.

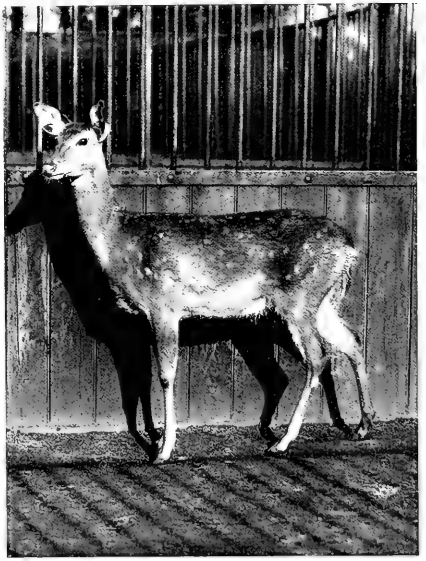
Moose.

THE Elk or Moose, it is true, is much the largest of existing deer in the body, but its proportions are anything but elegant, the legs being very long and the neck short, while the head is of a very ugly shape and the broad "palmated" antlers not to be compared with the branching adornments of the typical deer. The Moose is, however, like so many awkward-looking creatures, a very interesting animal, and always commands the sportsman's admiration. It feeds mostly on twigs of trees, preferring the mountain-ash above all others. It is far less gregarious than most deer, but the idea that the bull only associates with one cow appears to be erroneous. The Elk is an excellent swimmer, and when swimming is remarkably high out of the water; it also wades after the leaves of water-lilies, which it much appreciates as food. This species has a very wide distribution, being found all round the world in northern latitudes. "Elk" is the European name, the term "moose" being only used in America, where the name "elk" is universally but quite wrongly given to the above-mentioned wapiti deer. Some time ago a pair of moose were turned out in the South Island of New Zealand—a very wise step in acclimatization; but more stock will probably be needed in order to establish the species properly, although it is known that the present fine stock of red deer now in the colony arose from a very few individuals. It may be mentioned that the huge extinct deer commonly called the Irish Elk was not an elk at all, but a giant form allied

FEMALE MANCHURIAN WAPITI.

YOUNG MOOSE.

JAPANESE STAG.



FEMALE FORMOSAN DEER.

Photos by W. P. Dando, F.Z.S.

to the existing fallow deer; were it living no deer known could compare with it for majesty of appearance.

Japanese Stag.

A great contrast to the huge unwieldy moose is the neat little Sika stag, which is shown in his winter coat of uniform dark sepia-brown; in summer he is chestnut with white spots, the seasonal colour-change present in so many deer being unusually well-marked in this species. When the stag's antlers are newly-grown and still in the velvet they have a remarkable colour, being bright chestnut-red with black tips, and look very handsome.

Although often not so big as the fallow deer, the sika stag is a compact little fellow, and looks not unlike a miniature of the red deer; his antlers also are of a somewhat similar type, but do not carry so many points, four being the usual number. The sika was long ago introduced into British parks, and does extremely well there; indeed the animals breed freely in their confined quarters at the Zoological Gardens. In parks they sometimes interbreed with the red deer, a somewhat remarkable fact when their great distinctness in size and other characters is considered.

There is one drawback to the sika as a park animal, and that is his savage disposition, in which he resembles the red deer and differs completely from the gentle fallow deer. For this reason it is not advisable to encourage sika deer to become tame, as a tame deer, if of a savage race, is sure sooner or later to abuse his familiarity with man, with very serious results. Sika deer come from Japan and North-East Asia, the mainland form being larger.

Photograph by W. P. Dando, F.Z.S.

SAMBAR STAG.

Formosan Deer.

This species (*Cervus tæevanus*), which is confined to the mountains of Formosa, is a near ally of the Sika, but undergoes little colour-change according to season, the coat being always spotted and more or less reddish in colour.

The Sambar.

The powerful but somewhat clumsy-looking deer (*Cervus unicolor*) which bears this title is the most widely-distributed species in South-Eastern Asia, where it becomes divided into numerous sub-species. The characteristic points of Sambar are the stout antlers with only two terminal tines and a brow-tine, the large ears and longish bushy tail, and the uniform brown colour; even the young are not usually spotted in India, though further east this is not the case. Some of the insular forms of the sambar are very undersized, an insular habitat tending to dwarf deer in many cases. Thus the smaller size of the Japanese race of the sika has been alluded to above, and the smallest forms of the red deer occur in the Hebrides and Corsica. Just as the wapiti is miscalled elk in America, so is the sambar in Ceylon, though in this case the error is certainly less excusable. At the same time the sambar is a fine big beast when at its best, and quite the largest of tropical deer. The antlers also, if not so fine as those of the red deer and wapiti in respect of length and number of points, have nevertheless a grandeur of their own in the great thickness of the beam and the ruggedness of its surface. They are less apt to throw off "sports" than those of some other deer.

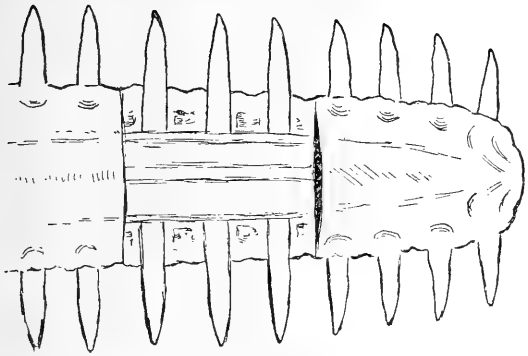


Fig. 1. "Saw" of a Sawfish, with a portion cut away in order to show the mode of implantation of the teeth.

ANIMAL DENTITION.

By R. Lydekker.

III. FISHES.

Part I.

In the opening chapter of his great work on teeth the late Sir Richard Owen wrote as follows:—"If the ichthyologist have reason to complain of the monotony which unavoidably pervades his descriptions of the external characters of the objects of his study, the anatomist in treating of the dental system of fishes, finds, on the contrary, his difficulty in obtaining the command of language sufficiently varied to portray the singular diversity and beauty, and the interesting physiological relations which are manifested in that part of their organisation. The teeth of fishes, in fact, in whatever relation they are considered, whether in regard to number, form, substance, structure, situation, or mode of attachment, offer more various and striking modifications than do those of any other class of animals."

This is by no means an exaggerated statement of the case, and when we take into consideration the vast number of kinds of fishes—recent and fossil—that are known to science, the difficulties which beset a writer who attempts to compress into the limits of a couple of articles even a few of the more important and interesting types of the dentition of fishes, can be better imagined than described.

Not the least remarkable feature connected with the teeth of fishes is their variety of situation. They may occur, for instance, on all the bones or cartilages of the mouth, and are also frequently developed on the bones—the so-called pharyngeals—which strengthen the pharynx, or upper part of the throat. They may likewise be situated on the (hyoid) bones supporting the root of the tongue, as well as on the arches to which the gills are attached. Most remarkable of all is, however, the situation of the teeth of the Sawfishes, the largest of these being implanted in the well-known sword-like cartilage formed by a prolongation of the upper jaw, and thus being entirely outside the mouth. The "saw" is employed as a weapon of terrific power to tear open the bodies of whales and other marine creatures on which these gigantic and voracious fishes subsist. The teeth are fixed in distinct sockets on the two edges of the saw—a mode of implantation comparatively rare in the class. The teeth of the sawfishes are also remarkable from the circumstance that a single set has to serve throughout life, whereas in the great majority of the class the teeth of the jaws are constantly being shed and replaced by new ones.

The position of the teeth of the sawfishes outside the mouth is, however, but a specialised reversion to a condition which probably obtained in the ancestors of all fishes, for it has been found that in their most primitive condition the teeth of fishes correspond exactly in structure with the small bony and enamel-capped granules met with in the

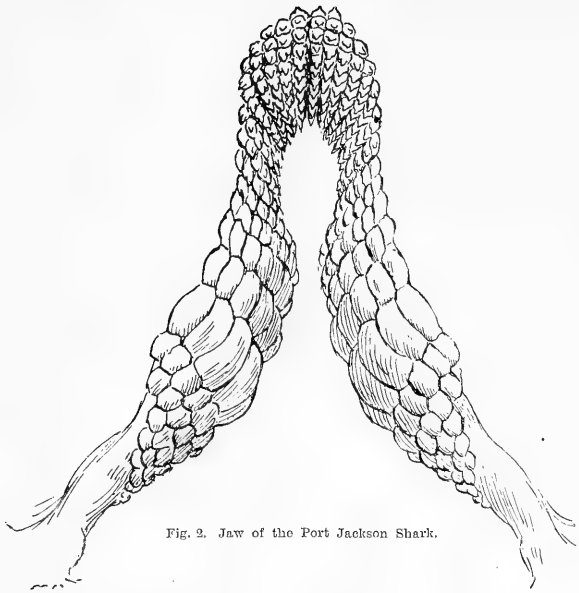


Fig. 2. Jaw of the Port Jackson Shark.

skin of rays and sharks, which give to "shagreen" its peculiar rough surface so admirably adapted to the requirements of the polisher. There is, in fact, an imperceptible transition from such skin-granules to true internal teeth, and we thus learn that teeth, like the lining membrane of the mouth, were originally simple external structures, which, with their transference to the interior, gradually developed the extraordinary variety they now present.

I have said that in most fishes the teeth of the jaws, as they become worn out, are succeeded and replaced by new ones. In many cases, however, especially among the sharks and rays, the mode of replacement is quite different from the one obtaining among crocodiles, where each tooth is replaced by a successor growing beneath its root (see previous article of this series). In the sharks and rays, as well as in many of the enamel-scaled fishes, the teeth are developed on the surface of a more or less complete half-cylinder. In the front of the jaws of sharks (Fig. 2) and throughout those of some rays (Fig. 10) the teeth are arranged in straight rows on this half-cylinder, but on the sides of a shark's jaw the rows are oblique, so that a spiral arrangement occurs. As a consequence of this spiral arrangement, it results that the lowest and youngest of the teeth are actually immediately below the topmost tooth in the same row which they are ultimately destined to replace, the crowns of the two teeth at the top and bottom of the series being, of course, turned in the opposite directions. This remarkable arrangement is well displayed in the largest row of crushing-teeth on the sides of the jaw shown in Fig. 2. As the teeth in use on the margins of the jaws become worn and shed, the whole half-cylinder gradually revolves on the jaw so as to bring a fresh series of teeth into use, while new teeth are developed on the basal line, which in life is, of course, deeply embedded in the gum. Another feature of the teeth of sharks and rays is that they are always confined to the cartilages commonly called jaws, although, as a matter of fact, such cartilages do not correspond with the jaws of other fishes.

In the most primitive extinct sharks (Fig. 3) the teeth consist

Fig. 3. Tooth of a Primitive Shark (*Diplodus*).

Fig. 4. Tooth of the Giant White Shark, much reduced.

Fig. 5. Tooth of Comb-Toothed Shark.

of two large lateral cones with a much smaller cone between them; and they were implanted by broad bases in such a manner that they interlocked with their fellows of the opposite jaw, and thus teeth of several longitudinal series were in use at the same time. The modern form of shark-dentition—whether of the piercing or crushing type—in which not more than one or two series are in use simultaneously, has been brought about by the deepening and narrowing of the base of attachment of the individual teeth, rendering their support less fixed, and not permitting them to come into use until they attain the summit or pass to the outer side of the jaw-cartilage.

The complete dental apparatus of ordinary Sharp-Toothed Sharks is so well known that it has been thought unnecessary to give a figure, and the cuts are therefore devoted to the illustration of a few of the more distinctive types of individual teeth in this group. The simplest type of tooth is presented by the Porbeagle Shark and its immediate relatives. The crowns of such teeth are formed by a single dagger-like cone, frequently flanked on each side of the base by one or more small denticules. The cutting-edges of such teeth are devoid of serrations. The compressed form of the base characteristic of all modern sharks is well shown in Fig. 4. From such a type of tooth there is a gradual transition to one in which the "dagger" becomes very much shorter and broader, with its cutting-edges broken up into fine serrations. In the existing Rondelleti's White Shark, which has teeth of this type and attains a length of about forty feet, the bases of the individual teeth measure a little short of a couple of inches. What, then, must have been the dimensions of the species to which teeth like the one represented in Fig. 4 pertained, some of such teeth having a basal length of fully four inches? Teeth of this type have been dredged from the ooze of the bed of the Pacific in such a condition as to indicate that the monsters to which they belonged lived, probably, at no very great time ago.

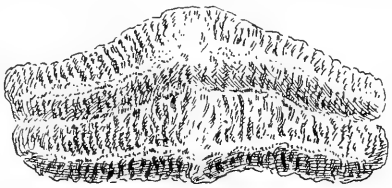


Fig. 6. Two Crushing-Teeth of the extinct Carboniferous Shark *Orodus*. From the Mountain Limestone of Armagh.

By the increase in number and size of the lateral denticules found at the two basal edges of so many sharks' teeth, accompanied by a proportionate diminution of the central "dagger," may have been evolved the very remarkable type of tooth (Fig. 5) characteristic of the Comb-Toothed Sharks. Six or seven transverse rows of such formidable teeth (of which, by the way, the upper are somewhat more simple than the lower ones) are developed in each jaw, and, unlike other modern sharks, several longitudinal rows of these are in use at the same time.

Allied in several respects to the comb-toothed sharks, more especially by this simultaneous use of several longitudinal series of teeth, are the Pavement-Toothed or Port Jackson Sharks, the sole survivors of a once dominant group, many of the members of which attained dimensions far exceeding those of their modern relatives. The teeth of these sharks, as shown in the jaw represented in Fig. 2, differ from those of any of the species hitherto considered in the assumption of a flattened, pavement-like form by those in the hinder part of the series. The largest of these pavement-like teeth are those of the sixth transverse row from the hinder end. It will be noticed that all these teeth have a finely-granular surface, except on a very narrow mouth-like ridge running along the summit of the crown, this ridge representing the last vestige of the "dagger" of an ordinary shark's tooth. From the large sixth row there is a gradual diminution in the size of the teeth as we pass forwards, accompanied, as the extremity of the jaw is approached, by a greater development of the central ridge of

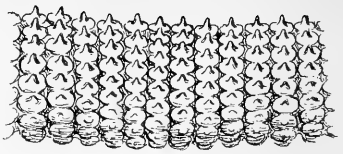


Fig. 8. A Dental Plate of a Sharp-Toothed Ray.

each tooth, which finally assumes a distinctly cuspidate form in the teeth at the apex of the jaw. Evidently this type of dentition is intended for a diet very different from that of ordinary sharks, which feed by tearing off large masses of flesh and swallowing them whole. As a matter of fact, the Port Jackson shark feeds chiefly upon shelled molluscs, for crushing which the pavement-like teeth of the hinder part of the jaws are admirably adapted. Crushing-teeth of a type very similar to those of the Port Jackson shark are very common in the Oolites and Lias, but, as already mentioned, are of much larger size, many of them measuring fully an inch and a half across. Before leaving this part of my subject, attention may be directed to the extreme beauty of the dentition of the Port Jackson shark, especially the crushing portion. A reproduction of this might, I think, be introduced with excellent effect into ornamental architecture.

Nearly allied in structure to the hinder crushing-teeth of the Port Jackson shark are those of the Carboniferous genus *Orodus*, two of which are shown in Fig. 6. The name *Orodus* signifies "mountain-tooth," and has been applied to the members of this group owing to the rugged and centrally-elevated form of the teeth.

Before leaving the dentition of the sharks, a few lines must be devoted to certain very remarkable extinct types which display some of the most beautiful spirals to be met with in nature. The best-preserved specimens are obtained from strata—corresponding roughly in age with the upper portion of our own Carboniferous system—in the Government of Perm, Russia, and the sharks to which they belonged have been named *Helicoprion*. One of these specimens is shown in the accompanying figure (7). It is supposed to be a single transverse row of teeth from either the upper or lower jaw. During life the individual teeth seem to have been continually replaced from within in the usual manner, while those at the top of the arched series would be in use. The discarded teeth did not, however, fall away from the jaw after the manner of those of modern sharks and rays, but remained fixed together by their bases, so that the series thus formed gradually curved into a complex spiral, which was either buried in or overhung by the lip. A similar mode of growth existed in certain contemporaneous sharks (cochliodonts) with teeth of a crushing instead of a piercing type.

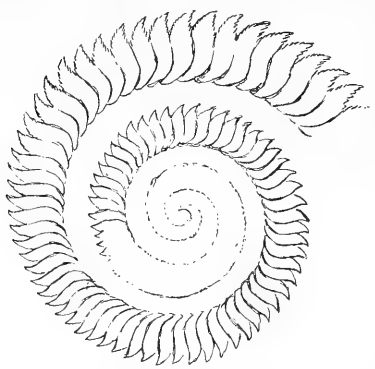


Fig. 7. Dentition of Spiral-Toothed Shark (*Helicoprion*).
[The details of the central portion are omitted.]

Not less interesting and beautiful than those of the sharks are the types of dentition presented by the numerous kinds of skates and rays, both living and extinct—although exigencies of space admit of reference only to a few. As a rule, the dentition of the latter fishes is of the crushing type, and the "pavements" formed by these crushing-teeth are even more solid than those of the Port Jackson shark. Unlike those of the sharks, which are always arranged on the sides of the jaws in oblique rows, the teeth of the rays invariably form straight longitudinal series, although, by the alternation of the individual teeth, a quincuncial arrangement may also be produced (Fig. 9). In some cases, as in Fig. 8, the individual teeth are very numerous, of small size, and terminate in a short recurved cusp, or

spine. And it is not a little remarkable that, while the male of the common Thornback Skate has teeth of this type, in the female of the same species all the teeth are of the crushing modification. It would seem almost certain that this indicates a difference in the diet of the two sexes, although I have not seen any statement that such really exists.

Fig. 9. A Dental Plate of an Eagle-Ray of the genus *Myliobatis*.

Very beautiful is the dentition of the Beaked Rays of the genus *Rhynchobatis*, in which the teeth are small and of a crushing type, arranged quincuncially, the beauty of the whole structure being much enhanced by the circumstance that the dental surface of the jaws is thrown into undulations, with the prominences of the one fitting into the hollows of the other. Yet another type, and one in which the millstone-like structure attains its supreme development, is presented by the Eagle-Rays. In one of these, *Rhinoptera* (Fig. 10), the teeth are arranged in from five to nine rows, those of the three middle rows forming transversely elongated bars, while the lateral ones are hexagonal tessaræ. In the true eagle-rays of the genus *Myliobatis* (Fig. 9), on the other hand, there are seven longitudinal rows of teeth, of which only the central ones are transversely elongated. Finally, in the species of *Ætobatis* all the lateral rows of small teeth have disappeared, and only the large central series persists. Some of the fossil representatives of the last two genera, judging from the size of their dental plates, must have attained enormous dimensions, far exceeding those of the existing forms, which in some cases measure twelve or fifteen feet across the fins.

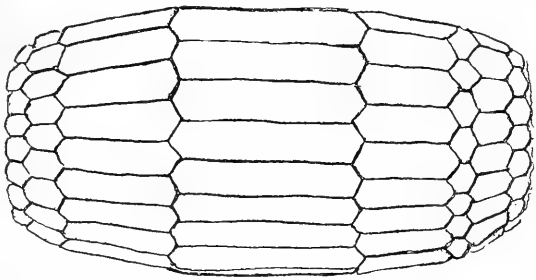


Fig. 10. A Dental Plate of a Ray of the genus *Rhinoptera*.

To extinct rays, probably nearly allied to those just mentioned, belonged the beautiful teeth from the Chalk similar to the one shown in Fig. 11. The teeth of these rays (*Ptychodus*) vary much in size in the same individual, and from specimens showing a number in association, which occasionally come to hand in chalk-pits, it is evident that these teeth were arranged in alternating longitudinal rows of large and small ones. All these teeth have broad and low crowns, with a marginal area marked by small pustules, and an elevated centre carrying a few smooth transverse ridges with a variable number of pustules between and around them.

That very remarkable fish the Chimæra, or king-of-the-herrings, is the type of an ordinal group of fishes represented by only one other living genus, but containing a number of extinct forms. In these chimæroids, as they are collectively called, the teeth are quite unlike those of the sharks and rays, and are of very large size, constituting, in fact, the whole of the solid portions of the jaws, as there are no bones corresponding to those of the modern type of ordinary fishes. It is not, however, by any means the whole surface of these massive teeth that is

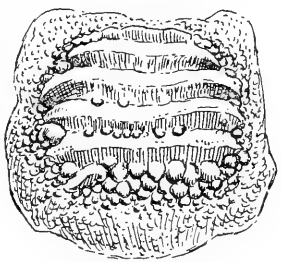


Fig. 11. Tooth of the Cretaceous Ray (*Ptychodus*).

employed for mastication; on the contrary, this function is performed only by certain raised and roughened areas, technically known as "tritors." These are well shown in the sketch of a tooth of a gigantic fossil member of the group reproduced in Fig. 12, such teeth being very common in the Chalk and some of the lower Tertiary formations of this country. Chimæras are entirely carnivorous fishes, feeding largely on herrings, but also eating shell-fish and crustaceans.

Fig. 12. Lower Tooth of an extinct Chimæra, showing the "Tritors."

Perhaps the nearest approach to the type of dentition characteristic of the king-of-the-herrings and its relatives is presented by the Lung-Fishes of the present day and their extinct predecessors. These strange fishes have only three existing generic representatives, namely, the Mud-Fishes of West Africa and tropical South America, and the Barramunda, or Dawson River salmon of Queensland. The mud-fishes (which take their name from the habit of rolling themselves into balls in the mud when the rivers or marshes they inhabit are dried up) are elongated eel-like fishes with whip-like fins. The barramunda, on the other hand, is of less peculiar form and proportions. Its teeth consist of two pairs of the type of that represented in Fig. 13, one pair being situated near the middle of the palate, and the other on the corresponding portion of the lower jaw. In addition to these, there is a pair of much smaller and simpler teeth near the front of the palate. The two large teeth in each jaw are placed side by side, with the ridges (from which the genus derives its name of *Ceratodus*) projecting outwards. Not the least interesting fact connected with these curious teeth is that they were known for many years only as fossils, and that it was not till well on in the second half of the last century that a living representative of the group turned up in the rivers of Queensland. This discovery served to confirm the conclusions deduced from their associated remains as to the fossil teeth belonging to fresh-water fishes, and also proved—what could not have been otherwise ascertained—that these fishes are herbivorous, the Queensland species feeding chiefly on the decomposing foliage of plants growing on the banks after it has fallen into the rivers. That teeth of the type under consideration should belong to herbivorous fishes, while those characteristic of the king-of-the-herrings are associated with carnivorous habits, shows indeed that no definite conclusions can be drawn from many kinds of fossil fish-teeth as to the nature of the food of their owners.

Extinct generic types of lung-fishes abounded during the earlier epochs of the earth's history, especially at and about the time when the forests from which our coal is formed were growing. In all of these the teeth were of the same general type as those of the barramunda (of which representatives even then were in existence), but in many of them the ridges on the grinding surfaces were more numerous, and in certain instances provided with comb-like processes. From this comb-like structure the name of *Ctenodus* (comb-tooth) has been assigned to those coal fishes of which the teeth are shown in Fig. 14.

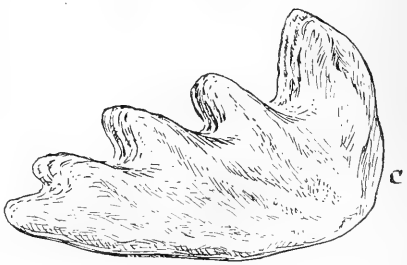


Fig. 13. A Tooth of a fossil Barramunda. *c*. Point of contact with the opposite Tooth.

The present article may be brought to a close with a brief mention of the teeth of the fish-like creatures known as Hag-Fishes and Lampreys, which are worm-like in form,

parasitic in habit, and furnished with sucking cylindrical mouths in place of jaws. In these so-called fishes there are no true calcified teeth, the place of which is taken by horny structures serving the same use. The general character of the dentition of the common lamprey will be apparent from the accompanying illustration (Fig. 15), and it will accordingly suffice to say that the teeth of the lips are arranged in converging rows, which may be as many as twenty in number, with four or more in each row. In addition to these, are a few larger teeth situated near the centre of the mouth which vary in form and arrangement in the different groups. In a Chilian species, for example, there are two triangular groups of three teeth each on the upper side of the mouth, opposed by two pairs of double teeth below. Lampreys prey on other fishes, to the sides of which they adhere by means of their sucking mouths while they rasp away the living flesh of their victims with their cruel teeth. On the other hand, the hag-fishes, in which the arrangement of the teeth is somewhat different, generally infest the interior of their involuntary hosts, among which the cod is frequently selected for their unwelcome attentions. When these fishes first attach themselves to their prey, the single curved tooth in the middle of the palate is thrust into the flesh to serve as a holdfast, after which the work of destruction is carried on by the laterally-opposed saws formed by the other teeth, aided by the sucking action of the mouth.

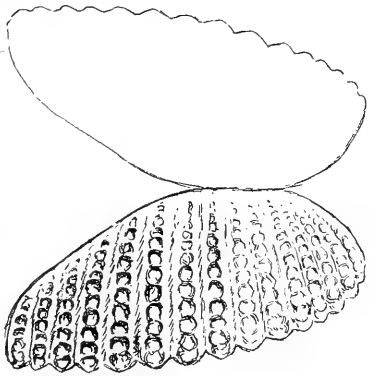


Fig. 14. Upper Dentition of a Lung-Fish (*Ctenodus*) of the Coal Period.

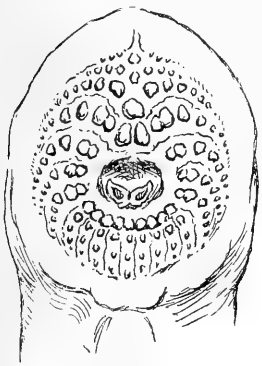


Fig. 15. Dentition of Lamprey.

In the next and final article of this series it is proposed to discuss the teeth of the modern bony fishes and their extinct enamel-scaled relatives.

ANIMAL OR VEGETABLE?

By Captain Cayley Webster, f.z.s.

THE vegetable bulrush caterpillar is a most extraordinary natural paradox, for it possesses characteristics at the same time animal and vegetable. In appearance it is distinctly animal, but its habits and mode of growth are so decidedly vegetable that at first glance one may well hesitate to classify it correctly or account for its origin. The body averages about three inches in length and resembles the mummy of a large caterpillar, the skin remaining intact as during life, with the head, feet, and every wrinkle of the body complete in every detail.

The substance of this paradox is hard and pithy instead of being soft and pulpy. Yet even this tough and fibrous woody structure reveals under the microscope the appearance of the transformed viscera of the animal with all its organs undisturbed. From one end of this mummy springs a long and rush-like stalk, generally from six to twelve inches in length, bearing on its extremity the club of a diminutive bulrush.

It is most often found in the leaf-mould at the base of some huge tree. Here, by looking carefully among the mosses and ferns, it may be discovered as a small brown shoot projecting a few inches above the ground. When this is excavated at its root, some nine or ten inches below the ground will be found the body of the deceased caterpillar, forming the root of the bulrush. This complex organism in its first stage is the larva of a large moth.

When this caterpillar has eaten its fill and attained its fullest growth, it seeks some place of retirement, where, undisturbed, it may undergo its metamorphosis into a chrysalis, and it usually finds a convenient place among the soft soil under some large tree. But before it enters its place of concealment it is attacked by a disease in the form of a fungus germ which has by some means found an entrance into its body, most probably through its breathing-pores, and when once established in such a favourable environment the germ commences to grow by throwing out minute thread-like fibres (*hyphæ*); these increase with great rapidity, spreading throughout the body of the caterpillar and feeding upon it until all the animal tissue has been transformed into the substance of a fungus. Then, finding no more food, the plant sends up toward the light its own seed-bearing stalk (*stroma*), which appears a few inches above

the ground and there produces the spores which, scattered by the wind, find a lodgment in the bodies of other unfortunate caterpillars who may be passing through the infected district on their way to the seclusion necessary for their change, first into the chrysalis and then into the winged moth.

The fungus, which is the second stage of the organism, is a member of a large and world-wide family, and this particular genus has about fifty different species well known to science as being for the most part parasitic upon the bodies of insects—those found in New Guinea being remarkable for their gigantic size. A close and detailed examination of the terminal or fruit-bearing end of the stalk will be of great interest. With the aid of a small magnifying-glass it is seen to be covered with bead-like seeds, very much like the seed-bearing stalk of the common plantain grass. With the assistance of higher power these seed-vessels will be distinctly seen as small capsules (*perithecia*) attached to the stalk by root-like threads. Some of the capsules will probably have a black spot on the top—the opening through which the spores have escaped. Under microscopical examination the capsule will be found to contain a large number of very small glassy tubes (*asci*) standing erect as if firmly fixed to the base of the cup. Such a remarkable phenomenon as a rush-like plant terminating in an animal tuber may well occasion surprise and suggest to the unscientific observer many theories to account for its origin and transformation. Some of the hypotheses invented to account for this natural paradox are both ingenious and amusing. It was affirmed to me with great confidence that perhaps the vegetable caterpillar itself is the origin of the vine which ultimately becomes the great rata tree, while another to whom I showed it, with equal emphasis said it was a freak of nature, or a mimetic form in imitation of the animal adopted by the plant for some inscrutable reason. One other opinion was that it was a "retrograde step in nature"—as if Nature started to make a caterpillar, but bungled in the process and turned it into a fungus.

Each little tube is, in turn, full of spores—minute rods or threads packed side by side and reaching from bottom to top of the tube; each thread is slightly curved in a spiral, which enables it to spring to a distance when released.

Each spore is divided into segments like a string of beads; these are the ultimate seed-germs into which the string or spore breaks up when dry. These final germs are, of course, infinitely microscopic, and when discharged from the capsule they are transported by the lightest wind until one of them finds a resting-place within the body of some caterpillar, where it completes the cycle of its existence.

The number of capsules on one stalk will average about ten thousand. A capsule will contain about twenty tubes and each tube about a dozen spores, every one with at least eight germ segments; this will give the amazing total of somewhere about twenty million seed-germs as the product of each fungus. There are two species of caterpillar liable to this disease, and at least one other fungus that attacks them in a similar manner.

Specimens of this caterpillar may be found with two or three stalks growing from them, and branched stalks are by no means uncommon; I have found one with a stalk growing from each end. The fungus itself may be frequently found covered with another kind of fungoid growth, which may possibly be an intermediate stage in the growth of the same species. When the vegetable caterpillar is dug from the ground the substance is moist and pithy and the body of the insect appears large and full, but it shrinks and gets tougher as the specimen dries. That many caterpillars escape the ravages of the disease is obvious, or the race would become extinct in a single generation. I presume, therefore, that only a small proportion are thus attacked, and those in the affected district.

It is probable that, being a lower form of life, fungi were in existence ages before this insect was evolved, and that some remote ancestor of this fungus perpetuated its existence upon dead or decaying vegetable matter. Thence, passing step by step through innumerable modifications, some individual found a suitable host in the body of a living insect, and discovering there such a suitable environment, it ultimately developed with great rapidity. Thus gaining considerable advantage over other individuals less favourably situated, it became at length specialised into a new species, parasitic upon insects, and it would probably become extinct should it cease to find an animal host on which to feed. All dead and probably all living animals are the prey of various species of fungi, more or less parasitic. Among the higher animals man himself is by no means exempt, for many of the disorders from which we suffer may be traced to the ravages caused in our economy by the presence of these low organisms, either in the skin, within the tissues, or coursing through our veins.

THE BULRUSH CATERPILLAR.

OUR COLOURED PLATE.

THE Stock-Dove (*Columba ænas*) is so similar in appearance when flying to the well-known woodpigeon or ringdove (*Columba palumbus*) that the two are often mistaken for each other. With the coloured plate before the reader it is unnecessary to describe the form, features, or colouring of this pretty bird. As to size, it averages 13½ inches in length, or in other words is about one-third smaller than the woodpigeon. It is fairly abundant in the wild state, but is of much more local occurrence than *Columba livia*. In Ireland and especially in Scotland the stock-dove is increasing in numbers, and the bird is very common in the southern and eastern counties of England.

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough,
F.Z.S., F.E.S., etc.

XIII. THE PUMA, CHEETAH, AND THE SMALLER FOREIGN CATS.

Photo by L. Medland, F.Z.S., North Finchley.
THE CHEETAH.

THE duration of these animals' lives in captivity is about the same as that of the ordinary domestic cat or dog—from eight to twelve years; but of course the length of time any animal lives when caged depends in a great measure on the treatment it receives at the hands of those who are responsible for its care and well-being. The writer's experience of foreign cats has been fairly extensive, and he has had up to the present about eight distinct species, some of which are preferable as pets to the others; he had a Fishing Cat for a few days once, but of all the savage and untractable brutes this species (*F. viverrina*) is absolutely the worst, and this particular specimen was shot after it had been in England less than a week.

The probable choice in selecting a foreign cat as a pet will fall upon the Ocelot (*Felis pardalis*) owing to the beauty of its markings and coloration, which bring it a close second to its cousin, the jaguar. It comes from South America. Another beautiful cat is the Serval (*F. serval*), an African species. This cat can be tamed just as readily as the ocelot, and with many people is a greater favourite than the other animal.

It is evident that the nature of the diet has a considerable influence on the disposition of the Felidæ. Animal food in any form tends to fierceness and uncontrolled temper, but when fed on farinaceous foods, with plenty of milk, they are certainly more tractable and amenable to influence. It is desirable that one person only should have the general charge of the foreign cats and perform the requisite cleaning operations, even when the animal is perfectly tame, as it often happens that the sight of a strange face excites them to a marked degree and renders them treacherous to the new-comer, as their temper, however calm and quiet the animal appears, can never be perfectly trusted. When irritated these cats nearly always fly to the face or neck.

Just as many individuals of the domestic cat are fond of chasing and catching bluebottle flies and other insects, so the ocelots delight in the same thing, and it is amusing to watch the frantic efforts put forth by a caged ocelot to catch a blow-fly which has settled just out of reach, and the delight of the same animal when the door is unfastened and it is able to chase the fly round the room.

A very pretty little cat, but unfortunately one nearly as untamable as the fishing cat, is the Leopard Cat (*F. bengalensis*). It is extremely shy and suspicious of any attempts to gain its confidence Possibly this may be due to the fact that it is more nocturnal in its habits than many others, and resents being disturbed during the daytime, as it is lively enough at night. It has a habit of striking with its paws at the bars of its cage, and does not usually indulge in the peculiar cat-like pacing up and down the cage so observable in the majority of the feline race. It is worth noting with regard to the feeding of this species that beef does not agree with it, and that the proper diet is bird-meat; sparrows and other small birds may be given, and are much

relished. A very good plan would be to contract with a poulterer to take all the fowls' heads he could supply; this he would readily do at a very low figure. Rats and mice may at times be given to vary the diet.

Another small cat very closely allied to the preceding species is the Rusty-spotted Cat (*F. rubiginosa*). Although so nearly akin, there is a great difference in the disposition of the two species, the one under present notice being much more amiable, generally permitting many little liberties. It is very light and nimble in its movements, but does not display before strangers. Some people say it is morose and sulky, but the writer has not found it so. One specimen he had was very nervous and continually crouched in one corner of its cage, and would not come to the front of the cage whilst a stranger was in the room. It is rather a short-lived creature, two years appearing to be the limit of its life in a state of captivity.

A rather rare species is the Golden Cat (*F. temmincki*). A friend of the writer's had a specimen for some few years. It was more active than almost any of the cats during the daytime, and had a habit of hiding its food under the bedding of its box while the sun was up, evidently with the intention of eating it at night, although it was never actually caught doing so. This is another species that beef does not suit, and the specimen in question was in a rather bad way until the writer recommended mutton as an alternative diet, supplemented with occasional live fowls, pigeons or rabbits; but as this is expensive and savours of cruelty, mutton and fowls' heads may be given.

The Marbled Cat (*F. marmorata*) unfortunately does not live more than a few weeks or months at the outside in captivity. Those who have kept it describe it as being extremely irritable and pugnacious in disposition.

The Jungle Cat (*F. chaus*) does not appear to be more amiable in disposition, being nearly as intractable as the fishing cat, generally spitting and snarling with every sign of vindictiveness at any person who approaches its cage.

The Pampas Cat (*F. pajeros*) is a robust-looking cat that is well worth anyone's attention, but in order to be kept in proper health must be fed on bird-meat. If a live bird be given it, it generally kills it with a round swing of its fore-limb instead of pouncing on its prey in the usual cat-like manner. Young ones can be trained to nearly the same extent of tameness as the domestic cat, and in the Argentine villages crosses between the wild pampas cats and the domestic breed are not uncommon; it is therefore extremely probable that a very handsome and powerful-looking cross could be produced between the domestic cats of that country and a tamed specimen of the pampas cat, especially if the latter had been caught as a kitten.

A very handsome cat of a warm reddish-brown colour and of a weasel shape is the Eyra (*F. eyra*). The temper of this cat is variable according to individual specimens, some being so tame as to be allowed partial liberty and others so treacherously savage as to be kept always caged.

The Kaffir or Egyptian Cat (*F. libyca*) is chiefly of interest as being the species kept by the ancient Egyptians and embalmed after death. Numerous mummies of these cats have been discovered during the excavations in Egypt. They are rather long-lived in captivity, and that is about the best that can be said of them, as the writer is no more friendly with one after ten years than he was on the first day.

The last two animals to be mentioned here are the Cheetah and the Puma. The cheetah, or Hunting Leopard (*Cyrelurus jubatus*), as it is more correctly called, is a very pretty and affectionate animal, but extremely difficult to keep; in fact it is about the most difficult of all the Felidæ to look after and maintain in health in a state of captivity. Travelling menageries seem more fortunate with these and other animals of the same family; at any rate their animals are generally in better health, and live longer than those in zoos or private menageries The great thing with the

cheetah seems to be that it must have plenty of liberty and change, and it certainly gets the latter when forming part of a travelling show. Cheetahs are very quiet and inoffensive, being, if anything, more gentle than a puma, but very timid and excitable —a strange noise for which they cannot account disturbing them for days and upsetting their nerves. Diarrhœa and fits are the two ailments which these animals generally suffer from; the former can be treated by variation of diet, the latter by keeping the animals on short commons. Overfeeding is a common fault which must be carefully guarded against. The dietary is beef or mutton chopped into mouthfuls, and fowls' heads and necks; they also relish occasionally a small dish of animal blood to lap at *if warm*. Beef does not always agree with cheetahs. These animals are extremely sensitive to chills and draughts, and the temperature in which they are kept must always be an equable one.

A larger cat than the others mentioned, and one that is more readily tamed than any of the family, is the Puma (*F. concolor*). Not only is it after awhile quite trustworthy as a pet, but it also becomes greatly attached to whoever looks after it well. It differs from other members of the family in that if caught adult it does not take kindly to a captive existence, but usually pines away and dies; if caught as a kitten, however, it is most affectionate, and can be safely trusted about the house except where there are dogs, for it never gets over its natural antipathy to those animals. The feeding is simple, beef being the chief article of diet, but the puma shows a great predilection for live food, such as fowls and small mammals. Taking, as these animals do, to a captive life so readily it is not to be wondered at that they enter into domestic arrangements, and they very frequently bring forth young, either one or two at a time, in captivity.

Generally speaking, the feeding of the foreign cats in captivity is not a particularly difficult matter, beef forming the staple article of diet with the exceptions noted.* Those who live in the country, where plenty of small animals and birds can be trapped, will have an easy task to feed their cats. A full-grown ocelot or other cat of the same size will want about a pound of beef every evening, with the exception of those times when the dietary is varied. Mutton, guinea-pigs, fowls' giblets, hashed vegetables, rats, mice, and small birds all form alternative diet, and the animals will be kept in better health where the dietary is varied. If the animals are young they will require a little more attention with regard to feeding, and must be given boiled milk, boiled meal, and sloppy foods generally, as they are not able to assimilate their food so well as the adult animals. Ocelots have been noticed to be fond of eating land and fresh-water snails. A supply of cut grass should be given at least three times a week, and a lump of rock salt and sulphur put in the cage for medicinal purposes.

The diseases from which foreign cats suffer are usually catarrh and inflammation of the lungs, generally caused by the cage not being thoroughly and properly dried after being cleaned. Too much care cannot be exercised in seeing that the cage is always well dried after each scrubbing-out. When a cold sets in it is almost impossible to administer medicine, as the cat usually resents being interfered with. All that can be done is to give half-an-ounce of the best castor oil in a saucerful of milk.

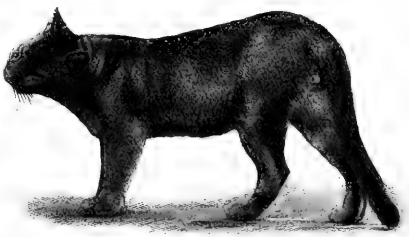


Photo by L. Medland, F.Z.S., North Finchley.

THE PUMA.

* See also the Article on the Lynx, page 229.

THE WOMBAT AT HOME.

A NATURALIST'S NOTES FROM THE BUSH.

By Cyril Grant Lane, with Photographs by the Author.

II. MORE ABOUT THE WOMBAT.

A GENUINE personal knowledge of the Wombat induces me to supplement my previous article* on this animal by briefly setting down a few concise and simple statements, the outcome of close practical observation aided by a keen interest in the study of the peculiarities and *modus vivendi* of this little-known burrower.

In the first place let me say a word about the wombat's physical structure and its general adaptation to the life it leads.

The animal cannot climb, neither is it capable of attaining any great speed when chased or attacked, for this reason: Nature has supplied the wombat with a hide so thick and tough that the sharpest fangs of dog or dingo fail to penetrate the greater portion of it.

The wombat — speaking proportionally — is possessed of enormously powerful fore-arms, fitted with long, curved claws, somewhat blunted at the extremities, the underside being slightly concave, or trenched. With these indispensable implements the deep soil of the forest is easily cast aside and burrows of varying length excavated.

Unlike the rapid, energetic, over-excited burrowing of a dog or rabbit, the wombat appears to work with precise calculation, steadily tearing away with those well-developed

* See Vol. I., page 304.

muscular arms the soft but root-bound earth as though intentionally posing as an experienced believer in conservation of energy where necessity demands severe physical exertion.

The animal works alternately at each side of the newly-forming burrow, first resting upon one side then slowly reversing its position in order to commence operations upon the other, even stretching upon its back to remove the more satisfactorily any object likely to bar its progress. Should an obstructive root or stone prove of great size, the burrow is slightly deviated in order to avoid it, the deviation almost invariably trending towards the left rather than to the right, beneath the obstruction rather than above it. Under all circumstances with which I am acquainted, the tendencies of the burrow are horizontal.

The necessity for short, thick-set limbs in an animal so constantly burrowing and digging will be readily understood (throughout the animal world long limbs are foreign to burrowers); and in its physical formation or structure will at once be recognised its suitability, or adaptation, to its environment.

From a profile point of view the wombat appears to have no neck, its head seeming to project straight from the broad, deep-set shoulders. Though I have spent many hours in watching these marsupials in their woodland homes, I can remember no instance where a wombat, desirous of examining any object in close proximity to itself or listening to any familiar or unusual sound issuing from behind or even beside it, turned its head without also turning its body. This is clearly another instance of "structural form in relation to environment." By way of contrast, take the koala, or native bear, which is capable of moving and directing its head to face all positions, and this without the necessity of also turning its body. It needs no elucidative comments to show how essential it is that the tree-climbing animal should possess all possible advantages in this respect, since, entirely dependent upon given situations among the branches offering little or perhaps no scope for movement, the animal, if deprived of this essential, would in no way be adapted to lead a climbing life among the tree-tops.

SKULL OF A BUCK WOMBAT.

In the quiet, secluded life of the wombat, however, always moving upon the ground or buried beneath the surface in the impenetrable blackness of its retreat, the possession of sinuous joints and supple limbs would be superfluous; not only out of keeping with the animal's

heavily-built frame, but also would signally fail in supplying much of the bulldog power so indispensable a faculty in the carrying out of its life's work. Again, the wombat has no tail, Nature once more showing her wisdom in the designing of its physical structure by denying the animal an appendage from which it would gain no benefit.

When burrowing, or seeking its food, the wombat does not make a general use of its snout, as does the wild boar, but by means of those able implements, its fore-paws, tears away the soil and selects such roots as are deemed palatable.

As I have stated, the burrows vary greatly in length, much usually depending upon the nature of the ground being worked. Thirty to forty feet is not an uncommon length where the soil is soft and comparatively dry: I have known them longer. If the animal, in consequence of drought or any other natural cause, is compelled to travel far in search of water, burrows of small dimensions and short length are excavated, to serve as points of vantage in case of danger or attack, at various intervals.

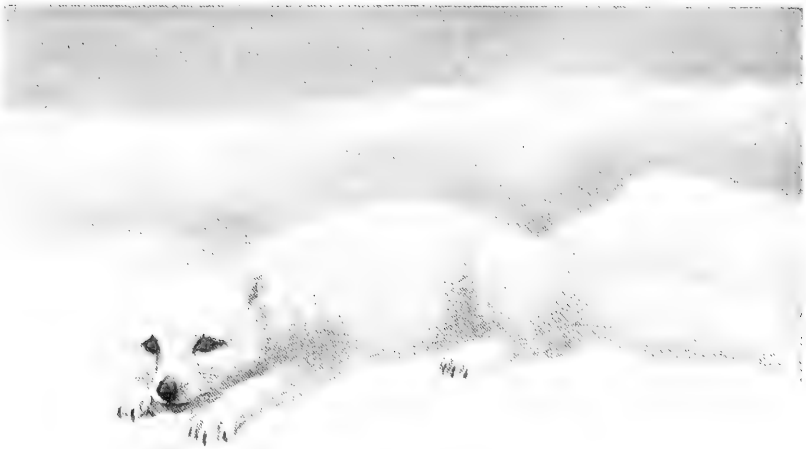
The wombat's locomotive power and action are in exact accordance with its solid proportions; this is practically determined and amply illustrated when the animal is watched by an unseen observer. When roaming at will among the heavily-timbered, densely-ferned gullies of the bush, its general style is sedate, its "every-day" walk in no way hurried. Calmly the animal moves along, occasionally halting to examine in a casual way some upturned fern, scratch away the earth from a favourite tree-root, or sniff the shaded atmosphere to test the "reading of the wind."

Nevertheless, however lethargically the wombat may seem to move about in moments of idleness and leisure, under circumstances causing excitability or sudden alarm it is difficult to believe that the slow-going, serious-looking creature is one and the same as that which gambols with its mate or neighbour, for its action, if clumsy, is at least an exhibition of unmistakable agility. Rushing along one of its many well-trodden lanes, the animal, as though suddenly petrified, remains perfectly motionless, awaiting, it would seem, a signal-grunt from its playful companion, upon hearing which the apparently immovable creature again sets off, as though bent on a mission of unparalleled importance, grunting spasmodically as it goes. Later, the two sportives will chase each other alternately and finally disappear into some adjacent cavern, wherein, to judge from the scuffling noise, the game is continued for awhile.

So well-defined and firmly beaten are the tracks formed by the wombat in the great fern-patches which clothe the sloping portions of the ranges, that I have frequently been tempted to cross these seemingly impenetrable bracken thickets, wild tangles which otherwise would remain "a closed book" to the hunter. Where wild oats, wire-grass, and a variety of creepers and low scrub hide the surface of the ground beneath a vegetable wilderness, the tracks of a wombat can only be seen by kneeling upon all fours; then, miniature avenues running in various directions suggest to the explorer what complete shelter from sun or shower can be enjoyed by the wombats in such shady lanes. These tunnels through the lower forest are largely patronised by other denizens of the ranges, such as rat-kangaroos, bandicoots, native cats and mountain opossums, as is evident by the tracks they leave behind them where the ground chances to be moist and soft.

The flesh of the wombat is extremely palatable, and can be "dished up" in a variety of different ways. Of late I have introduced it into two or three bush homes, and in all cases the request is the same: "More, please, as soon as convenient." The wombat may be classed with uniparous animals, since, speaking from my own unvaried experience, it gives birth to one "joey" only during the season.

[The next article in this series will deal with the Porcupine Ant-Eater.]



WHITE PHASE OF ARCTIC FOX.

BLUE PHASE OF ARCTIC FOX.
From an original painting by E. T. Smith

A. C. FOWLER, TYPO. LONDON.

A NOTE ON CICADAS.

Written and Illustrated with Photographs by T. A. Gerald Strickland, f.e.s.

CICADAS are large, handsome, noisy bugs usually found in warm countries, though one very scarce species has been met with in the south of England. Perhaps these insects are more noted for the music they produce than for any other attribute, though the family can also claim distinction from the fact that it contains the longest-lived insect known—the Seventeen-Year Cicada.*

But to return to the musical Cicadidæ, some of these were held in great honour by the ancient Greeks on account of the sounds they emitted. Probably the various species have different voices, as opinions vary so much as to the pleasantness or otherwise of their vocal entertainments. For instance, the Greeks kept the creatures in cages on account of their song; one poet spoke of the cicada as the "Nightingale of the Nymphs," and "to excel this animal in singing seems to have been the highest commendation of a singer." But, on the other hand, some authors write in quite a different strain, comparing the cicada's tones to a "combination of threshing-machine and frog pond" and the "whistle of a locomotive," whilst others speak of their "loud shrill screech," "harsh and deafening note," "bursting the very shrubs with their noise," etc. Be all this as it may, the stridulating apparatus of the male, producing the much-discussed sounds, is of great intricacy and interest: it consists, speaking non-technically, of two marvellously constructed little drums situated on either side of the

CRYPTOTYMPANA INTERMEDIA.

* See illustrated article on this subject, Vol. II., page 219.—Ed.

abdomen—the whole complex musical instrument being shielded with opercula. Why the male cicada should be furnished with such an elaborate and noise-producing apparatus is doubtful. Are the females, in which, however, "no special auditory organs have been detected,"* attracted thereby?

My friend Colonel J. Randal Wilmer has no doubt on this matter, as he has had ocular demonstration. He says: "On one occasion I noticed a male cicada perched on a tree-trunk chirping loudly, and I stopped to watch him. Presently I heard a slight rustling in the leaves overhead; the insect ceased his music for a time, but soon recommenced to stridulate even more violently. There was another rustle, and, straight as án arrow, a female flew down to him, and their marriage took place before my eyes. I then went into my house, procured a tumbler, placed it over the pair, and carried them captive away with me."

HUECHYS FUSCA.

CRYPTOTYMPANA INTERMEDIA.

GÆANA MACULATA.

GÆANA MACULATA.

If the female has no ears, how did she hear the song of the male? Did she feel certain vibrations caused by the noise? We do not know—and that is all about it. The females are silent—hence the lines of the "Saucy Rhodian Xenarchus":—

> "Happy the cicadas' lives
> Since they all have voiceless wives."

(No note on the cicadidæ, however short, would seem complete without this quotation, so I am relieved to have worked it in successfully!)

The emblem of the science of music was usually a cicada sitting on a harp, and I may end this little note by telling the old story which shows how a mere insect became thus honoured:—

Once upon a time, when the World was Younger and Things Happened, because people Believed that they Did, there lived in Athens two Musicians named Eunomus and Ariston, who were Rivals. They commenced to Play. Suddenly a String snapped in the Harp of Eunomus!—and yet he was Victor, for a Cicada perched upon his Instrument and took the place of the Broken String.

* Dr. Sharp, in *Cambridge Natural History*, "Insects."

YOUNG BLUE TIT.

NESTING-BOXES FOR BIRDS.

Written and Illustrated with Photographs

by HERMANN LEA.

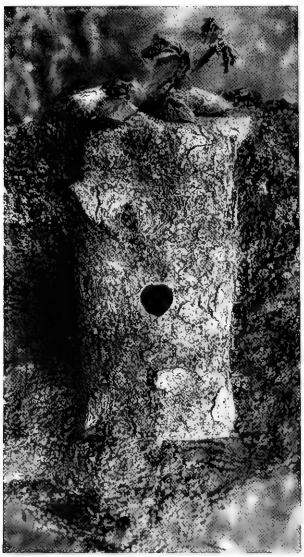
BLUE TITS.

ONE of my first labours after taking possession of my present house and garden was to fasten up suitable boxes for birds to build in, each box being adapted for a particular kind of bird. The idea I had in mind was to entice birds to build where they would be comparatively safe from their natural enemies, and also that I might have the pleasure of watching them more intimately. By encouraging birds to build their nests in my garden I get the added advantage of their usefulness in ridding the ground of surplus insects—for Nature has so arranged her scheme of life that birds form one of the most effective checks to the over-multiplication of insect life. My efforts were quickly rewarded, for some three days after the boxes were put up a pair of robins selected one and hastily constructed their nest. Later a pair of starlings took a second box; two pairs of greater tits built in two others, and a pair of blue tits reared an extensive family.

All those species of birds that naturally select a hole in a tree, wall, or bank may be induced to take to a box provided it is of suitable size, is placed in a proper position, and has an entrance suitable to the size of the bird. In winter they frequently use the boxes as roosting places.

BLUE TITS.

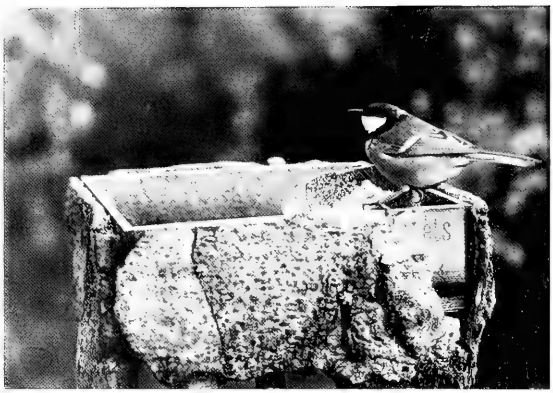
One pair of greater tits selected a box that was far too large for their nest, and consequently spent many an extra hour filling up the surplus room with moss. They seem to prefer a hole just large enough to squeeze in, doubtless finding from experience that the smaller the aperture the less risk is there of interference from cats, or from other birds—although in this last matter the



NESTING-BOX.

straws wound round the sides. Another three days passed, and the whole contents, including the four eggs, was strewn on the lawn underneath. Then the birds made yet another start, constructed a nest of sensible size, laid a second batch of eggs, and successfully reared a brood of youngsters.

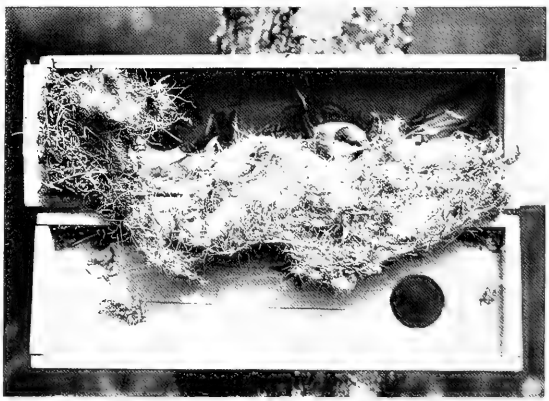
Yes, it certainly pays the gardener to expend a little trouble in fixing up boxes, for



GREATER TIT WITH NEST IN BOX.

greater tits are quite competent to take care of themselves, and will defend their home with vigour.

Starlings are birds possessed of curious characters. A pair took to one of my boxes some weeks before actually beginning to build, and one or other of the pair was always close at hand, on the watch to prevent others intruding. Then we saw them busy, early and late, for a week or more, and on looking in the box we found it contained one celandine, a piece of coloured string, and two or three straws. They rested for a time and then began again, and in a day or two had filled up practically the whole box with straw, twigs, and various odds and ends. A few days later the box was emptied once more and four eggs were laid at the bottom, on the bare wood, with merely two or three



A NESTING-BOX OPEN, SHOWING NEST OF YOUNG GREATER TITS.

the birds are never weary of hunting for insects to satisfy the four to ten hungry, wide-open mouths.

As an instance of the advantages in having insect-hunters close at hand, I may mention that whereas some of my neighbours complain of their gooseberry bushes being covered with caterpillars and destitute of leaves, my own trees have not a single "palmer" on them. Nor do the birds rob me of an over-proportion of buds; in fact the amount they do take is beneficial, and ensures finer, better developed fruit. It has been stated by competent observers that the fruit buds picked off by the birds contain, in every instance, either the egg or larva of some insect.

"Do not the birds rob you of fruit?" my friends often ask. Certainly they do unless I take the precaution to net it. But I always let them have some share; it seems to me to be their due, after the help they have given during the earlier part of the year. Some birds—especially blackbirds, thrushes and starlings—appear to prefer a fruit diet to almost any other, but many birds eat fruit chiefly for the juice which it contains. Thus in very hot summers it is more difficult to protect the trees and bushes; but if pans of water be placed on the paths it will satisfy the cravings of a good many of the depredators, and they will leave the fruit in peace.

The first year I contented myself with plain bare boxes, but now I construct them more elaborately. The front is hinged, so that the contents may be more easily seen, and the boxes are covered with bark so as to match the trees to which they are attached. Many of the birds are so tame that they sit quietly on their nests and allow me to stare at them without showing any fear or any great surprise.

In Germany it is quite a common thing to see artificial nesting-boxes hung about in the gardens. These are usually made of pottery, in varying sizes; they last a long time—many years—and are always water-tight. I have never seen them in England, but no doubt if a demand were created they would soon be obtainable.

YOUNG WILLOW-WRENS.

ZOO NOTES.

Common Mynah.

No bird is more characteristically Indian than this species (*Acridotheres tristis*), which is found almost all over India and is the more familiar from its habit of making its nest in buildings and walking about in roads, and even the broader streets of towns. This Mynah is a handsome bird, too, its chocolate-brown plumage, diversified with black and white, being well set off by its brilliant yellow bill and feet. There is also some bare yellow skin round the eye, but the camera has somehow failed to reproduce this. New-comers to India at once recognise the mynah as a species of starling, and similarly the natives call our starling, which visits them in the winter, the "spotted mynah." This mynah is, however, as may be gathered from what has been said above, even more attached to the neighbourhood of man than is the starling of Europe, and, being tame without the intrusiveness of the crow and sparrow, is popular with both Europeans and natives in India. It is also a useful insect-destroyer, and this attribute has led to its introduction into many countries not naturally within its range.

Photo by W. P. Dando, F.Z.S.

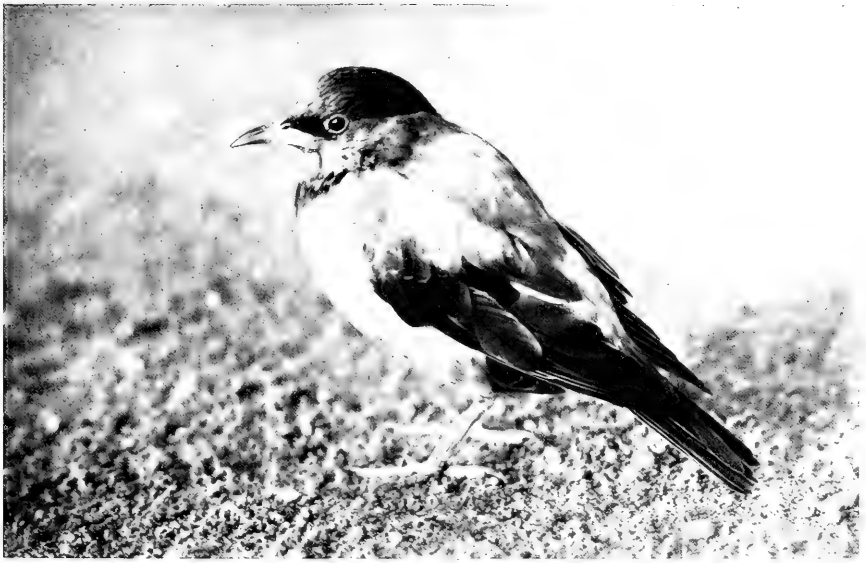
COMMON MYNAH.

Rosy Pastor.

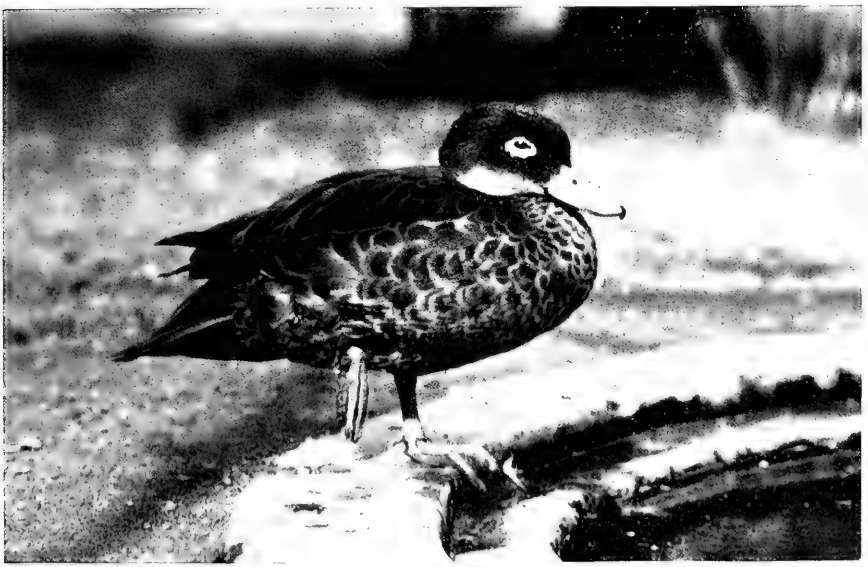
Another Eastern member of the Starling family is *Pastor roseus*, whose beauty is hardly done justice to by the photograph, which was taken from a specimen not in its best plumage. When in its full bravery of spring attire the Rosy Pastor has a long, drooping crest which, with the rest of the head, the wings and the tail, is of a fine metallic black, while the remainder of the plumage is of the most lovely salmon-pink, affording a combination quite unique among birds. In addition to this, the bird is more gracefully formed and more active in its movements than starlings generally, and may be ranked as the most beautiful of the family. Although most birds of this species winter in India, they do not breed there, but in various localities from Central Asia to Italy, thousands nesting together, and then perhaps deserting that locality for many years. The young fledge rapidly, and on leaving the nest almost exactly resemble the dull-coloured young of our own starling in plumage; their differently-formed beak, however, at once distinguishes them. The bird not unfrequently straggles to England, odd specimens getting mixed up with flocks of starlings.

Andaman Teal.

This is at first sight rather an uninteresting little duck; even the drake presents no bright hues, unlike the male of our own Teal, but bears the sombre plumage common to the females of so many of the duck tribe. It possesses, however, some remarkable



ROSE-COLOURED PASTOR.



Photos by W. P. Dando, F.Z.S., Regent's Park.

ANDAMAN TEAL.

points. One is its fondness for perching; the specimens in the Western Aviary at the Zoo, where this photograph was taken, are constantly to be seen up on the perches with the doves confined with them; and in flying they seem almost as active as pigeons. Another remarkable thing about the bird is its proneness to variation. The specimen illustrated has only the throat, a ring round the eye, and a little patch at the base of the bill white, of the head-feathering; but many examples have very much more white on the head, the whole face being frequently of this colour. It would thus seem that the species is still in a state of evolution, and, as such white-faced specimens were apparently unknown less than a quarter of a century ago, the evolution is quite recent.

YOUNG HERRING-GULL.

Herring-Gull.

In the brown-mottled plumage which so many of them wear as their first dress, the Herring-Gull (*Larus argentatus*) is almost impossible to distinguish from the Lesser Black-Backed Gull (*L. fuscus*). Herring-gulls have bred well at the Zoological Gardens, and it is noteworthy that the more richly-coloured herring-gull of the Mediterranean (*L. cachinnæus*) reproduces truly there, and shows no tendency to assume the paler and weaker hues of the northern species though bred in our very different climate. The ordinary herring-gull also breeds in the London parks; two specimens bred last year in Regent's Park might often have been seen flying about there, and there is another unpinioned specimen in the park which, judging by the fact that its plumage last year showed much of the pure grey and white of maturity, must have been a year older. It would be a very good thing if a park-bred strain of herring-gulls could be established, as the evolutions of these fine birds on the wing make them great ornaments to the parks.

Photos by W. P. Dando, F.Z.S., Regent's Park.

ARGUS PHEASANT.

Argus Pheasant.

The poor Argus Pheasant looks very "sorry for himself" in the illustration, and well he may be, for he has evidently lost the ends of his toes from exposure to cold and damp in the aviary near the cattle sheds. Indeed, the argus, coming from the warm steamy jungles of the Malayan region, might be expected to need some

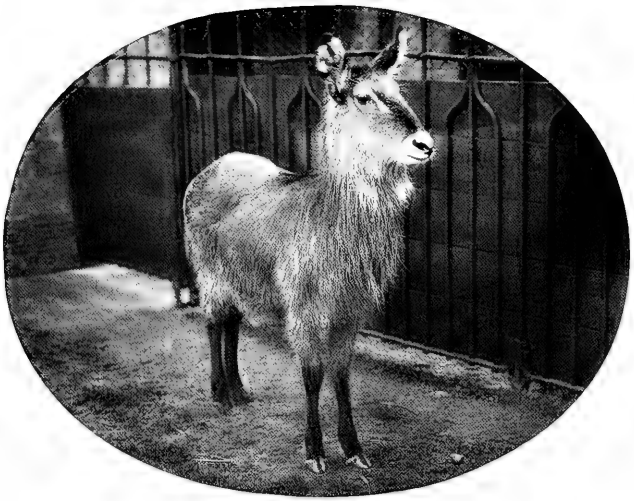
protection, although the peacocks, also inhabitants of hot climates, seem to be much more hardy. The courting display of the argus is even more remarkable than the peacock's, for when showing off to the hen he expands his great wings and brings them forward so as to meet in front and form a huge fan before his head, this being the best way of exhibiting the numerous "eyes" with which they are decorated.

Photo by W. P. Dando, F.Z.S., Regent's Park.
EASTERN ONE-WATTLED CASSOWARY.

One-Wattled Cassowary.

THE most noticeable distinctions between the different kinds of Cassowaries are to be found in the colour of the bare skin of the neck. In the present species (*Casuarius unappendiculatus*) this is bright orange-yellow, and, with the fact that the wattle at the lower part of the neck is single, easily distinguishes it from the blue-necked and double-wattled Common Cassowary (*C. galeatus*). The one-wattled species was first described by Blyth, nearly fifty years ago, from a specimen kept in the menagerie of Babu Rajendra Mullick, a great collector of animals in Calcutta.

The taste for keeping live creatures has greatly fallen off among the natives of India of late years, but many foreign animals, cassowaries of one sort or another included, are still imported. Cassowaries are amusing pets when young, and the present writer has seen them allowed to run loose about a dealer's yard, where they would lie down to sleep at night close to the native servants. Even when young, however, the cassowary shows signs of the fierce temper which renders it, in most cases, positively dangerous when adult even to human beings. One of the above young birds was offended by the airs of a fawn-coloured European turkey which used to parade about the yard, and with one kick

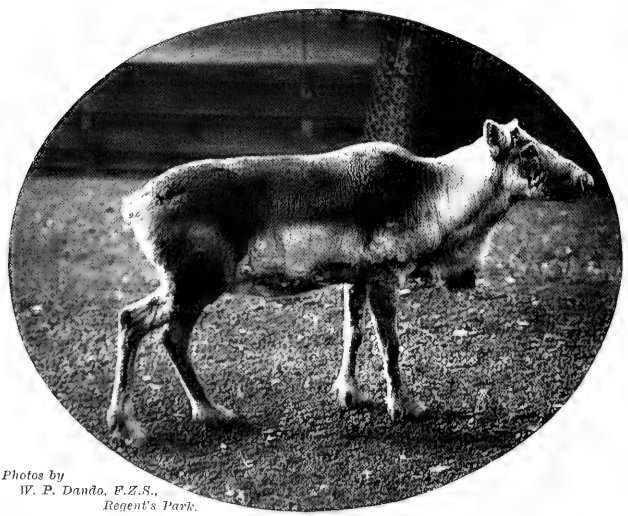


FEMALE WATERBUCK.

so damaged poor Bubbly-jock that he died of his injuries.

Female Waterbuck.

THE figured example of *Cobus ellipsiprymnus*, not having the characteristic horns of the male, might easily be mistaken for a female of the deer family, its general proportions and coarse, wiry coat being very deer-like. In size also it about equals a red deer. It is, however, a true African antelope, and the buck's horns are of quite an ordinary antelopine type, ringed, erect and diverging. In its habits it is more aquatic than most antelopes other than the curious long-hoofed swamp species forming the genus *Limnotragus*, and habitually frequents the margins of rivers and other swampy and even muddy ground overgrown with moisture-loving plants rather than the dry, open country which antelopes commonly affect. It is also fond of wallowing in hot weather. Mr. Selous, however, has found it on steep stony hills, even a mile from the nearest river; he noticed that in spite of its heavy form it was wonderfully swift and sure-footed in negotiating the steepest hillsides, although when pursued it always made for the waterside. It is evidently a beast of adaptable nature, and is very common in the parts of Africa it affects; it has a wide range, from the Limpopo River in South Africa northwards up the east side of the continent to the Shebeyli River in Somaliland. It is a frequent prey of the lion and leopard, but



Photos by W. P. Dando, F.Z.S., Regent's Park.

REINDEER WITH ITS ANTLERS SHED

the flesh is not appreciated by man, even the negro not having a great relish for the hard, stringy, rank-smelling meat.

A peculiar point about the coloration of this antelope is the curious white horseshoe on its hind-quarters, though, on account of the position in the photograph, it cannot be seen. Why the waterbuck should have a narrow ribbon across the quarters in this way remains one of the puzzles of animal marking, notwithstanding Mr. Pocock's ingenious suggestions.

Reindeer.

THE illustration of this animal (*Rangifer tarandus*) well exhibits its characteristic peculiarities of form—the rather short legs, small ears, and large hoofs, which, together with the low carriage of the head, render this beast very unlike the elegant animals with which we usually associate the name of deer. The Reindeer, however, yields to none of its family in usefulness to man or in scientific interest. It is the only deer which can be fairly called a domestic animal, supplying the Lapps and other northern races who use it the place of both horses and oxen; and it is also unique in the fact that both sexes regularly possess antlers. The present individual happened to be photographed when these appendages had been shed; when present they are long and many-pointed, but present great variations, the two antlers being frequently unlike in the same individual. The brow-tine is remarkable in that it is branched and often flattened or palmated.

Reindeer vary a great deal also in colour and size, so that it is not astonishing that some naturalists recognise several species. But the best authorities admit only one, which is found all round the world in high latitudes, being called caribou in America.

Chacma Baboon.

THE two likenesses of this animal show how pathetically human even these "dog-faced" apes are when ill; it is easy to see that the second photograph was taken not long before the poor beast's death. In spite of their brutal physiognomy, the baboons are among the most intelligent of monkeys, and the present species (*Papio porcarius*) has been often trained to perform various useful

Photos by W. P. Dando, F.Z.S., Regent's Park.

CHACMA BABOON IN HEALTH AND SICKNESS.

actions in its native country of South Africa; the story, related in the first number of ANIMAL LIFE, of the one that worked the railway signals sufficiently proves this statement.

GILA MONSTER (*Heloderma suspectum*).

RANDOM NOTES ON LIZARDS.

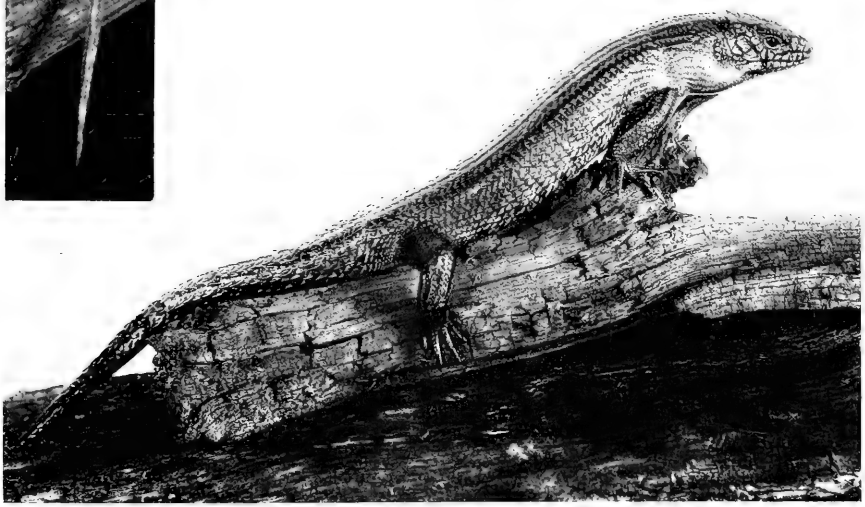
Specially written for ANIMAL LIFE by Dr. R. W. SHUFELDT (of New York), C.M.Z.S., etc.

Illustrated with Photographs by the Author.

THE fact that almost every large city contains a number of shops which sell living animals, either to private individuals as pets or to zoological gardens for their collections, shows that the interest in animal life is very general. It is to these shops that naturalists are often indebted for being able to study and photograph living specimens of animals which otherwise they might have no opportunity of observing. Three of the lizards illustrating these notes came to me in this way. The species to which I refer are, first, one of the three forms of lizards occurring on the Canary Islands and known scientifically as *Lacerta callotis*; second, an unusually fine specimen of Cunningham's Skink (*Egernia cunninghami*) from Australia, nearly ten inches in length; and lastly, two large specimens of the common Stellion Lizard (*Agama stellio*) found in Syria, where these were captured. It is very seldom indeed that any of these lizards are seen alive in America, so it was with an unusual interest that I made their photographs and studied them.

My other reproductions of photographs from life herein shown are also some of my own studies, and they represent lizards found in the United States, viz., the Common Alligator Lizard, or as it is sometimes called, the Fence Lizard, or, less frequently, the Swift, and the far-famed Gila Monster or Heloderma, a reptile of which I have had a very considerable experience. The picture I have selected from my collection to represent this lizard here is a direct dorsal view from above of a large specimen (over 20 inches long) that I had alive for nearly a year. It makes an unusual and interesting illustration from the fact that this famous lizard is more commonly photographed from a lateral point of view.

COMMON STELLION (*Agama stellio*).



Photos by R. W. Shufeldt, New York.

CUNNINGHAM'S SKINK (*Egernia cunninghami*).

Photo by R. W. Shufeldt, New York.

A CANARIAN LIZARD (*Lacerta callotis*).

Photo by R. W. Shufeldt,] A RACE TO THE TOP—A DEAD HEAT. (A pair of Stellions.) [*New York.*

The lizards foreign to the United States of which I give illustrations here I have not enjoyed the opportunities to study in their natural haunts, but in many respects these have been given us by others who have visited their habitats. Like nearly all the larger skinks, the Cunningham's I found to be a very gentle, quiet, in fact somewhat sluggish reptile that exhibited no fear upon being handled, and no disposition to bite the person who held it fast. I made several photographic negatives of the reptile, the most spirited one being reproduced in the present communication.

The true skinks all belong to a large family of ground lizards that have a wide distribution, being found not only in Europe and Asia, but also throughout Australia, Africa, and America. In their relationships they are more or less closely connected with other groups of ground lizards noted for their having either no limbs at all or else only rudimentary ones. The well-known Slow Worm, or, as they call it in England, the Blind Worm, or in Cornwall the Cripple Worm, is one of these latter. Such a limbless lizard we also meet with in the United States, where it is known as the Glass-Snake (*Ophisaurus ventralis*). It is noted for the great brittleness of its tail or that part of the creature situated posterior to the vent.

FENCE LIZARD.

One of the best-known groups of the typical limbed skinks is, however, the genus *Eumeces*, of which over twenty species have been described, with a few subspecies. I have personally collected a number of the skinks in America, and especially the very beautiful Blue-Tailed Skink (*E. quinquelineatus*), and others. In early spring they may frequently be discovered by turning over old logs or flat stones in the woods, where they will be found concealed among the dead leaves of the previous year, or such other débris as accumulates in such places.

With Cope I have noticed the tendency of the adult scincoid reptiles to lose their colour with advancing age, and of the two Cunningham skinks before me from Australia the smaller one is darker than the larger, though no brighter in the matter of glossiness. I have noted this also to be the case in Heloderma, the big Arizona species of lizard, where the black and the orange in the younger specimens were very much darker than in those far advanced in age.

Many of the limbless relatives of the skinks are subterranean in their habits, making it difficult to study them in nature; and as a matter of fact, in so far as the American forms are concerned, we have a vast deal yet to learn in regard to their geographical distribution, their mating and breeding habits, and the foods upon which they subsist.

The Stellion Lizards are extremely susceptible to the effects of cold. It was very chilly the morning I brought them over to my study packed in a box, a distance of about a mile from their owner's. They appeared to be almost dead when I took them out in my hand, and suspecting that it was the cold I placed them on a table directly in the rays of the warm sun, and the effect on them was almost immediate. They at once revived, exhibited considerable strength, and became very active, so much so that I feared I should have considerable trouble in getting photographs of them.

I did not ascertain the sex of these specimens, and for all that I discovered to the contrary they may both have been males, or both females, or the two sexes may have been represented in them. I photographed the larger one as it stretched itself quietly on an old piece of timber, and upon placing another old dead limb in the vertical position they both ran up it together, and I obtained a fine picture of the pair as they arrived at the summit.

Stellions belong to a family of lizards technically known as the *Agamidæ*, a group containing many different genera, and found distributed throughout the tropical regions of the Old World and Central Asia. Some are arboreal in their habits, while still others are terrestrial. To the latter belong the stellions here shown, representing as they do the genus *Agama*, containing terrestrial forms of Western Asia.

In America the *Agamidæ* are not represented, being replaced throughout the New World by the *Iguanidæ*. If we compare various species in the two families, however, some very striking parallels are to be observed, and these doubtless have been produced through the operation of identical causes affecting the organisms in a similar manner. In terrestrial species the body is depressed, while on the other hand in the arboreal forms, as Mr. Boulenger has pointed out, it is compressed. Again, in the two families we meet with species possessing horny processes on the scales of the body, as well as still more pronounced ones on the head; while in both families still others develop horny spines on the tail. Turning to the arboreal forms of the two families, we meet with representatives in each of them having a median dorsal crest composed of a series of spine-like processes, resembling in some instances the dorsal fin-rays in ordinary fishes. In other species these crests are the result of elongated spines of the dorsal and certain caudal vertebræ, producing similar results.

The stellions of the *Agamidæ* now under consideration have their parallel exactly in *Phymaturus palluma* of the *Iguanidæ* of the New World.

The Canarian Lizard reminds me very much of the common American chamæleon found throughout the southern part of the United States. This lizard of the Canary Islands, however, belongs to the family *Lacertidæ*, an Old World group, while Dr. Günther considers our chamæleon to belong to the New World *Iguanidæ* and to be a representative of the genus *Anolis*, an opinion entertained by all herpetologists so far as I am aware.

All the ordinary four-limbed lizards in Europe belong to the same genus that this Canarian Lizard belongs to—that is, to the genus *Lacerta*. Even in England there are two well-marked species of the *Lacertidæ*, viz., the Common Lizard (*L. vivipara*) and the Sand Lizard (*L. agilis*), while the Green Lizard (*L. viridis*) is found on the island of Guernsey. The latter is the largest of the *Lacertidæ* within this area, though not so large or so well developed as specimens coming from south Alpine regions. The viviparous Common Lizard not only occurs in England and Scotland, but is also to be found in certain restricted districts in Ireland, and wherever found it delights in localities where the heath abounds and banks are common. Rarer than any of these species is the Sand Lizard, now I believe found in England only in the New Forest and in a few localities in the south. Specimens coming from the Continent, where it is abundant, are of larger size and more highly coloured. Continental examples may measure as much as nine or ten inches in length.

The Fence Lizard is also a viviparous species, and its eggs are sub-ellipsoidal in form and perfectly white. During the breeding season, the male of this lizard is a wonderfully handsome reptile, especially in the coloration of its lower parts, which although of a dingy white, are made conspicuous by being set off on either side by an area of deep, iridescent cobalt-blue bordered by a jetty black band. There are many species of this genus (*Sceleporus*) in the United States, differing much in size, colour, and appearance. I am most familiar with some of the south-western forms, and the type of the eastern one here shown. They are extremely interesting little reptiles, perfectly harmless, very gentle, and prettily marked. In the middle districts, as soon as the spring is thoroughly opened and the sun becomes powerful enough to warm up the woods and waysides at midday, then these lizards come forth from the places where they have spent the winter, and are to be observed basking on the old fence-rails or scampering with great agility up the tree-trunks when an attempt at capture is made. I have kept them alive upon many occasions, and found them to be almost wholly insectivorous, and especially fond of flies and ants. Dr. Günther and other herpetologists have classed this genus among the terrestrial lizards, but I have found the members to be quite as much arboreal in their habits as *Anolis*, which by no means confines itself to the trees, as the author I have just quoted seems to believe, placing it as he does, in his classification, among the arboreal genera.

De Kay, an American naturalist, claimed that this Fence Lizard (*S. undulatus*) has the power of changing the brownish olive or grey of its back to a bright azure colour, but I have never seen anything of the kind take place, and I think De Kay was mistaken, or at least misinformed in this matter. It is a well-known fact to naturalists, however, that the little fence lizards lay their white eggs, that I have described above, in the sand in the early part of June, and that they hatch out in about a month; and it is said that when the young appear "they are treated with the utmost gentleness by all the adults." I have collected this lizard as far south as Mount Vernon, Alabama, and have found it abundant in the District of Columbia and in Maryland.

Passing next, for a brief consideration, to the Heloderma, I find that the reptile has been written about and figured in many papers and works upon natural history. Still, no little doubt seems to prevail among people generally that this lizard is a venomous one, and that its bite may prove to be fatal in the case of man. This is one of the most interesting parts of its history, and the more I investigate the matter the less inclined am I to believe the truth of the statement. Indeed, I have yet to meet with a case, either in my reading or through personal observation, where a person has died from the effects of the bite of a heloderma. Certainly, up to a few years ago, when I published a full account of the species, no well-authenticated instance of the kind was on record, and, as I say, no such case has come to my knowledge since. There seems to be, however, some pretty good evidence extant going to prove that with respect to the nature of the wound it inflicts with its teeth, in the case of small animals it has been established that it occasionally turns out to be fatal. Dr. Mitchell's experiments with heloderma venom in Philadelphia appear to corroborate this much. As I have already stated, in my own case the bite was certainly non-venomous, although it was inflicted by a very large and healthy specimen recently captured in Arizona, and the wound, a very severe one, cutting through the ball of my thumb clear to the bone. Beyond sucking the incision, and the internal administration of about an ounce of pure whiskey, with a simple subsequent local dressing, nothing whatever was done in the way of treatment.

While they were formerly very common in the south-western States, these reptiles are becoming very rare. This is due to their having been killed whenever met with.

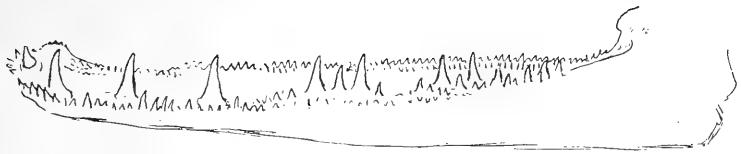


Fig. 1. Lower Dentition of the Bony Pike.

ANIMAL DENTITION.

By R. Lydekker.

PART IV. FISHES—(*concluded*).

THE preceding article of this series was devoted to the consideration of the dental apparatus of the sharks, rays, chimæras, lung-fishes, and their extinct allies; in the present, and final, section we have to consider the teeth of the modern bony fishes and their forerunners the enamel-scaled fishes, of which the great majority belong to long-past epochs of the earth's history. These groups comprise such an enormous number of representatives that anything like a comprehensive survey of the various modifications presented by their dentition would obviously be altogether impossible in the space at my command, while it is only too likely that it would prove wearisome to my readers. I shall accordingly confine my observations to some of the more strange and remarkable types of dentition, especially those which are of more than ordinary interest either from their intrinsic beauty, or from peculiarities in structure, arrangement, or situation.

If we omit their near relations the sturgeons, which have exchanged the polished scale armour for a series of bony plates, the only modern survivors of the great group of enamel-scaled fishes are the Bony Pike (*Lepidosteus*) of the rivers of North America, and the Bichirs (*Polypterus*) and Reed-Fish (*Calamöichthys*) of those of tropical Africa. As regards the teeth of these survivors of a lost group, it must suffice to say that in the bichir there are two rows of small sharp teeth, of which those in the front row are the largest, while the hinder ones are rasp-like. The long jaws of the bony pike (Fig. 1) are armed with similar pointed and rasp-like teeth, arranged in several rows, those of one row being much larger than those of the others, while each tooth is separated from its neighbour by the sockets of older teeth which have been shed. Teeth of the same general type also occur on the bones of the palate. Fishes from the Carboniferous formations (*Rhizodus*) exhibit a somewhat similar type of dentition, but, in correlation with the superior dimensions of the fishes themselves, the enlarged teeth were of great size, measuring an inch or more in length, and constituting formidable weapons of offence.

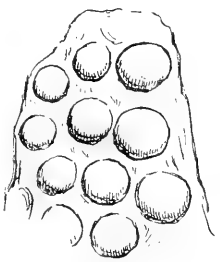


Fig. 2. Palatal Teeth of the Giant Lepidotus, from the Kimeridge Clay.

Of a widely different type from the foregoing is the dentition of the Wealden and Oolitic fishes known as Lepidotus, in which the palate was covered with a number of blunt hemispherical teeth evidently adapted for crushing. In the species from the Wealden formation of Kent and Sussex these teeth are comparatively small, and the crown forms a distinct although blunt cone. On the other hand, in the giant Lepidotus (Fig. 2), from the Kimeridge Clay, which is considerably older than the Wealden formation, the palatal teeth are much larger and flatter, and look like buttons. Not the least curious

Fig. 3. Mode of succession of the teeth in *Lepidotus*. At the top is a tooth in use, while below on the right is its successor, turned the wrong way up.

feature of these teeth is their mode of succession, the new ones being developed on the under-surface of the bone, and being gradually brought into use by its rotation as those on the opposite edge are worn away and shed (Fig. 3). It results from this peculiar mode of succession, which is very similar to that of some of the sharks, as described in the preceding article of this series, that the germs are situated immediately below the teeth in actual use, but, unlike the successional teeth of crocodiles, with their crowns facing in the opposite direction. These teeth must have belonged to huge fishes of six or seven feet in length, and, indeed, entire specimens of these approximate dimensions have been discovered in the corresponding formations of the Continent.

Whether these fishes were carnivorous or herbivorous I have no means of determining. The Wealden species, which was the last of its kind, was a fresh-water fish. On the other hand, judging from the associated fossils, the giant Lepidotus was marine. Apparently this indicates that a decadent type, originally marine, obtained a temporary refuge in fresh-waters (where it became dwarfed in size) before its final extinction.

From those of Lepidotus there is an easy transition to the teeth of the Oolitic and Liassic group known as Pycnodonts, or thick-toothed fishes. Like Lepidotus, these enamel-scaled pycnodonts were deep-bodied fishes, somewhat recalling a John Dory in shape. The teeth on the palate, and more especially on the bones known as the vomers, as well as those on the lower jaw, are arranged in a number of longitudinal rows, more numerous in the lower than in the upper jaw. From this regularity in their mode of arrangement, coupled with the elegant sculpture on the crowns of some, the teeth of the pycnodonts are some of the most beautiful of all fossils. In the typical Pycnodus (Fig. 4) the teeth have smooth and often transversely elongated crowns, those on the vomer forming a central row of broad ones flanked by two rows of narrower ones, while in the lower jaw there is a gradual diminution in size from the two middle rows to the outer ones. On the other hand, in the genus *Gyrodus* (Fig. 5), as well as in several allied types, the crowns of the teeth are beautifully fluted, sometimes concentrically and deeply, and sometimes more irregularly. These pavements of thick, round, convex or flattened teeth characteristic of the pycnodonts, wrote Sir Richard (then Professor) Owen many years ago, are adapted, like the corresponding teeth of certain existing fishes, to crush small molluscs and crustaceans. Whether this is anything more than an inference I am unaware; but evidence is, I believe, afforded that these fishes were carnivorous from the occurrence within their fossilised remains of scales of other members of their tribe. All of them were apparently marine.

Much more might be written with regard to the dentition of these and other types of extinct enamel-scaled fishes, but were I to devote more space to this group I should have none remaining for the bony fishes of the present day and their extinct relatives, some of which possess most remarkable dental adaptations of their own.

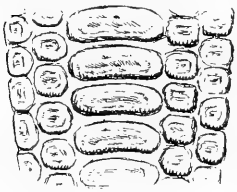


Fig. 4. Palatal Dentition of Pycnodus.

As one of the most aberrant and remarkable, I may commence with the curious Globe-Fishes, or Porcupine Fishes, whose small bodies are sparsely covered with spines, and when inflated (as they can be at the will of their owners) look like spiny footballs. In these tropical fishes the whole front of the jaws is formed by a great cutting-tooth, which in one genus, hence called *Tetrodon*, is divided in the middle line, both above and below, into two halves (Fig. 6), while in the other (*Diodon*) it is continuous in each jaw. In the former there is a rudimentary dental plate on the palate and

corresponding portion of the lower jaw, this dental plate becoming very large in the second of the two genera, where it is divided into two halves by a median cleft. The most remarkable feature about these teeth is, however, their structure, since they consist of a vast number of very thin plates superimposed upon one another somewhat obliquely, so that their edges are exposed upon the grinding surfaces. In these teeth the uppermost plates are, of course, the oldest. Globe-fishes feed largely upon coral, the branches of which their dentition is admirably adapted to break off and crush. The allied genus *Triodon* is intermediate between the other two so far as its dentition is concerned, the upper jaw-tooth being divided, while the lower one is single.

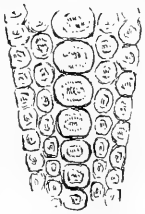


Fig. 5. Palatal Dentition of another Pycnodont Fish (*Gyrodus*).

The huge Sun-Fishes, which are nearly allied to the globe-fishes and have a dentition of somewhat similar type, claim special notice on account of the circumstance that teeth are also developed on the bony arches by which the gills are supported, as shown in Fig. 7. In this connection it may be mentioned that up to a few years ago the largest known sun-fish was a specimen in the British Museum, taken off the Dorsetshire coast in 1846. Its length is $7\frac{1}{2}$ feet. This specimen is, however, largely exceeded in size by one captured off Redondo, California, which is reported to have measured 8 feet 2 inches in length and to have weighed nearly 1,800 lbs.

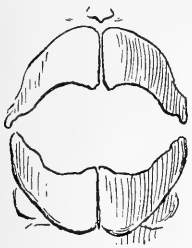


Fig. 6. Dentition of a Globe-Fish (*Tetrodon*).

Distant allies of the globe-fishes, the File-Fishes (*Balistes*) of the tropical seas have an altogether distinctive and peculiar type of dentition, in which the large teeth are limited to the jaws and the pharyngeal bones. In the upper jaw (Fig. 8) there are seven pairs of teeth arranged in two rows—four in the front and three in the hind row. The lower jaw carries only four pairs, corresponding to those of the front row of the upper one. In form these front teeth are somewhat triangular cones, and have their anterior surfaces coated with an enamel-like substance of a yellow colour. The second row of upper teeth are thin and shaped somewhat like the blade of a spoon; when partially worn they present some resemblance to unusually thin and broad upper human incisors, having a beautifully-polished external surface. A constant succession of both series of these teeth is maintained, so that if the bone of the jaws be cut open a number of successional teeth will be seen in their sockets destined, in course of time, to replace those in use. The pharyngeal teeth form small, laterally-compressed, curved and sharp-pointed cones, regularly arranged in two rows upon the opposing margins of the two pairs of supporting bones. The file-fishes, many of which are beautifully coloured and marked, feed on corals and molluscs, breaking off large pieces from the branching species of the former organisms with their front teeth, or chiselling holes into the shells of the latter with the same efficient implements. They do much damage to the mother-of-pearl fisheries by destroying the pearl-oysters in this manner.

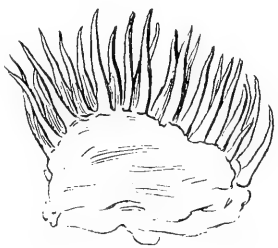


Fig. 7. Gill-Teeth of Sun-Fish.

Since I am not treating the subject in anything approaching a systematic manner, and merely select noteworthy types without reference to their zoological affinities, I make no apology for turning suddenly to a very different group of fishes, as represented by the Sea-Breams (*Dentex*). The name "Sea-Bream," it should be mentioned, must not

be taken to indicate that these fishes have anything to do with the common bream of our rivers, which belongs to a very different family—that of the carps. In the sea-breams and their allies the teeth, as in the file-fishes, are limited to the jaws and the pharyngeal bones, and are remarkable for their variety in form, and frequently also for their large size. In the true sea-breams of the genus *Dentex* the jaw-teeth form a single row, and are sharp and pointed, the series in some species being of equal size throughout, while in others larger tusk-like teeth occur at intervals.

Fig. 8. Teeth of a File-Fish, from the side.

In the fishes known as Gilt-Heads (*Chrysophrys*), which are members of the same group, the teeth display a somewhat aberrant type, those in the front of the jaws being adapted for seizing and tearing prey, while those further back are suited for crushing the food, this arrangement recalling the one which obtains in the Port Jackson shark, as described in the preceding article of this series. In these fishes there are two or three pairs of large tusk-like teeth in the front of the jaws, behind which comes a double or treble series of grinders, varying somewhat in form in the different species. A constant succession of teeth occurs throughout life, the new teeth in many of the species being similar to those they replace. On the other hand, in the common gilt-head of our own shores some of the hinder and inner crushing-teeth, which are hemispherical in the young fish, are replaced in the adult by one or occasionally two much larger teeth of an oval form.

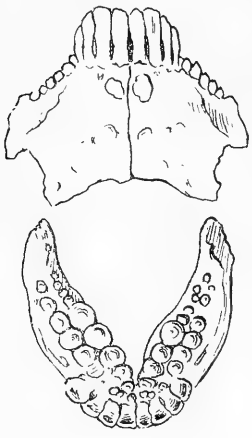


Fig. 9. Lower Dentition of the Sargus, from in front and from above.

A further modification of the same type of dentition is presented by the fishes of the genus *Sargus*, a well-known representative of which commonly goes by the name of Sheep's-Head in America. In the true sea-breams, as we have seen, the dentition is of a purely carnivorous type; in the gilt-heads it assumes a crushing character in the hinder part of the jaws; while in the sargus it is converted into a purely herbivorous type by the modification of the teeth in the front of the jaws into a form recalling the incisors of man or the corresponding lower teeth of a sheep. The resemblance of the upper teeth to human incisors is indeed so strong that, as Sir R. Owen remarks, it would have been no matter for surprise had the one been mistaken for the other by the older palæontologists. The number of these incisor-like front teeth is liable to a certain amount of variation in the different species of sargus. In one kind, for instance, there are four pairs in the upper and three in the lower jaw; in a second there are four pairs in each; while in a third the numbers in the two jaws are just the reverse of those in the first species. In the common Mediterranean representative of the genus the margins of the sides of the jaws are paved with hemispherical grinding-teeth arranged in three rows; these teeth become larger towards the hinder part of the mouth, those of the inner row being the largest, and those of the middle row the smallest. In the lower jaw there are two rows of similar teeth, those of the inner row being the larger. As with the

Fig. 10. Pharyngeal Teeth of Wrasse.

front teeth, there is a certain amount of variation in the number and size of the grinding-teeth according to the species. There is a constant and free succession of teeth in the sargus, as in the other members of the sea-bream tribe. Seaweed seems to form the food of these fishes. There are several other members of the tribe with sharp teeth in the front of the jaws and grinders behind, among them being the species of *Pagrus* and *Pagellus*. A difference in the form and number of the pharyngeal teeth occurs in each genus.

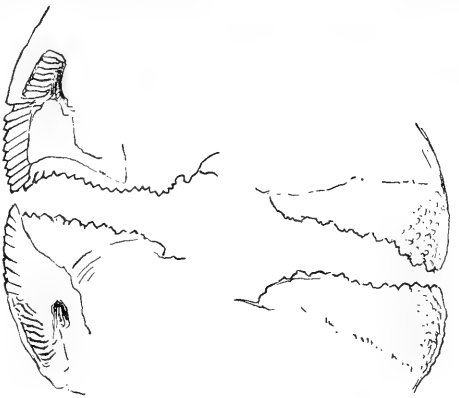


Fig. 11. Jaws of Parrot-Fish, from the inner and outer aspects.

Brief mention must be made of the dentition of the fishes known as *Chætodonts*, or bristle-tooths, among which is included the well-known Archer-Fish, remarkable for the habit of killing flies by darting a jet of water from its tube-like snout. In most of these fishes the teeth in the jaws resemble the hairs in a fine brush, and are of a soft, flexible, translucent texture; some genera have comparatively large teeth, while in others they are more like velvet pile.

The next fishes on my list are the beautifully-coloured Wrasses (*Labrus*, etc.), chiefly remarkable, so far as their dentition is concerned, for the great development of their pharyngeal teeth. In the jaws of these fishes the teeth are generally arranged in one or two rows, those of the outer row being conical and slightly curved, with a few at the front, and sometimes also at the hinder end of the series, considerably larger than the rest. The whole of the exposed surface of the pharyngeal bones of the throat is covered with a pavement of crushing-teeth (Fig. 10) varying somewhat in form, number and arrangement in the different members of the group, and likewise differing in shape in different parts of the bone in the same species. In most specimens of these bones it will be noticed that some of the sockets for the teeth are empty, and in the centre of a considerable number of them will be seen the summit of the crown of a new tooth, destined to replace the one which has been shed. Wrasses feed on molluscs, crustaceans, sea-urchins, etc., which are seized by means of the long front teeth, and ground to a pulp by the mill-like action of the crushing pharyngeals.

A still more powerful and complicated type of pharyngeal dentition is presented by the gorgeously-coloured Parrot-Fishes (*Scarus*, etc.) of the tropical seas, which browse, as Sir R. Owen graphically expresses, on the branches of the submarine forests of coral in a manner analogous to that in which ruminants crop the land foliage. The coral branches being, however, of a stony nature, require a much harder bite than do the twigs and leaves of the forest, and we accordingly find the jaws of these fishes modified into a beak simulating roughly that of a parrot in shape, but, in place of being sheathed in horn, encrusted with a highly-polished pavement of

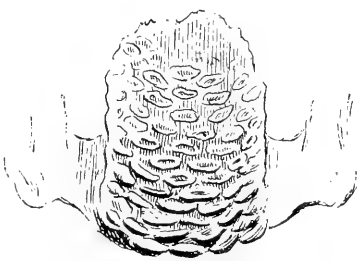


Fig. 12. Lower Pharyngeal Teeth of Parrot-Fish.

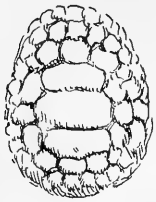


Fig. 13. Pharyngeal Plate of *Phyllodus*, from the London Clay of Sheppey.

smooth or tuberculated teeth arranged so as to form a quincuncial pattern, and having a fine cutting-edge at the margins of the jaws (Fig. 11). Such an arrangement is, of course, admirably adapted to prevent the surface of the jaws being abraded by the rasping action of the coral as the fishes browse. There are no teeth on the palates of the parrot-fishes, so that the grinding-up of the fragments of coral broken off by the jaws (which are worked by muscles of unusual power) is entirely relegated to the pharyngeal teeth (Fig. 12). On the two upper pharyngeal bones of the majority of these fishes the teeth form two pairs of longitudinal rows, which are convex from side to side. The two middle rows are in the shape of transversely elongated plates, set somewhat obliquely, and interlocking with one another in the middle line. The two outer rows, on the other hand, are small nodule-like teeth placed in the angles between the large plates. On the lower pharyngeal bone, which is undivided, the teeth occupy a much wider area, with a concave grinding surface to receive the convex upper millstone, as it may be called. All the teeth are comparatively small, with elliptical grinding surfaces, and form five or six longitudinal series, which alternate with one another so as to form a quincuncially-arranged grinding-plate of great power and efficiency.

But it must not be supposed that fishes of the present day have anything like a monopoly in the matter of crushing pharyngeal teeth of this type. Their ancestors of the Upper Chalk and the London Clay were equally efficient in this respect, as is exemplified by the pharyngeal plates belonging to the extinct genera known as *Pharyngodopilus* and *Phyllodus* (Fig. 13), both of which were more or less intimately related to the wrasses. The pharyngeal teeth of *Phyllodus*, of which the central ones are much larger than those of the marginal series, are remarkable for their extreme tenuity, and the rapidity with which they are shed and renewed. From the former character the genus derives its name of *Phyllodus*—leaf-tooth.

Crushing-teeth of a widely different type are developed in the voracious Wolf-Fish (*Anarrhichas*), a gigantic relative of the diminutive blennies of our shores. The wolf-fish, like the wrasses, feeds largely on shelled molluscs, and in order to pick these off the rocks or the ocean-bed a certain number of the front teeth in both jaws are large, conical, and recurved. The rest of the dentition is, however, of a crushing type, and the bones of the hinder part of the jaws and of the palate are covered with large nodular teeth, recalling an old-fashioned pebble, or "cobble," pavement. The pharyngeal bones support much smaller conical and pointed teeth. It would seem, therefore, that the wolf-fish crushes the shells of its prey in its mouth instead of, as in the wrasses, in its throat. A further remarkable difference from the latter fishes is to be found in the circumstance that the new teeth of the wolf-fish come up alongside those in use, instead of replacing them from beneath. Several of the teeth in a wolf-fish's mouth are generally broken or twisted out of place owing to the violent use to which they are subjected.

Fig. 14. Dentition of Wolf-Fish.

Passing over a large number of groups of fishes, a few words must be devoted to the dentition of the Carp tribe. In the great majority of these fishes the jaws are devoid of teeth, which are restricted to the bones of the pharynx. The degree of development of these teeth probably depends to a great extent on the extent to which these fishes feed on vegetables,

the Tench and the Carp, which subsist very largely upon water-plants, having the most powerful pharyngeal teeth. In the carp these teeth (Fig. 15) are arranged in two or three rows, the innermost row including a single tooth, the second having in some cases two rather larger ones, while those of the third row are the largest and most complex of all. In these the front one is the largest and has a smooth crown; the crowns of the others, when unworn, being sculptured.

Fig. 15. Pharyngeal Teeth of the Carp.

The last type of fish dentition to which I have space to allude is adapted to a purely carnivorous diet, and is presented by those voracious fishes known as Barracuda-Pikes (*Sphyræna*), which are relatives of the mackerel and the thunny. In one of the largest species the lower jaw (Fig. 16) is armed with a formidable array of sharp, lancet-like teeth, arranged in a single series, there being about twenty-four of these in each side of the jaw, and their size gradually increasing from back to front. In the upper jaw they are opposed by a double series of similar teeth, into the interspace of which they fit when the mouth is closed. In addition, there are also nine or ten lancet-shaped teeth on the palate which present the peculiarity, rare among fishes, of being implanted in separate sockets. As a rule the alternating teeth are shed, so that the formidable dentary apparatus is always maintained in a thoroughly efficient condition. Teeth of extinct barracuda-pikes are met with in the Tertiary deposits of Europe; but the antecedent Cretaceous seas must have absolutely swarmed with huge fishes armed with teeth more or less closely resembling those of the barracudas, and frequently inserted in distinct sockets. When the so-called coprolites of the Cambridge Greensand were worked for artificial manure, no vertebrate remains were more common in the phosphate heaps than the spear-like teeth of the fish then known as *Saurocephalus lanciformis*, but now called *Protosphyræna ferox*. An American Cretaceous fish of this type, known as *Portheus molossus*, must have been an even more formidable monster, attaining probably a length of twelve or fifteen feet, and thus perhaps disputing the tyranny of the ocean with the great swimming lizards which abounded at the same epoch.

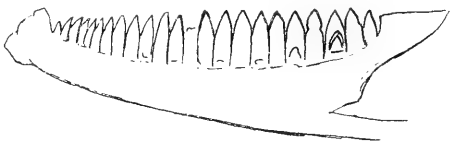


Fig. 16. Lower Dentition of a Barracuda-Pike.

Unlike what was the case in earlier periods of the earth's history, when the fishes were either predaceous sharks and rays, or were for the most part encased in complete suits of impenetrable armour of quadrangular enamel-coated plates, the seas of the Cretaceous epoch swarmed with thin-scaled fishes much like those of the present day, which must have fallen an easy prey to the barracuda-like *Portheus* and *Protosphyræna*. Among the most common of these Chalk fishes were species closely allied to and in some cases generically identical with the existing *Hoplopteryx* and *Beryx*, commonly known as Slime-Heads.

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough, F.Z.S., F.E.S., etc.

XIV. THE OTTER.

Photo by W. P. Dando, F.Z.S.

COMMON OTTER.

LEAVING for a time the exotic forms of uncommon pets, this article of the series deals with an animal indigenous to this country, yet at the same time one that is not often seen in a state of captivity. This is owing to the constant persecution it undergoes at the hands of those interested in the fishing rights of rivers inhabited or frequented by the animal, either by the watchfulness of the keepers attached to the preserve or from the systematic hunting down by well-organised packs of otter-hounds.

The skin of the Sea Otter is probably the most valuable of animal furs, and in one court of Europe—the Russian—ranks almost as Imperial purple, as none but those of royal blood may wear it. This otter is, however, not only specifically but generically distinct from the Common Otter. The sea otter is reputed to have the most acute hearing and power of smell of almost any living animal, and it has been reported that a small fire lighted five miles to the windward of some of these animals has sufficed to alarm them and cause them to leave the locality, and it has been further stated that the footmarks of a human being must be washed over by many tides before the traces cease to alarm the sea otter and prevent it from landing on that part of the coast.

It is a curious fact in connection with the common otter that it has no settled lair and, with the exception of a female and her young, never sleeps in the same spot for two nights running, although its knowledge of local topography is most extensive; an otter, when taking up his quarters in a district, is probably familiar with every hole, drain or culvert for miles around. If possible the entrance and exit to any hiding-place that may be selected is situated under water, so that the animal may always leave or enter his dwelling unobserved, and without leaving any scent for the hounds or other enemies to trace it by. It very often happens that the otter selects a hiding-place behind a water-wheel so that, although the slats permit the otter to get through easily, the hounds are quite unable to do so from their larger size.

The otter is not often noticed when wild for two reasons, one of which is that it is to a great extent nocturnal in its habits, sleeping in the day and ranging the rivers by night; and the other is that it does not drop into the water with a splash like a water-rat and thus draw attention to itself from a passer-by, but glides into the river as noiselessly as if it were entering a bath of oil, hardly making a ripple on the

surface of the water, and swimming for a considerable distance below the surface before coming to the top for breath. In districts where otter-hounds are few and far between, an excursion along the banks of a stream will often result in several otters being seen gambolling about or else hunting for fish, provided only that perfect silence is preserved and the footfalls on the banks made as noiselessly as possible; the best time is about half-an-hour after sunset, so that the watch be made during the gloaming, when the opposite bank can be just seen without unduly straining the vision.

When otters are captured young they are easily tamed, and soon get strongly attached to those who may have the looking-after of them; so much so, in fact, that many instances are on record where they have been trained to enter the water in search of fish and bring back their spoils to their owner. Indeed, in India and China the systematic training of otters for this purpose has been reduced to a fine art, and they are kept almost as frequently as cormorants are in the same countries and for the same purpose. The training, according to Bishop Heber, is very similar to that adopted for falcons; the otter is taken when very young and dieted on bread and milk alone, fish being particularly eschewed. After a time the actual training commences; an artificial fish is tied to a cord and the animal persuaded to chase it and return with it to its master. After awhile a real fish is used in place of the artificial one; should the otter mangle it while hunting it or bringing it to its owner it is punished, whilst if the fish is brought back uninjured the animal is encouraged by some particular dainty. The bishop relates in his journal that the otters were to be seen lying on the banks of the rivers with collars on their necks, plaited or woven out of straw, to which were attached long cords or ropes to prevent the animals wandering away on their own account and not returning to their owners. Some little difficulty is experienced at first in training the otter—I am now speaking of the common otter—to return to the bank from which it started, and on which presumably its owner is awaiting its return, and many individuals cannot be broken at all of the habit of taking their captures on to the opposite bank and having their meal there before returning to their owner, leaving the partly-consumed fish behind them. In such a case the best thing to do is always to use the otter with a very thin cord—silk for preference—about ten yards longer than the width of the stream at its widest part; this permits the otter perfect freedom in the water, but also allows the owner to bring it back to the proper bank after a capture. The line must be fine and yet strong. A silk fishing-line is light, fine and strong, and the most suitable; it also has the merit of being cheap, as it may be got from a halfpenny per yard upwards.

Photo by Lewis Medland, F.Z.S., Finchley.
SMALL-CLAWED OTTER.

Otters must be kept out-of-doors, as coddling of any kind is most detrimental to them. Two of one sex must not be confined within the same enclosure, as they are very jealous animals, and the petty quarrels between those of the same sex soon result in bitter and prolonged fights, with the conclusion usually of one or both

receiving serious injuries to the tail and limbs. A true pair when kept together are company one to the other, and although disagreements are sure to arise there is no serious result. The male and female are very fond of gambolling together, rushing at each other and rolling over one another, evidently having the keenest enjoyment in their antics; this is not only noticeable when they are kept captive, but they may be observed occasionally when wild sporting together on the banks of the streams they frequent. As a peculiar incident of animal-play, that of the American Otter (*Lutra canadensis*) may be noticed. This species, it appears from well-recorded and authentic observations, takes a delight in "tobogganning," or perhaps more correctly, "sliding." In winter the animal selects a high ridge of snow with a long slope, to the top of

Photo by Herbert Lazenby, York. OTTER FEEDING.

which it scrambles, gives itself a "send-off" with its hind-limbs, and slides down the declivity; one pair were observed to make twenty-two slides before they ceased their fun.

On land the otter runs with a peculiar "loping" gallop, but on ice the American species, if pursued, makes a short scrambling run and then takes a slide as far as its impetus will carry it, repeating the process again and again. In water, however, the otter is quite another creature, and glides with beautiful movements almost surpassing those of the seal, moving to and fro more like a shadow than a living animal; its course, more often than not, only being traced by the track of air-bubbles rising to the surface of the stream, rather than by any actual sight of the otter itself.

The best plan for those who do not live in districts where otters are to be found will be to apply to keepers of preserved fisheries, as these have a more direct interest

in keeping their eyes on otters than anyone else, and with very few exceptions nearly all the otters that get into dealers' hands come from this source of supply. A short advertisement in ANIMAL LIFE would probably result in the reader getting into communication with a keeper, who would procure a puppy otter for fifteen shillings or a sovereign. An adult trapped otter is useless, or almost so, as a pet since it hardly ever gets even to tolerate its owner, and certainly never quiet enough to be handled, whereas a puppy can be brought up to be almost as domesticated as a dog.

The greatest difficulty in keeping otters is in arranging a proper water supply, as, unless they have the freest of access to water, ophthalmic troubles always arise, and anything wrong with the eyes of an animal, besides its own personal discomfort and suffering, renders it unsightly to the owner and his friends; apart from this, which is a preventible disease, otters are unusually free—for animals in captivity—from ailments of any kind. If the prospective owner has an ornamental basin of water with a central fountain, as is found nowadays in many suburban residences, this will be just the thing for the otter to have a swim in if wired over and the kennel placed inside the wirework, which must be either of *very strong* wire-netting or else rod-iron placed closely together, as the otter is an extremely lithe animal, and it is surprising through what small openings it can squeeze itself. If, however, the reader has not such a pond in his garden, one must be made some six or eight feet square—the larger the better. This is a very simple and comparatively inexpensive matter, the greatest item being the fixing of a pipe stopped with a movable plug at the bottom of the pond and running it into the nearest drain. The pond itself is merely excavated in the ground to the required size and depth and lined with cement. The kennel can be an ordinary dog's kennel fully lined with straw, as much as it will hold loosely. The pond and kennel must be kept quite clean, as the otter is a scrupulously fastidious animal. The feeding is simple—small birds, animals, fish, etc.; they particularly relish frogs as a *bonne bouche*, and do not object to grubbing in the garden in search of worms, snails, and other small insects. A perfectly tame otter may safely be permitted to enter the house and play about the rooms, and will curl itself up in a chair or stretch itself out on the hearthrug with the air of being quite at home. Otters are fond of being played with and notice taken of them, putting up with a good deal of handling, but they nearly always resent their head, and most particularly their snout, being interfered with. Apart from their "touchiness" about their nose, they are most good-tempered little creatures with the exception of those which have been captured when adult; upon whose temper, consequently, no reliance whatever can be placed. Although May and June are specifically mentioned as the two chief months in which otters breed when wild, young puppies are noticed nearly all the year round.

Photo by Herbert Lazenby, York.

OTTERS LEAVING THE WATER AFTER THEIR BATH.

FULL-GROWN PORCUPINE-ANTEATER.

A NATURALIST'S NOTES FROM THE BUSH.

By
CYRIL GRANT LANE.

Illustrated with Photographs by the Author.

III. THE PORCUPINE-ANTEATER.

THIS interesting and curious animal, which has no connection with the true Porcupine, but is one of the two egg-laying mammals, has very frequently come under my notice while crossing the mountain tracts of Victoria, and at all times awakens within me a desire to observe its actions while following out the routine of its daily life; being, of course—and this is the true secret of successful Nature observation—unseen myself.

There is something so sedate, so matter-of-fact, in relation to its general method of carrying into effect any passing desire. No hurry or unnecessary bustle is at any time noticeable; and while the sharp ears and sharper little eyes are perpetually on the *qui vive*, it requires an accustomed and observant onlooker to detect the high-strung condition of its nervous system.

With back arched and a formidable array of pointed spines laid evenly upon the thick hairy coating, the porcupine moves among the scrub or ferns with a regular, leisurely step, occasionally pausing in its erratic course to overturn a strip of bark or scratch aside half-decayed sticks and roots likely to prove a good resort for lurking insects.

A little while ago I caught sight of a very fine porcupine busily engaged digging into an ant-heap. Creeping to within a few yards of the animal as quietly as I could I sank cautiously down among the ferns, and prepared myself to watch it while thus occupied in obtaining its natural food.

So far as I could judge, it appeared to be quite oblivious of possible danger; in fact, I have sometimes felt almost convinced that the animal is not of a nervous disposition at all. However, experiments I have resorted to always proved it otherwise. This particular porcupine I subjected to one or two tests, and I am since content to admit that, like every other denizen of forest country, the porcupine is ever on the alert. Making a spring of a supple twig I released it with a sharp snap against my leather legging and noted that the effect upon the porcupine was considerable, causing a spasmodic shudder to convulse its whole body; suggesting, too, that such a sound in the bush is uncommon. When whistling the familiar call-notes of various bush-birds no heed was taken at all, the animal even failing to turn its head in the direction from which the sounds emanated.

Again, through closed lips I drew my breath sharply, producing that shrill effect so frequently in demand when one is desirous of attracting the attention of a dog, caged bird, or encouraging a horse to quicken its pace; and once more the effect upon the animal was most pronounced, the porcupine instantly assuming a ball-like attitude and setting every spine on end. A second time I tried the same experiment, and the animal at once commenced to burrow.

Since I eventually maintained perfect silence, burrowing operations were soon deemed a superfluous effort, and the animal somewhat deliberately unfolded from its spherical pose, pausing for a moment to reconnoitre ere it resumed the interesting occupation of unearthing its treasures from their case-hardened, weather-crusted receptacle.

With little hind-legs well set apart and long, pointed snout nearly hidden beneath its chest, the porcupine tore away the caked exterior of the ant-heap, much as the English mole, when alarmed during a moonlight ramble, burrows into the outside walls of its dome-like edifice. The broken earth was cast aside, not rapidly, or even energetically, but with a most effective shovelling stroke, serving to reach in a surprisingly short time the nurseries and egg-stores of the ant colony.

With great rapidity the porcupine's tongue—which is very long and slender—was darted into the midst of the excited and teeming millions of ants, the glutinous substance peculiar to insect-eating animals and birds retaining them till swallowed.

Long before the supply was exhausted the ant-hill was abandoned, which, one is led to think, suggests that a succession of visits is made by the porcupine to various ant colonies in the course of its search for food.

My own painful experiences supplied the knowledge that the species of ant thus unearthed is of a savage disposition, sharp, continuous, throbbing twinges being the effect of its sting.

The porcupine, upon vacating the hollow it had excavated in the ant-heap, leisurely rubbed its long, delicate snout against the softer fur of its fore-arm, then, with a quite consequential air, walked slowly away among the ferns.

Only once do I recollect seeing a porcupine quicken its pace to a run, and then merely for a few yards, incited into such unusual activity by the iridescent hues of a burrowing fire-beetle.

As is so conspicuous in all animals, especially when studied midst the surroundings of their natural environment, the physical protection provided for the porcupine is notably in keeping with its *modus vivendi*. How many enemies this animal would be forced to contend with were it not for the wound-inflicting array of spikes with which it is so admirably guarded; a guard so sharp, so strong, and so effective that great difficulty is experienced in handling the owner even when dead!

The tenacity with which the animal clings to the ground when attempts are

PORCUPINE-ANTEATER AT HOME.

made to turn it over is a singularity with which every bushman is acquainted. After most strenuous efforts, aided by a stout stick used as a lever, I have known children utterly fail in their endeavour to overturn a full-grown porcupine.

Dogs are at all times greatly irritated by the presence of this anteater, and little wonder, since their every attempt to bite the burrowing animal can but mean severe punishment. A little while ago—and it is the only instance coming under my notice—I was informed of a cattle dog (smooth-haired collie) which succeeded, after extraordinary perseverance, in killing a porcupine, though the treatment the determined animal was subjected to was extremely severe. Muzzle, gums, tongue, in fact the dog's mouth generally, were considerably swollen and bleeding profusely—yet, with a warlike stride, ludicrously expressive of *Veni, vidi, vici*, the animal marched round its fallen victim in apparent satisfaction, despite the pain it must have suffered.

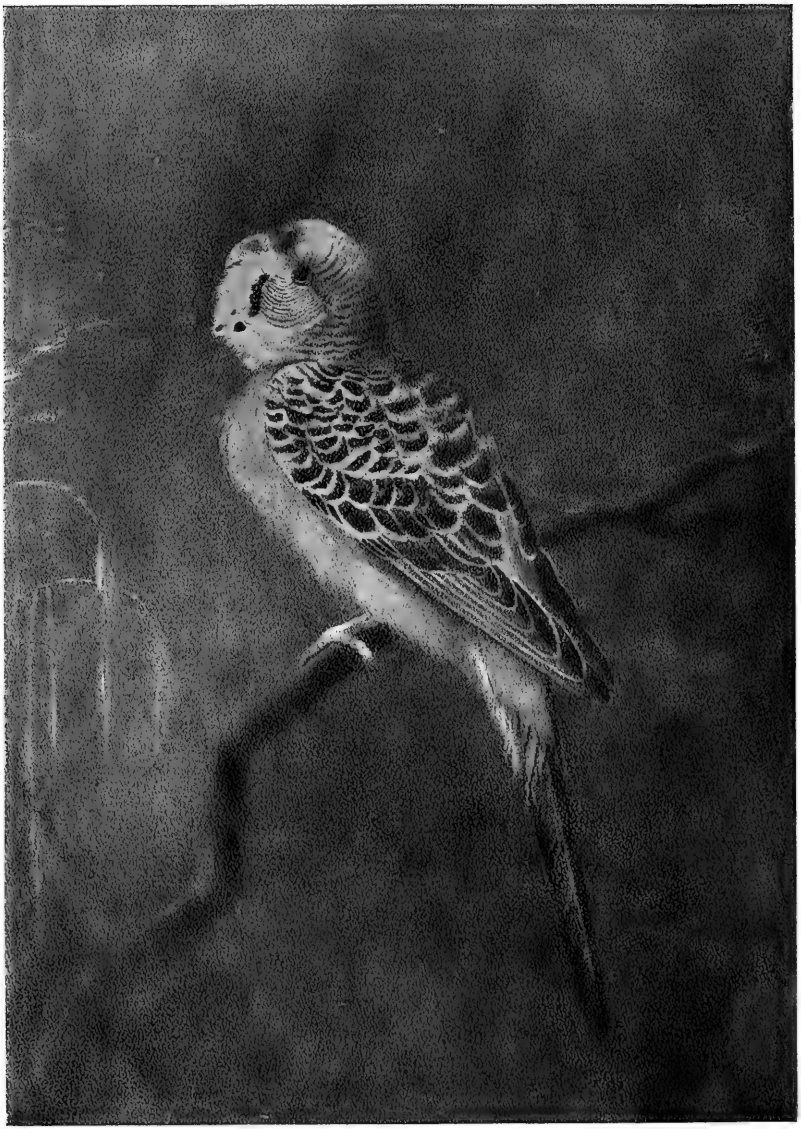
The photograph on page 299 is of a fine porcupine, which, with the assistance of an enthusiastic companion, I removed from some bracken ferns where it was discovered to a more open spot, but even before I had time to get my camera in position the porcupine had already commenced to sink into the ground, the black earth, visible in the foreground, being cast aside in the usual deliberate and effective manner. My other photograph on page 298 of another specimen was more successful.

ANT-HILL.
Showing excavations made by Porcupine-Anteaters.

The under-parts of a porcupine's body are well covered with soft hair of a brownish tinge. The fore-feet are armed with very long and powerful claws, as are also, though in a less degree, the hind-feet. When digging, the animal's head is tucked under until the top of its skull rests upon the earth; the long, sensitive snout by this means is safely protected among the soft fur thickly coating the chest.

During the winter months the porcupine hibernates, seldom coming forth from its retreat till the warmth of late spring excites the insect world to renewed activity.

The flesh of the porcupine is by many bushmen considered a delicacy, while by the aboriginals it is looked upon as a customary item in the bush menu whenever procurable. The native's method of cooking the flesh is somewhat strange. After being captured and despatched, the animal is taken to the creek-bed, swamp, or water-hole beside which the natives are camping, and a fair supply of "pug" (yellow adhesive clay) having been scooped from the moistened soakage or water-way, the porcupine is entirely enveloped in it. Thus a heavy ball of clay is the result. This is placed among the hot embers of their camp fire and allowed to bake. As may be imagined, the clay slowly hardens till it cracks asunder, at which stage the "dish" is considered fit to serve. When the clay casing is finally broken away, all the quills, hair and skin adhere thereto, the flesh being cooked to a turn.



BUDGERIGAR.

From an original painting by The Hon. Alice Foljambe.

A. C. FOWLER, TYPO. LONDON E.C.

THOSE THAT CHEW THE CUD.

SOME RANDOM REMARKS ON RUMINANTS.

"HANGUL" is the true native name of the large deer of Kashmir (*Cervus cashmirianus*), although it is not unfrequently called the "Barasingha." The latter name, however, properly belongs to a quite different deer (*Cervus duvauceli*), which does not occur in Kashmir but inhabits the plains of India. The hangul is a member of the group which includes our red deer and the American wapiti. In size it resembles the former, but in the voice of the stag—a squeal instead of a roar—it is more like the latter; while it differs from both in the fact that the stag's antlers usually have no more than five points. Moreover the young retain their spotted coat for an unusually long time, it is said until the third or fourth year. This fine deer has not a very wide range; besides Kashmir it inhabits some of the neighbouring Himalayan valleys, and is represented by an allied species in the woods of the Yarkand River in Eastern Turkestan.

The Hangul.

In Kashmir it frequents pine-forests, varying its elevation according to the season; in winter it may come down as low as five thousand feet above sea-level. The species has been exhibited at the London Zoological Gardens, but is seldom sent to Europe, and the specimen shown in the annexed cut was photographed in India.

Photo by S. Nasiruddin, Calcutta.

THE HANGUL.

The present writer heard, when in India, that there was some idea of introducing the American wapiti into Kashmir; if this project should succeed it is quite possible the hangul would cease to exist as a species, for it would almost inevitably interbreed with the wapiti, and the hybrids, which would certainly be fertile, would gradually mongrelise the stock.

Young Serow.

The little animal shown in the photograph on this page belongs to a species very rare in captivity, the Serow (*Nemorhædus sumatrensis*). No specimen of this animal appears to have reached Europe alive, and the present one was thought a great rarity in India, where the photograph was taken. The serow is a member of the curious group of animals known as goat-antelopes, which are all mountaineers, and are most

YOUNG SEROW.

familiar in the person of the European chamois. The present species has a wide range in South-East Asia, extending from Kashmir to the island of Sumatra. There is a certain amount of difference between examples from different parts of this large area, which gives reason for the establishment of several sub-species, the Himalayan serow being thus styled *Nemorhædus sumatrensis bubalinus*. In colour this form is black-and-tan, with white belly and stockings; a specimen from Arakan in the Indian Museum, the *Capricornis rubida* of that eminent naturalist the late Edward Blyth, was tan throughout. The serow is about the size of a donkey when adult, and both sexes have short but sharp horns, ringed at the base and gently curved backwards. The longest pair recorded barely exceed a foot in length. Nevertheless, in spite of his awkward appearance and insignificant-looking weapons, the serow is an animal of much character. Extremely active, he frequents the most difficult and steep ground, though he does not range to a very high elevation; and he is not only dangerous to man when brought to bay, but is said to be a match even for the terrible dholes or wild dogs (*Cyon dukhunensis*), the worst foes of Indian big game.

The Banting, or Javan Wild Ox.

For the accompanying illustration, said to be unique of its kind, the writer is indebted to the Governor of one of the provinces of Java. It represents a cow and a calf of the Banting, or wild ox of Java (*Bos sondaicus*), a near relative of the Indian gaur (*Bos gaurus*), but distinguished, among other features, by the circumstance that old bulls are alone dark-coloured (nearly black in this instance), as well as by the presence of a horny boss between the bases of the horns, by the much smaller development of the hump on the withers, and by the conspicuous white blaze on the rump. In English collections, whether of living animals or of their skins, the wild banting is among the rarest of the larger mammals. The last specimen exhibited in the Zoological Gardens in the Regent's Park was a bull (whether adult, history sayeth not) presented so long ago as 1863 by Sir Arthur Phayre; and as this came from Pegu, it was not (as will be shown below) a member of the typical Javan race. The British Museum possesses the mounted skin of a very old bull from Java, but in too bad a state for exhibition; and (in addition to skulls and horns) the species is represented in the public galleries only by a stuffed specimen

THE BANTING, OR JAVAN WILD OX.

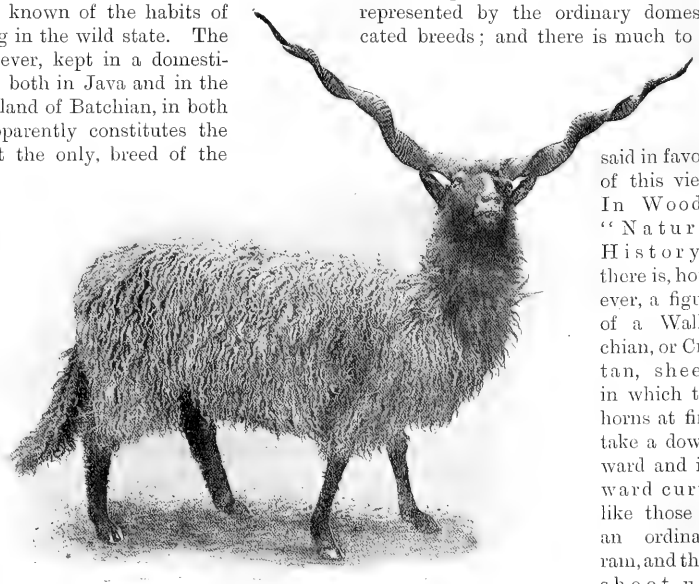
of the domesticated Javan breed, and by two heads of the Burmese race. The latter (locally known as "Tsaine") differs from the typical Javan animal by the tawny colour of the fully adult bulls. The only mounted specimen of a Javan bull in good condition in this country is a head in the collection of Sir Edmund Loder, at Leonard's Lee, near Horsham. Mr. F. E. Blaauw, of Graveland, Holland, is, however, the fortunate owner of one or more living examples of this (in Europe) rare animal.

Very little is known of the habits of the true banting in the wild state. The species is, however, kept in a domesticated condition both in Java and in the neighbouring island of Batchian, in both of which it apparently constitutes the common, if not the only, breed of the country.

The Wallachian Sheep.

SEVERAL of the continental countries of South-Eastern Europe and South-Western Asia are the home of a very remarkable breed, or rather of several closely-allied breeds, of sheep characterised by the corkscrew-like form of the long and slender horns of the rams. As shown in our illustration, which is taken from a ram of the Wallachian breed, these sheep have black faces, ears, and legs, and long bushy tails. The fleece is also rather dark-coloured, and consists of long, shaggy wool mingled with hair. The most striking feature is, however, undoubtedly formed by the horns, which are present in both sexes, although very much smaller in the ewes than in the rams. It is said these horns attain their finest development in the Cretan breed. In the Wallachian breed, however, they are also of great length, and diverge at about an angle of 45 degrees from the middle line of the head. In the Hungarian breed the divergence is very much less, the two horns forming a narrow V. It will be seen that the horns form a regular closely-twisted corkscrew-like spiral, recalling that of the lesser kudu among the antelopes, and the markhor among the wild goats.

By Linnæus the spike-horned sheep was regarded as a species distinct from the one represented by the ordinary domesticated breeds; and there is much to be said in favour of this view. In Wood's "Natural History" there is, however, a figure of a Wallachian, or Cretan, sheep, in which the horns at first take a downward and inward curve like those of an ordinary ram, and then shoot upwards in the straight corkscrew-like spiral, of which, by the way, the twists are much more open than in the specimen here figured. Whether this is true to nature or a fancy of the artist is not easy to determine; if the former, it suggests that these sheep are nearer to the ordinary breeds than is commonly supposed.



WALLACHIAN SHEEP.

Apparently these sheep are by no means uncommon in their native countries, although it is difficult to ascertain whether they take the place of the ordinary breeds, or whether they are a special half-wild breed. Authentic information on this point would be of interest.

Another Regimental Pet.

THE young Beisa Oryx, shown in the accompanying photographs, was caught by a British officer a few months ago. At first it was very wild and nervous, but the kindly cow in the photograph (a loan to the same officer by a friendly Somali sheikh) took pity on it and brought it up with her own calf, which may also be seen in the photograph looking out under its mother's nose. The little oryx has gone many marches, packed comfortably on a camel's back, and it originally had as a companion another baby antelope, an awal or Sœmmerring's gazelle, also to be seen in the photograph, packed on the camel; but that has unfortunately died since.

A YOUNG BEISA ORYX AND ITS FOSTER-MOTHER.

The photographs, taken in Somaliland, have been kindly sent to us by Mrs. Barnard.

Taking the Bottle.

"THE enclosed photograph," writes Mr. Herbert Lazenby, "shows the method of feeding lambs which have been forsaken by the mother. The lambs draw the milk from the bottle by the aid of a large teat, and it is astonishing how soon they become familiar with the sight of the bottle. It is quite amusing to see the struggle that takes place when the lady in the photograph appears with the milk, and it will be seen that the animals look no worse for this substitute for their parent."

Photo by Herbert Lazenby.

TAKING THE BOTTLE.

ORYX PACKED ON A CAMEL.

ZOO NOTES.

The Australian Pelican.

This, the only Pelican found in Australia, is easily distinguished from all the other large pelicans by the large amount of black in its plumage—the others only having the quills black—and by having the bare skin of the face restricted to a ring round the eyes, whence its scientific name of *Pelecanus conspicillatus*—the Spectacled Pelican. It breeds on the ground, and, like the other big pelicans, is a surface-feeder, reaching down for its food while swimming. Like pelicans generally, it does remarkably well in captivity, a specimen having lived at the London Zoological Gardens for over thirty-two years. It showed no signs of age when the writer last saw it, in 1897, and the keeper afterwards said that when it died it passed away so quietly, in the ordinary position of repose, that at first he thought it was merely asleep. Pelicans have, however, been known to live in captivity much longer than this. It is a curious fact that these large pelicans are not a match for the ordinary white swan; in St. James's Park a common pelican (*P. onocrotalus*) was killed by one of these birds, and another swan in the Calcutta Zoological Gardens accounted for two pelicans, one of the Australian and one of the common species.

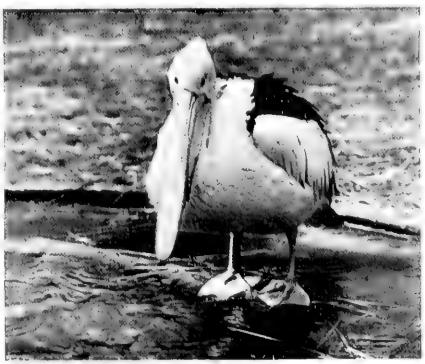


Photo by W. P. Dando, F.Z.S.

AUSTRALIAN PELICAN.

"Jimmy."

The poor little chimpanzee so named is now no more, like his companion "Susan," whose likeness appeared a little while ago. "Jimmy" was never strong, and he recently succumbed to pneumonia following on influenza. Indeed, the Ape House was recently visited by an epidemic of *la grippe*, but owing to the excellent arrangement of the building the results were not very serious, "Jimmy's" being the only fatal case.

It is a great pity these anthropoid apes are so delicate, but no doubt if they were properly cared for at the time of capture, their constitutions would be better able to bear the trials of captivity. Some day, perhaps, the various Zoological Gardens of Europe may find it worth while to finance a joint scheme for the proper management of the capture and export of such valuable and interesting animals as these, keeping a trustworthy agent in their native countries, who could be depended upon to give them proper treatment from the first, and not to ship them till they were thoroughly robust and the time of year favourable. Under these conditions, chimpanzees, orangs, &c., would no doubt prove very much easier to manage when they arrived in this country.

The Brown Pelican.

This species (*Pelecanus fuscus*) is not very appropriately named, since the prevailing hue in the plumage of the old bird is a silver-grey, the head being cream-colour and the neck dark brown. The young, however, are of a general dull light-brown colour. This species is the smallest of the pelicans, about

"JIMMY."
The last photograph taken before his death in January.

BROWN PELICAN.

equalling an ordinary goose in size, but its bill and pouch are much larger in proportion than those of the bigger species of pelicans. It has also unusually long wings and short legs, and, unlike the large pelicans, fishes on the wing, plunging down on its prey like a gannet; it goes completely under water, and comes up with its head facing in the opposite direction to that it took in making the plunge. It is a sea-coast bird, and is confined to the warmer parts of North America, where it usually breeds. On Pelican Island, however, where these birds have for some time been protected, the great number breeding has resulted in the destruction of the trees to a great extent, so that the pelicans have taken to building on the ground, thus showing that birds are willing to change their habits considerably rather than leave a locality to which they have become attached. Although the change of conditions in captivity must be much greater in its case, the Brown Pelican lives as well in that condition as the larger and less active species.

COMMON GULL.

Photos by W. P. Dando, F.Z.S., Regent's Park.

AUSTRALIAN THICK-KNEE.

The Common Gull.

THE Common Gull (*Larus canus*) is also not quite properly named, for with us at all events it certainly is not so common as the herring gull (*L. argentatus*) or the laughing gull (*L. ridibundus*), to which last species most of our winter visitors to London belong. The common gull is one of the smaller species, being little bigger than the laughing gull, although more stoutly made. In its pure grey and white plumage it much resembles the similar-sized kittiwake (*Rissa tridactyla*), but the latter may be distinguished when in adult plumage by its blackish feet, the feet of the common gull being pale greenish in colour. The young birds of the two species are very different, young kittiwakes being grey and white with a black band on each wing and at the tip of the tail, while young common gulls are of a mottled drab, and look much like small editions of the young herring gull. Unlike the kittiwake, which is essentially a sea-bird and a cliff-breeder, the common gull breeds on low shores, and is especially addicted to coming inland.

WHITE-HEADED SEA-EAGLE.

WHITE-TAILED SEA-EAGLE.

Photos by W. P. Dando, F.Z.S.

THE Thick-Knees or Stone-Curlews form a small family of birds closely allied to the plovers, which they nearly resemble in shape, though they are very much larger as a rule. They may, however, be easily distinguished by having the corner of the mouth extending to the eye, while in the true plovers it terminates below the forehead. They are night birds and have large yellow eyes, whence in India they are called goggle-eyed plovers. The present bird (*Burhinus grallarius*) is the largest of the family in linear measurement, though in bulk and stoutness of build it is inferior to the great-billed stone-plovers (*Æsacus*) of India and Australia. These great plovers do well in captivity, and the present kind and the common Indian great-billed species (*Æsacus recurvirostris*) exhibit a peculiar habit of rushing about with wings and tail expanded so as to display their conspicuous black and white markings, which are concealed in repose. A similar habit has been observed with our English stone-curlew (*Æ. crepitans*) when at liberty.

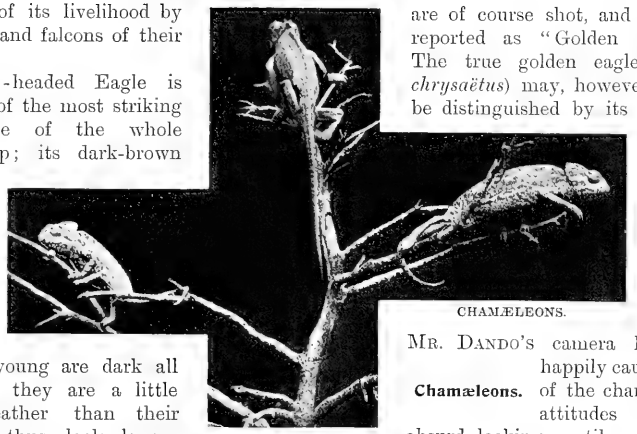
The Australian Thick-Knee.

The White-headed Sea-Eagle.

THIS is the *Haliaëtus leucocephalus* of ornithologists, and the "Bald Eagle" and "Bird of Freedom" of American writers, the national emblem of the United States. Benjamin Franklin, indeed, objected to its use in this capacity, alleging that it was a rascally bird and did not get its living honestly, preferring to rob the industrious osprey of the fruits of its piscatorial labours. But, after all, this accusation might be brought against eagles in general; in India the osprey is victimised by the white-bellied sea-eagle (*H. leucogaster*), and in the same country one of the hunting eagles (*Aquila vindhiana*)

gains much of its livelihood by robbing kites and falcons of their prey.

The White-headed Eagle is certainly one of the most striking in appearance of the whole aquiline group; its dark-brown plumage is well set off by its pure white head and tail, and in size it about equals the golden eagle. The young are dark all over, and as they are a little longer in feather than their parents, and thus look larger, they were at first described as a separate species. A pair of white-headed eagles once actually bred in the London Zoological Gardens, but the eggs were not hatched.



CHAMÆLEONS.

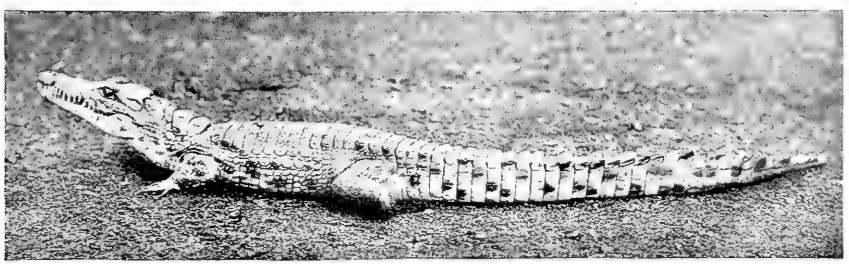
are of course shot, and generally reported as "Golden Eagles"! The true golden eagle (*Aquila chrysaëtus*) may, however, always be distinguished by its feathered shanks; these in all the sea eagles being bare.

Chamæleons.

Mr. Dando's camera has very happily caught some of the characteristic attitudes of these absurd-looking reptiles. Particularly noticeable is the way in which the left-hand specimen has taken a turn of his tail round the bough, as if his slow movements and strong grasping feet were not enough to secure safety from falls. This species of chamæleon (*Chamæleon vulgaris*) is frequently imported, but is not very easy to keep. It will, indeed, live for some time even without feeding; but, according to Dr. Gadow in his excellent book on reptiles, the real difficulty is to keep it through the winter, unless it has been well fed up and got into good condition previously. Moreover the dealers seem usually to be unaware of the fact that these creatures need water, and will commonly only take it in the form of drops; hence those in shops are apt to be so thirsty that they are dull and unwilling to feed. Sprinkling the twigs or leaves in their cage will give them a chance

White-tailed Sea-Eagle.

This fine bird, sometimes called the Erne (*Haliaëtus albicilla*), is the only sea-eagle to be found over a large part of the northern shores of the Old World, while it also inhabits Greenland. The erne is certainly not equal to the white-headed eagle in beauty, though equalling it in size; the adult being of drab colour throughout, with the exception of the white tail. The young have the tail mottled with brown. Although this bird nowadays does not breed in our islands, the young frequently visit us, and



Photos by W. P. Dando, F.Z.S. NILE CROCODILE.

to revive, and once they can be got to feed and take a variety of food they have a fair chance of survival. They must of course be kept in a warm place, and no one should attempt to keep them who cannot command a constant supply of living insect food of some kind. This species of chamæleon is found in North Africa, Syria, and Asia Minor, and also in a few places in Spain. It is the species which was known to the ancients, and gave rise to the proverbial expressions of the chamæleon's change of colour and power of feeding on air.

Nile Crocodile.

THERE is a great general similarity in the appearance and habits of crocodiles, but the N. African species (*Crocodilus niloticus*) is peculiarly interesting as being the real original crocodile, which, says Herodotus, the Egyptians called *champsa*, but the Greeks *crocodile*, after the crocodiles which were on the walls—of course, lizards of some kind. In this connection it is interesting to note that the Greeks still call the lizard *Stellio vulgaris* by the name of crocodile, according to Dr. Krüper (quoted in Mr. Dresser's "Birds of Europe"), who found this reptile to be a common prey of the rare Eleonoran Falcon (*Falco eleonoræ*) on the island of Myconos. The Nile Crocodile is an African species, and also inhabits Madagascar, where it is extremely numerous. Although it seems to have been very common in Lower Egypt even in historical times, it is now practically exterminated there. It is, of course, a fierce and dangerous reptile, but the largest specimens do not appear to equal in size the biggest Indian "Muggers"—a specimen of the Estuarine Crocodile of the East (*C. porosus*) having been known to attain the enormous length of thirty-three feet. The largest specimen of the Nile crocodile in the British Museum is less than half this length. The individual figured here is about a yard long, and has been in the Zoological Gardens more than three years; it came from East Africa.

North Aldabra Tortoise.

As one of the species of gigantic tortoises, now, alas! so rapidly approaching their extinction, *Testudo gigantea* is worthy of more than a passing glance from the visitor to the Zoo. There are at the time of writing this no less than eleven species on view in the Tortoise House. These vary considerably in age and size, the largest being only a few inches short of five feet along the curve of the shell, and weighing about six hundredweight. It is quite possible that this specimen is three hundred years old! This species is now quite extinct in its original home, the North Island of Aldabra, but a good many specimens are still kept in a semi-domesticated state in the Seychelles. These large tortoises, both the Eastern species and those of the Galapagos, have been carried about a good deal, and one of the present species has lived at St. Helena for more than a hundred years.

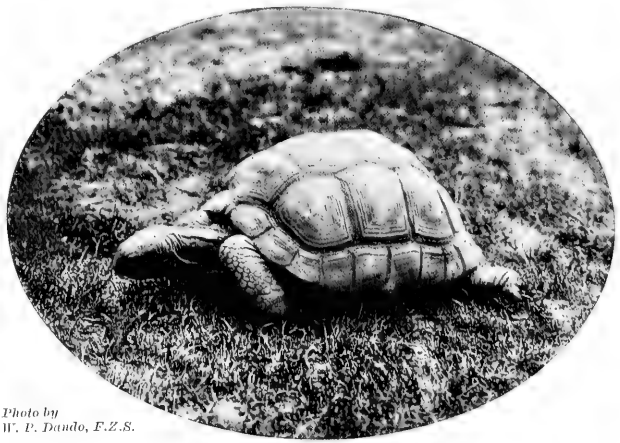


Photo by W. P. Dando, F.Z.S.

NORTH ALDABRA GIANT TORTOISE

A NATURALIST'S NOTES FROM THE BUSH.

By Cyril Grant Lane.

IV. THE AUSTRALIAN LYRE-BIRD.

AT all times when reference is made to the Australian Lyre-Bird I seem to be swiftly transported to the forest home of these singularly interesting birds; to hear, as it were, the subdued splashing of the scrub-embowered, fern-hidden creeks flowing over the bed-rock of their chosen course from down the mountain-gullies, deeply shaded by canopies of promiscuous foliage, which, by its very density, defies the brilliant actinic rays of cloudless skies to filter through the secret depths of shadow and illumine the crystal waters flowing beneath: to be midst solemn mountains studded from base to summit with the softly-gleaming trunks of the mountain-ash, clothed with the olive-brown of their tapering, pendulous leaves: instinctively to feel that great hush so impressive, that calm and dignified silence so potent a part in the whole atmosphere of a mountainous region: and then, listen to the lyre-bird! The dogwood scrub thrusts its slender canes up towards the greater light; the supplejack, with toughened strands and sinuous tendrils, clasps the vegetation in powerful embrace, while the drooping fronds of ten thousand graceful tree-ferns gently fan the flower-scented atmosphere and shade the deep rich soil from the fiercer heat of the sun. From the margin of all such creeks rank patches of bracken-fern creep up the rugged sides of the contiguous ranges, covering their slopes with a mantle of green and brown, and affording to the entire animal life of the locality admirable cover from the ravages of their respective enemies.

Here, among these great quiet ranges, where a perpetual softened twilight percolates in delicate shafts of green and amber hue through the reticulate masses of foliage, is the ideal home, the true haunt, of the most wonderful bird-vocalist resident in the forest depths of the bush. I feel that in taking up my pen to write of this bird all diffidence and hesitation may be waived on one side, for I have known the lyre-bird in its every phase of life, am conversant with its every habit, mood, and feature of interest, and best of all, am familiar with the almost unlimited ability it possesses of imitating the variety of sounds common to its environment.

Photo by Cyril Grant Lane.

THE HAUNT OF THE LYRE-BIRD.

To see and judge of the bird for one's self it

is strictly necessary to visit just such localities as are described above; for there the lyre-bird moves about with a spirit of perfect freedom, waking the still forest depths with the charm of its wonderful voice.

To gain a correct idea of the bird's talent in mocking sounds with which it is familiar, it is a *sine qua non* that one should be other than ignorant of the general "music of the ranges," for a far greater conception of its vocal powers can be received when, in the multiplicity of sounds issuing from that one able throat, the call-notes and songs of other birds are recognised.

The harsh notes of the wattle-bird, the bugling of leather-heads (friar-birds), and the liquid whistling of the native thrush, are about as dissimilar in tone and manner of production as it is possible for the call-notes of birds to be, yet all are so perfectly imitated as frequently to give rise to feelings of incredulity even among practical bushmen. Then again, the cry of the curlew, which is at all times sad in the extreme, long-drawn and very penetrating, bears no resemblance to the whining, querulous screams of the black cockatoo; nor are the inquiring flute-like notes of the mountain magpie like the continuous, noisy laughter of the merry laughing jackass, or the incessant chattering of parrots; but to the lyre-bird it is an easy task to imitate them all to perfection.

The lyre-bird seems particularly fond of mocking the strange notes of the coach-whip-bird. The long, scarce-audible, sighing note is beautifully produced; then comes that sharp, loud crack, echoing all down the gully, which so forcibly reminds one of the report of a well-handled coach-whip.

Like most other birds, the lyre-bird is silent during certain periods of the day, and to those unaccustomed to assign the minutest causes to the actual presence of the bird, the great shady gullies appear to be untenanted by any such illustrious vocalist.

On the other hand, to those conversant with the signs and symbols of the bush, there is ample proof of their presence in localities frequented by them. When strolling among the belts of dogwood scrub bordering the creeks, we see the deep black soil scratched and furrowed just as the earth in a back-yard is disturbed by domestic poultry. Keeping a watchful eye upon the ground as we press aside the cane-like scrub and edge our way round the butt of a monstrous forest tree, we shall probably be rewarded by finding some of those long graceful feathers and hair-like appendages, which latter constitute so singular a feature in the lyre-bird's tail. As a matter of fact I have seen (apparently perfect) specimens of the birds' tails which, in reality, are a collection of feathers gathered from the lyre-bird haunts and cleverly arranged in natural order to deceive the buyer; for, on account of the handsome ornament provided in a well set-up tail, there is considerable demand for them. Of late years, however, the stricter enforcement of the Protection Act serves to shield the birds from wanton slaughter. Should the locality prove to be the true home of the lyre-bird, its nest will sooner or later be seen, although—to those uninitiated into the ways of these birds—it will not be recognised as such.

I have sometimes been asked what site the lyre-bird may be considered to favour specially, and as a result of long and interested experience I can but reply that the lyre-bird is as changeful, and, I almost feel inclined to say, humorous as the little jenny-wren of the British Isles in its choice of a nesting-place.

In Gippsland, among the Angora ranges, Tambo valley, I saw a nest of this bird partially protruding from a huge hollow limb some twenty-five feet above the ground. It is interesting to know that when a nest is placed in a position some feet above *terra-firma* it is absolutely necessary for the bird to mount the side of the range or some well-branched tree before it can hope to reach its nest, for the simple reason that lyre-birds cannot rise straight up off the ground in manner like an English

"rocketer," but are obliged to mount gradually some loftier object than the nest from which to float on expanded wings to the desired goal. Among the forested ranges at the base of Mount Torbrek I saw a nest conspicuously built upon the splintered summit of a lofty stump, standing erect in the midst of a grove of fern-trees.

In the wilderness of rock lying away at the back of the Cathedral Mount I have detected the nests of these birds in a variety of positions, such as resting upon ledges, jambed tightly into fissures, or ensconced among the roots of the out-jutting scrub which clambers so profusely over the boulders.

Where the country is deeply furrowed by mountain water-courses and dense with the vegetable life of a virgin forest I have most frequently found the nest on, or very

Photo by Loghorne, Wood's Point.

VICTORIAN LYRE-BIRDS DANCING ON THEIR "HEAP."

near, the ground, in which case it is generally covered with a heavy dome, entrance being made through an opening in one side. My experience of the bird and its nursery suggests that it is merely an exception to the rule when the nest lacks this roofing of twigs and bark, of which material the whole structure is comprised.

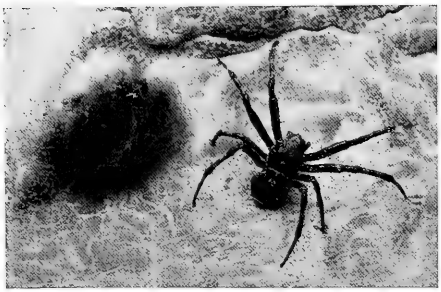
The massy, spacious top or crown of a tall tree-fern is not infrequently utilised as a suitable position for nesting purposes, and in consequence of the abundant foliage shooting out on all sides, forms at least a safe, secluded retreat.

OUR COLOURED PLATE.

THE BUDGERIGAR.

THE tiny Australian parraquet locally known as the budgerigar, but frequently termed in Europe the Australian love-bird, shell parraquet, or grass parraquet, is one of the prettiest and most elegantly coloured of the smaller members of its group. Scientifically it is known as *Melopsittacus undulatus;* and it is the sole representative of its group. It forms an excellent cage-bird.

NOTES AND COMMENTS.



GARDEN SPIDER AND NEST.

Garden Spider and Nest.

SPIDERS would appear to be creatures not well adapted for taming; nevertheless the writer knows of an instance where fairly successful results were obtained by an attempt to gain the confidence and affections of a member of this group; "Mrs. Spider," it is said, answering to the call of her master. The true, or web-making, spiders, of which the ordinary garden, or cross, spider is in this country one of the most familiar examples, bring themselves most prominently into notice by the structures from which they take their name. In addition to these, the females, however, construct nests in which are deposited the eggs; the nests of the common house-spider taking the form of small cocoons of silky material, frequently placed in the corners of neglected rooms or outhouses. The nest of the garden spider is shown in the photograph. Spiders of different species display marked variability in the amount of attention they bestow on their nests and offspring. The garden spider, which, by the way, generally suspends its nursery on or near the web, leaves its young to shift for themselves. Certain other species, on the contrary, remain for a certain period on guard in the neighbourhood of the nest, and look after the young when hatched. The fineness and at the same time the strength of spider-silk is familiar to all; but it is probably less well known that a few years ago an establishment was formed in France for the purpose of obtaining this silk in quantities sufficient for commercial use. Large numbers of spiders were kept, and their silk worked off from time to time on reels. For a time, at any rate, the experiment was stated to be a success; but we have not heard lately of the progress of the new venture.

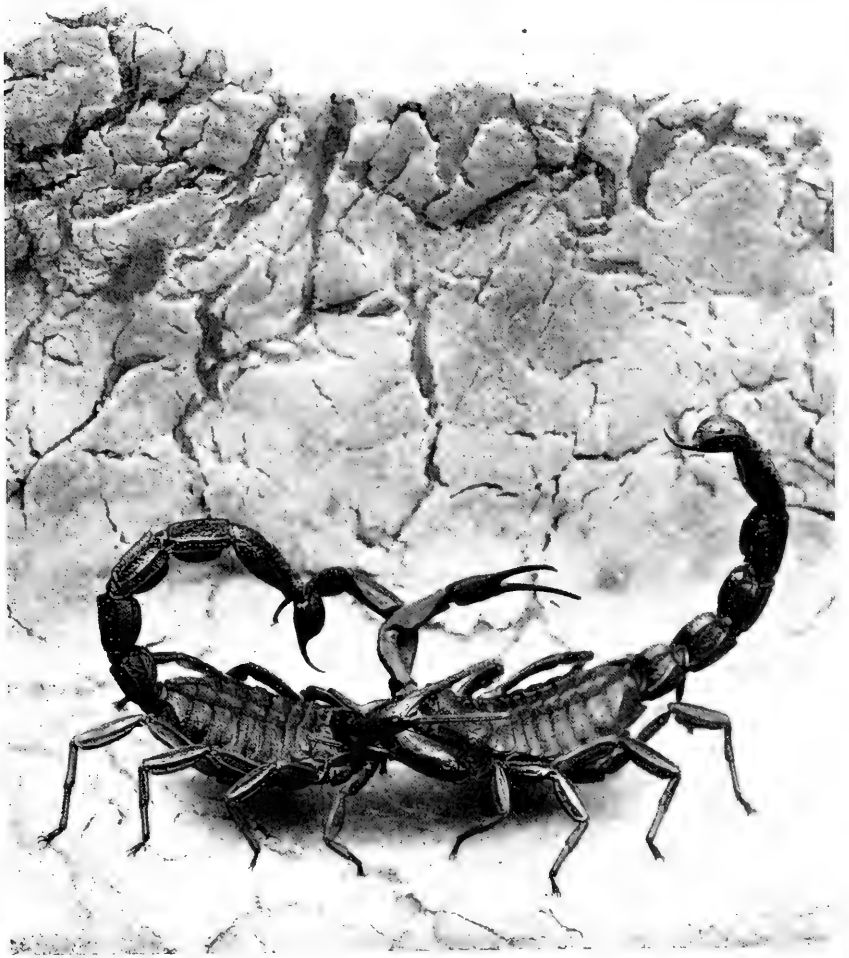
Nest of Young Field-Mice.

"A FEW days ago," writes Mr. Herbert Lazenby, "whilst walking in the country I heard the squeak of a mouse, which appeared to come from under some loose grass near to my feet. I carefully removed the grass, and found a nest of the Field-Mouse with four young ones, which I photographed for the readers of ANIMAL LIFE. The young mice appeared to be only a day or two old, and were very funny little animals with perfectly smooth skins. The nest was well made of fine grass, and the young ones appeared quite snug."

NEST OF YOUNG FIELD-MICE.

Scorpions at rest and in combat.

THE two annexed photographs of Scorpions, the one showing a male and female in repose, and the other a couple of males fighting, readers of ANIMAL LIFE. These creatures (for we must not call them insects) vary much in size, but are all nocturnal in their habits, skulking under stones or bark during



SCORPIONS FIGHTING.

serve to illustrate an interesting chapter in Mr. Lydekker's "Mostly Mammals,"—a book which we take for granted is familiar to all the daytime. Although the sting of the small European species does not inflict a severe wound, that caused by the larger

tropical kinds is a very serious matter indeed. Despite the fact that in the species in which the tail is light it is generally carried straight, whenever the sting is about to be brought into use the tail is curved over the back and the wound inflicted by a forward thrust of its weapon. Apparently when male scorpions fight with one another the sting is invariably brought into use, as in our first illustration; but its effects are much less severe in such instances than when other creatures are attacked, for it has been proved that scorpion-poison is innocuous to the creatures by which it is produced. This, it may be added, effectually disposes of the old legend that a scorpion when surrounded by a ring of fire (from the effects of which, it may be incidentally remarked, it would speedily perish) puts an end to its misery by turning its tail over its back and stinging itself to death. Although apparently unprepossessing animals for pets, Mr. Pocock, the new Superintendent of the "Zoo," says that scorpions can easily be tamed and taught to know their master.

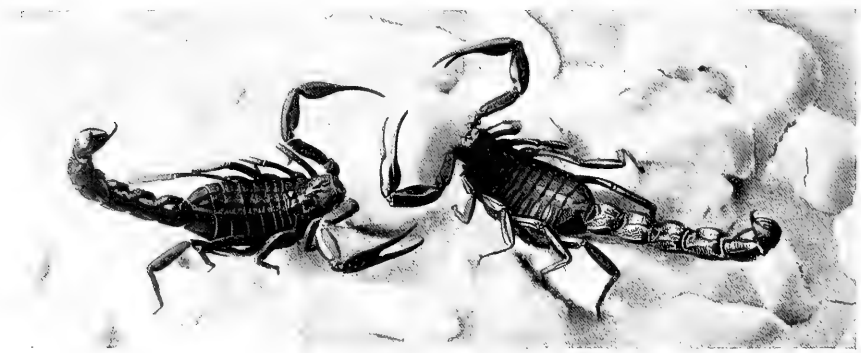
Young Foxes.

Those who are fortunate enough to be owners of a country residence situated alongside of a fox-covert cannot fail to be delighted with the playful gambols of the fox-cubs when they leave their "earths" in early evening to wander about in the neighbourhood and to be taught the business of life by the vixen. Few persons, by the way, know the reason why the female fox is called by the latter name; and yet, as Sir Herbert Maxwell has told us in the third volume of that delightful series of books entitled "Memories of the Months," it is merely the south-west country pronunciation of foxen, said to be the Saxon feminine of fox (see also Johnston's "British Mammals"). Perhaps we may be permitted to suggest that it may really be a Saxon plural, as in "oxen," and that the singular was "vix."

Curiously enough, in that well-known work "Bell's British Quadrupeds" there appears to be no mention of the fact that fox-cubs, like puppies, are born blind. This omission is, however, supplied in Sir Harry Johnston's volume of the *Woburn Library*, in which we are told that they do not open their eyes until about the tenth day.

As regards the playful habits of the cubs, the following extract from a correspondent of Bell may be given: "We have ourselves noticed the playfulness of young foxes, and may observe that they can be watched without giving them the least alarm, if the observer be elevated only a few feet from the ground. Seated in the top of a pollard ash, we have watched for an hour at a time, without exciting the least suspicion, several half-grown foxes, although they were continually within a few feet of us."

Although differing somewhat in colour, fox-cubs are otherwise miniatures of their parents—veritable "chips of the old block."



SCORPIONS AT REST: MALE AND FEMALE.

THE GAIT AND FLIGHT OF BIRDS.

Fig. 1. Ostrich's Foot.

By

FRANK FINN,

B.A., F.Z.S.

ALTHOUGH as a general rule birds employ but one pair of limbs at a time in executing the movements necessary for progression, there is a considerable amount of variety in their actions, which are often much misrepresented even by scientific writers.

When moving on the ground, birds have in the ordinary way but two modes of progression—walking, when each foot is advanced alternately, and hopping, when both are moved together in a series of leaps. By increasing the rapidity of the alternate movements the walk is converted into a run, which is often very rapid. As a general rule, birds are digitigrade—that is to say, they walk on the toes only, the whole surface of at least the three anterior toes being applied to the ground. But there are a few exceptions. The Ostrich carries the digitigrade mode of progression to a greater length than any other bird, the basal joints of its two toes being raised off the ground, so that the foot has a pastern like that of an ordinary ungulate mammal. To this, no doubt, the peculiar springy gait of this great bird is due (see Fig. 1). On the other hand, some birds in which the shank (wrongly called in ornithology the *tarsus*) is peculiarly short apply this also to the ground in walking, and are thus plantigrade, since the shank of the bird corresponds to the *planta* or sole of a mammal. This is the case with some of the very short-legged parrots, such as the Salmon-Crested Cockatoo (*Cacatua moluccensis*), with the typical Swifts (*Cypselus*), and the Mouse-Birds (*Coliidæ*), all of them being birds which naturally walk very little. It has been stated on high scientific authority that several groups of diving birds, Penguins, Auks, etc., are plantigrade, but this is a mistake; they walk on their toes like other birds, although they may, like many of these, sometimes apply the whole of the shank to the ground when sitting. The Guillemot always does this (Fig. 3), but it certainly can walk on its toes at times.

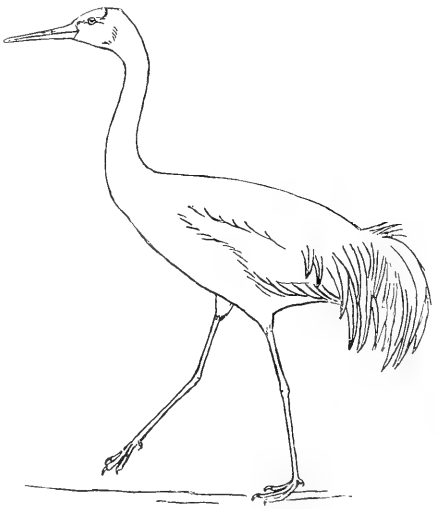


Fig. 2. Crane walking.

The Divers (*Colymbidæ*) appear to be unable to walk at all, but to shove themselves along on their breasts like seals, although there is at least one instance

recorded in which a winged Great Northern Diver was seen to rise and run for some distance. The idea that Grebes are as helpless as divers is quite a mistake, as I have been able personally to observe in the case of five species; but it must be admitted that the large grebes are able only to walk a little way at a time, which makes the awkwardness of the similarly built but still larger divers easy to understand.

Quadrupedal progression is very rare in adult birds, but is exemplified by the Penguins, which, when they wish to travel fast, will go on all fours, using their flipper-like wings as fore-legs, and the New Zealand Mountain-Duck (*Hymenolæmus malacorhynchus*) in its native torrents is stated to aid itself with its wings, which are armed at the bend with a blunt knob, when climbing up slippery boulders.

With regard to the ordinary locomotion of birds which walk or hop on their toes a good many discrepancies are observable, and these are not always easily accounted for on structural grounds. Broadly speaking, it may be said that most groups of birds walk, although this gait may vary from the speed and grace of the ostrich to the laboured waddle of the diving grebe and the flying swallow; for birds which spend most of their time in the air are as awkward on the ground as the most aquatic species. It has been stated that birds of prey can only hop, but this is quite wrong, although their walk is usually neither easy nor graceful, their long talons probably encumbering their movements.

Fig. 3. Guillemot in plantigrade position.

Some remarkable differences of locomotion are found among the Parrots, the Lories hopping, while other parrots walk or waddle; in the Kingfishers, which usually waddle, the largest of the family, the "Laughing Jackass" (*Dacelo gigantea*), nevertheless hops; while among the Nightjars I found that a large Indian species (*Caprimulgus macrurus*) hopped, while a smaller one (*C. asiaticus*) walked, as does also our English species. In these cases all the birds concerned are short-legged, but among the Cuckoos, Rollers, and Hornbills, the ground-frequenting species, which walk, have longer legs than the tree-haunters, which hop. It may be mentioned that the bigger Tree-Hornbills are the largest birds which affect this mode of progression; as a rule birds which hop do not exceed a pigeon in size (Fig. 4).

Among the Pigeons we encounter another curious inconsistency. The Ground-Pigeons certainly have longer legs than the arboreal species; yet all walk as a rule, though some of the Green-Pigeons (*Treroninæ*), which are strictly tree-birds, are inclined to hop when on the ground.

The Passerine birds, as everybody knows, usually hop; but the typical Crows (not the Jays, nor most of the Pies) walk, as also do the Wagtails, Larks, and most of the Starlings. Many of the tree-haunting starlings hop, however; but, on the other hand, some Passerine birds which live mostly on the ground always hop, such as the Chats and Pittas. These, however, travel rapidly and gracefully, very unlike the awkward action of many hopping birds. Some Passerine birds, such as the larger Thrushes, have a curious habit of frequently changing from the walking or running action to the hop, and the gait of the Chaffinch and Hedge-Sparrow is a curious compromise between a hop and a walk, a sort of shuffling blend of both. Passerine birds, as a rule, do not close the toes of the foot which is being lifted as they walk, although the Oven-Bird (*Furnarius*) does so (see Fig. 9 on page 199, Vol. II. of Animal Life), and the same peculiarity is found in the gait of some birds of prey and waterfowl. As a rule, of course, the action of lifting the foot closes the toes automatically.

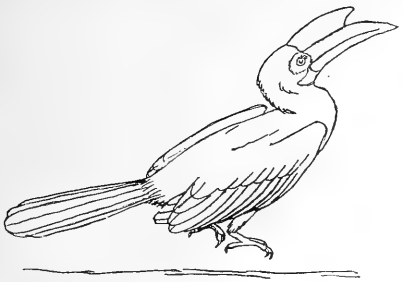


Fig. 4. Hornbill hopping.

Unlike leaping mammals, birds which hop never attain any great speed, all the swift species being runners. The Ostrich has the reputation of being the swiftest of all running animals; but the Road-Runner of California (*Geococcyx mexicanus*), a ground-cuckoo no bigger than a magpie, is said to be able to keep ahead even of a horseman for many hundred yards. As a rule, however, the best runners outside the Ratite group are confined to the Bustards, Game-Birds (*Phasianidæ*), Tinamous and Plover-like forms, and these have the hind-toe reduced or absent.

The actions of birds on trees are usually correlated with their movements on the ground, whether they spend much or little time there; thus, birds which hop on the ground not only jump from one branch to another, but if moving along a branch travel with sidelong hops. A bird which walks, on the other hand, will, although it may jump from one bough to another, nevertheless travel "hand over hand" along a bough if it has any distance to go. The different actions of a Jay and Touracou in a tree exemplify this (Fig 5).

Parrots not only walk along the boughs, but hook themselves from one to another with their bills, and so, among the finches, do the Cross-Bills (Fig. 6). Lories, however, in accordance with their hopping gait on *terra firma*, hop and sidle much among the boughs, and comparatively seldom call in the assistance of their bills.

Something must be said about the movements of birds when swimming. This accomplishment most of them apparently possess, but as non-aquatic birds usually propel themselves by striking with their wings, they soon become draggled and exhausted, and drown in spite of their lightness, which ensures their floating. Those which use their legs like waterfowl, as the waders do when out of their depth, manage well enough; the wild turkey, when its limited powers of flight have failed to take it across a wide river, gains the shore in this way. The great flightless birds are also good swimmers. I have heard of an immature Cassowary reaching land after a four miles' swim in a rough sea; and these birds and the Emu and Rhea are known readily to cross rivers.

Of birds which swim habitually, the feet, which are usually webbed or lobed, are the agents of propulsion on the surface, and usually strike alternately, the automatic closure of the foot as it is drawn forward lessening the resistance to the water, while it is expanded for the back-stroke. The diving waterfowl usually swim low, more or less, like the Cormorant (Fig. 7), which is almost an extreme example, although its relative, the Darter or Snake-Bird (*Plotus*) shows only the serpent-like neck above water.

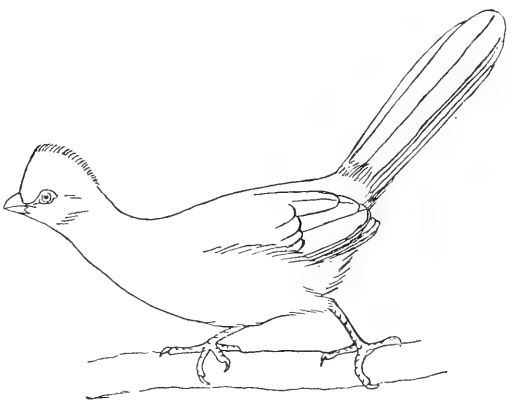


Fig. 5. Touracou running along bough.

Purely surface-swimmers, like Gulls (Fig. 8), sit high, especially in the stern, and there are many gradations between these two extremes. The Grebes, however, although thorough divers, sit high ordinarily, but will sink almost level with the surface at any alarm.

In diving, some birds at all events, such as Grebes and the Diving Ducks, use both feet together, as may be easily seen in the case of the latter in St. James's Park when Pochards are diving near the bridge. Under ordinary circumstances grebes and diving ducks seem not to open their wings under water, but when chased the latter do so, keeping the wings half open. Guillemots fly under water in this way, not using their feet at all, and I have seen the elegant Pheasant-Tailed Jaçaná (*Hydrophasianus chirurgus*), essentially a light-floating surface-bird, do the same thing.

Penguins are specially constructed for sub-aquatic flight; their wings, which only move at the shoulder-joint, being perfect paddles, and their feet not being used for propulsion under the surface (Fig. 9). They differ from other diving-birds in being able to swallow prey under water. The only aquatic Passerines, the Dippers or Water-Ouzels, also fly under water, using the wings half closed; their feet are like those of ordinary Thrushes, and I am not aware that they are brought into play in swimming.

Fig. 6. Parrot climbing.

It is, of course, the flight of birds which is their most interesting form of movement, and the one which is the most difficult to understand in some of its phases. Birds may fly in two ways—by beating the air with the wings, or by gliding with these motionless, although in the latter case there must be some previous impulse to give momentum. In beating, the wing is brought downwards and forwards—much more forwards than one is apt to suppose, although instantaneous photographs have made more familiar poses which Japanese artists had apparently been able to appreciate from studying birds with the naked eye (Fig. 10). The down-stroke of the wing occupies more time than its upward recovery, and is that which constitutes the propelling force. During its continuance, the hinder edge of the wing is forced up and the tips of the primaries bent by the resistance of the air, so great is the force employed in the stroke. At the close of the down-stroke the wing moves at first backwards, and then, being sharply flexed, rises upwards, while the plane of the wing is altered so that its lower surface looks forwards instead of backwards as in the down-stroke. The end of the humerus, or upper wing-bone, in performing these movements describes a downwardly inclined ellipse, the down-stroke occupying the front half of this. Both wings always move together, unlike the legs in walking.

The exertion in this kind of flight is greatest on rising; a Pigeon's wings touch each other at the up-strokes and nearly so at the down-strokes, when the bird starts, and for this reason very large birds, such as the Condor and Adjutant, often have great difficulty in rising, though they fly superbly when well under way. It is indeed probable that, even were the struthious birds provided with wings and pectoral muscles

proportionate to their bulk, they would still be unable to rise on the wing on account of the disproportionate difficulty their great size would cause; and we have no evidence that any bird able to fly has ever existed even of the size of the modern Rhea.

At the same time it must be borne in mind that sometimes, at all events, large birds can rise easily enough; thus, Jerdon states that the Great Indian Bustard (*Eupodotis edwardsi*), which may attain a span of eight feet and a weight of nearly thirty pounds, can spring into the air without running a single step, and eagles can manage to carry off objects of greater weight than themselves.

The statements that any birds are unable to rise from level ground, so frequent in natural history books, should be received with caution. This is often said about Swifts, but in several experiments with the common Indian species (*Cypselus affinis*) I found that most healthy individuals could raise themselves. It is also known that Albatrosses and Frigate-Birds can do so, so that length of wing and shortness of leg combined do not incapacitate a bird in this way. Circumstances may alter cases. With regard to the short-winged diving-birds, which are also supposed to be very helpless in this respect, I have found the Indian Dabchick unable to rise off a lawn; but then the birds I tried were wild exhausted specimens from the bazaar. Gulls rise from the land with peculiar ease, not even troubling to stand up first if they happen to be lying down.

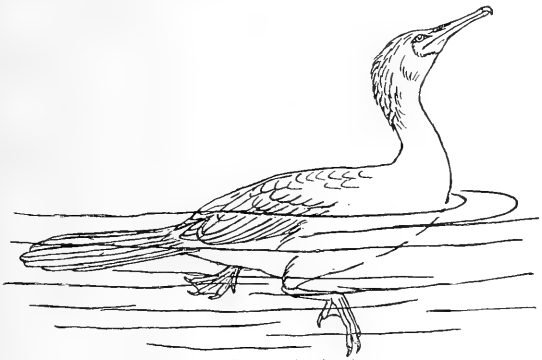


Fig. 7. Cormorant swimming.

In rising there is, accordingly, often some difficulty. A vigorous spring is usually made, as by most birds, or a run taken, as by those whose great size or pre-eminently aquatic adaptations render this necessary. On rising from water, birds are more apt to paddle along the surface than they are to run when on land, and all the more awkward species like to be head to wind in this case, as without this assistance the difficulty is likely to be insurmountable.

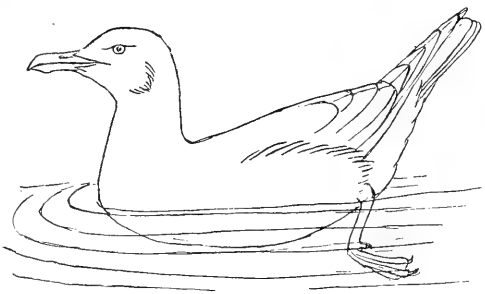


Fig. 8. Gull swimming.

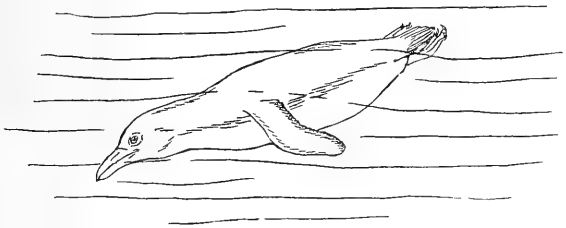


Fig. 9. Penguin diving

Once launched, the bird may continue its course by

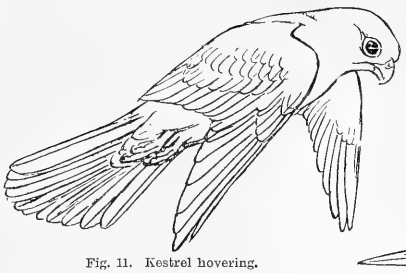


Fig. 11. Kestrel hovering.

simply flapping, or by flapping and gliding alternately. The Duck is an example of the former method, and the Gannet and Partridge of the latter. But whereas the partridge's flight is quick and violent—whiz alternating with skim—the gannet's strokes are slow and easily counted. The partridge, like other short-winged birds, has to make up in the rapidity of its strokes what it lacks in their efficacy; it and other such birds thus acquire great speed, but they are soon exhausted, and may be even ridden down.

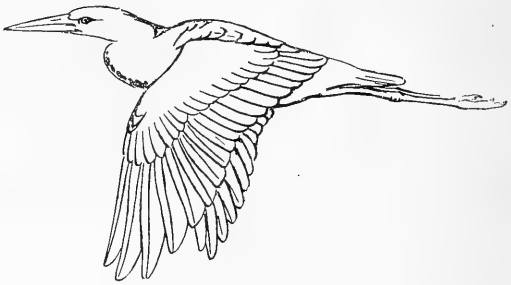


Fig. 10. Heron flying.

Some short-winged species, such as the Guillemot, do not even skim, but keep on a continuous quick flutter from first to last. Species with noticeably large wings and light bodies can do much as they like in the air; but among these there will be noticed remarkable differences according to the form of the wings, a species with large rounded wings like the Lapwing being not fast, but clever at sudden evolutions, while a sharp-winged bird with long wings easily attains to great speed, but cannot rise or shift so readily.

Thus the sharp-winged Falcon finds the Heron, with its large hollow wings, rise much more easily, and in order to get above it, has to bring into play all its strength and speed, tearing round in vast circles, in the centre of which the heron is making small rings.

In the same family the smaller species will move their wings much more quickly than the larger. This is well seen in comparing the flight of a Duck with that of a Goose, or that of a Partridge with that of a Peacock. The flight of the last bird, by the way, has no intervals of cessation, and with its comparatively slow strokes seems fairly easy; but the peacock is really a poor flyer, and cannot "stay" long, even in the wild state.

On the other hand the Swan, which rises with great difficulty, is, when fairly launched, a very swift flyer, owing to its great weight and muscular power, and easily passes a Duck at full speed.

A very large number of birds, nearly always of small size, have a peculiar undulating flight, since after a few quick strokes they close their wings and drop, again rising with another flutter; this mode is particularly characteristic of Passerine birds, though not found in large species like the Crows, nor in some smaller ones. It is probably a means adopted to gain impetus for a light weight. The largest birds which practise it are some of the Woodpeckers, such as our common green species, which is shown at the instant of closing its wings (Fig. 12). The mention of this group shows that the practice is not confined to Passerines, but it never occurs among groups which live on the ground or swim, and some tree-birds never use it; thus the Parrots fly with steady repeated strokes like Waterfowl.

Some birds have a very eccentric flight; thus, the Jay, although short-winged like the Magpie, does not travel by rapid flaps like that bird, but with slow, measured

strokes like the long-winged Crow. The Hornbills, though some of them move by measured flaps, in other cases alternate a single measured flap with a short sail, thus progressing in an easy but by no means rapid manner. The Hoopoe alternates strong strokes with a closure of the wings, which are large and broad, though not long, and thus looks rather like a large butterfly; it is one of the hardest birds for a hawk to catch, from its great power of shifting and mounting.

The slowest fliers move their wings more quickly and travel faster than one would suppose; I found on timing one more than once that our common Heron takes two strokes to the second.

The speed of birds' flight has, however, been much exaggerated; a pigeon is certainly above the average in speed, and it is a good "homer" that will cover fifty miles in the hour. Dr. Blanford, in the "Fauna of British India," says that the great Spine-tailed Swifts (*Chætura*) are probably the swiftest of living birds; one observer says they go past with a twang like a harp-string; and another that the Alpine Swift (*Cypselus melba*), which is swifter than our Swift, seems to fly like an owl after the speed of the spine-tail has been seen just before.

In flying, the tail undoubtedly comes into play in helping the bird to turn, and it is lowered as a brake when the bird alights; but it is not so easy to see why it is spread on rising. Anyway, it cannot be a very essential organ, as some of the finest flyers, such as the above Spine-tailed Swifts, have quite short tails. Birds with long wedge-shaped tails, like the Magpie, seldom fly remarkably well, though there are exceptions to this rule; forked-tailed birds are almost all good flyers, and readily execute evolutions.

Fig. 12. Woodpecker flying, showing closure of wings.

Hovering, or standing still in the air, can only be performed by light birds with powerful wings; as may be seen in the drawing of the Kestrel, our most conspicuous exponent of the art, it is done by rapid forward and downward strokes of the wings, with the body raised and the tail spread (Fig. 11). Humming-Birds are constantly hovering as they poise in front of a flower.

Swooping is, of course, done by closing the wings; few birds except those of powerful flight care to attempt it; it is a speciality of the Falcons when striking their prey.

When about to alight, most birds set their wings rigidly and extend their feet in front to be ready to use them on perch, ground, or water; but the Grebes, which probably never from choice alight on land, come down anyhow, their wings working and their feet trailing behind to the last.

The backward extension of the feet in full flight is undoubtedly the rule among most families of birds, and not only among the long-legged waders and the waterfowl, as was thought till recently; but some families tuck up their feet in front, such as Passerines, Woodpeckers (see Fig. 12), Barbets, and Hoopoes. The length of the shank has nothing to do with the method of stowage adopted, for such short-legged birds as Pigeons, Parrots, Cuckoos, Kingfishers, and Rollers carry their feet astern; and some Passerines have quite long legs, such as the Starlings.

Gulls undoubtedly tuck up one or both feet at times, but normally, as anyone can see in our London winter visitors, their legs are carried under the tail. The stowage of the neck in flight is as difficult to understand as that of the feet. As a rule long-necked birds stretch it out, like the Ducks, and short-necked ones draw it in, like Crows. But the long-necked Herons and Pelicans draw in their necks, and so do the bare-necked

Adjutant-Storks and Vultures, some of which last have decidedly long necks. In the case of the Heron the kink in the neck-vertebræ, which renders a curved position for the neck the easiest, may be the excuse, and perhaps the Bare-necked Storks and Vultures may draw in their necks for warmth, but it is not so easy to find the reason in the case of the Pelicans. The big bill of the last-named will not account for it, as the Hornbills fly with outstretched necks, and these have, if anything, more weight in front.

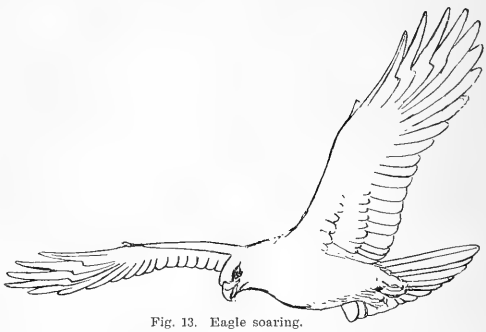


Fig. 13. Eagle soaring.

There is no doubt, however, that the most active flyers are found among those which draw in their necks, though many groups which extend the neck, such as Cranes and ordinary Storks, fly strongly and are adepts at soaring.

Soaring is simply the gliding movement continued for a long period, the bird moving in circles or spirals, either close to the ground or water, as in the case of the Albatross or Lammergeier, or high in the air as with Vultures, Eagles, or Storks, which will rise to enormous heights in this way. The Vultures and Storks have their wings extended to the utmost and perfectly flat, while those of the Kites flex slightly at the pinion-joint. The Eagle (Fig. 13)—

> "Soaring in supreme dominion
> Through the azure fields of air"

looks noblest of all, as his wings are not only extended to their fullest stretch, but slightly inclined upwards, which gives a less stiff effect.

Buzzards, unless near enough for their smaller size and distinctive markings to be seen, cannot be distinguished from Eagles in their flight, and as they are now fairly common in parts of Britain, it is be hoped our physicists will pay more attention to their movements and solve the mystery, for how soaring is done is still somewhat of a puzzle. All long-soaring birds are big, and none are fast flyers; some weight of body and a great span of wing seem requisite. The wings of high-soaring birds are always broad and rather blunt, while those of the low-gliding Albatrosses are, though long, decidedly narrow.

Calm weather is adverse to soaring, so that a certain amount of wind appears to be necessary, and in the curves or circles described the bird sails alternately up and down the wind, sinking in the latter case and rising in the former.

As in the case of swift-flying birds, soaring species may have tails of varying length, and the long-tailed ones, like the Kites, undoubtedly make much use of the tail when soaring; one side of the tail can be easily seen to be elevated while the other is depressed, and so on.

The fact, noted by Sir Walter Buller, that the New Zealand Harrier (*Circus gouldi*) does not soar while in its young plumage, shows that some birds at all events acquire expertness in this magnificent art with practice; the creature requires time to make an efficient aeroplane of itself. But the penalty of a mistake is light, for such a bird can right itself with a few flaps; and the fact that we have not this enormous mechanical power at our command whenever needed seems to be the greatest obstacle to man's conquest of the air.

GREAT SNAKES.

By R. Lydekker.

ANIMALS that greatly exceed the other members of their tribe in bodily size always command a large amount of popular interest, and when to this superiority there is added some marked structural peculiarity, especially one indicative of their descent from less specialised forms, the interest is, of course, largely increased. Both these claims to distinction are held by the snakes commonly called pythons and boa-constrictors, which are not only the largest representatives of their kind, but also retain evidences of affinity with lizards lost in the more typical snakes. Nor is this all, for these reptiles are likewise remarkable on account of the mode in which they kill their prey and afterwards reduce it to a condition fit for swallowing;—namely by first crushing the hapless victim by compression of their coils till life is extinct, and then, by a continuance of the same process, reducing the lifeless body to the condition of a huge sausage. A further feature of interest in connection with these snakes is afforded by the circumstance that the females of some at least of the larger species incubate their eggs.

First of all with regard to the names by which these great snakes are commonly known. By naturalists they are divided into pythons and boas, the first of which are inhabitants of the warmer regions of the Old World, while the latter are mainly restricted to Tropical America. In Africa the pythons are commonly known as rock-snakes, while in India and the Malay countries the name boa-constrictor is in almost universal use among English-speaking people for these snakes. Boa, I believe, is the native South American name for one or more of these snakes, the huge anaconda being specially designated as the Giboa. *Boa constrictor*, on the other hand, is properly speaking the scientific designation of one particular South American species, and that by no means a very large one. It has, however, become in popular parlance the recognised title for all the larger American members of the group; and to this use there can be no particular objection, although the enlargement of the term so as to include the pythons of the Old World is certainly to be deprecated, since it leads to confusion with regard to the geographical distribution of the group. As regards the origin of the unpopular term Python, it appears that *putho*, subsequently modified into *puthon*, was the old name for Delphi, the seat of the well-known oracle in classical Greece, where the presiding priestess was called *puthoness*, or, in Latin, *pythoness*. Very generally a snake was associated with establishments of this nature, and so the name python may have been used for the snake itself, which could not, however, have been one of the reptiles so designated by naturalists. On the other hand, some of the ancient writers speak of the serpent python as having delivered oracles at Delphi previous to the advent of Apollo, and during the Roman imperial period the name was often applied to soothsayers. Whether any of the ancients applied this name to the great snakes of India, or whether this usage dates only from the European culture of natural history, I am unable to say.

I have already alluded to the popular confusion between boa-constrictors and pythons, and it must be confessed that naturalists are not altogether free from blame in this matter, although it is not very easy to see how the difficulty could have been avoided. Zoologically, both pythons and boas (as the South American forms are best collectively

termed) are classed in a single family, the *Boidæ*. This family is divided into two groups or sub-families, the first of which includes the true pythons of India and the Malay countries, as well as the African rock-snakes and the Australian and Papuan carpet-snake. Unfortunately it likewise includes a single aberrant species from Southern Mexico, so that in the zoological sense there is some justification for saying that pythons occur in the New World.

Worse confusion occurs in the case of the second sub-family—the *Boinæ* of the naturalist—since, in addition to the typical boas of Tropical America, and their outlying representatives in Madagascar, the group includes the snakes of the genus *Eryx*, which are natives of North Africa, Greece, and South-Western Asia, as well as certain Papuan and Pacific Island forms, all of which are, in one sense, entitled to be called boas.

In the present article the latter term will be restricted to the larger snakes of Tropical America and their immediate, although smaller, relatives, while by pythons will be meant only the snakes properly so called, together with the African rock-snakes, the Australian carpet-snake, etc.

In common with other snakes, boas and pythons are enabled to twine their bodies into the well-known unbroken and regular coils owing to the structure of the vertebræ and the loose articulation between these and the exceedingly numerous ribs.

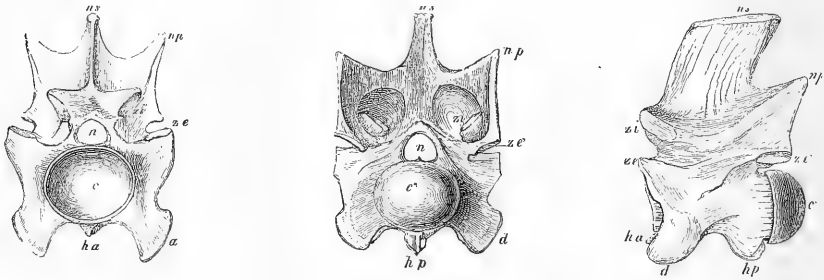


Fig. 1. Front, hind, and lateral aspects of a vertebra of a Python; *ns*, dorsal spine; *np*, lateral process; *n*, neural canal; *ze* and *ze'*, pre- and post-zygapophyses; *zi*, zygantrum and zygosphene; *c* and *c'*, anterior cup and posterior ball; *ha* and *hp*, ventral spine; *a* and *d*, articular surface for rib.

Snake-vertebræ, as shown in Fig. 1, are characterised by possessing more interlocking surfaces than are to be found in those of most other animals, whereby the coils are formed with greater regularity and smoothness than would otherwise be the case, while the risk of dislocation is proportionately lessened. In addition to the ordinary articular facets known as pre- and post-zygapophyses, common to vertebrates in general, each vertebra of a snake has a wedge-shaped articular process known as the zygosphene which fits into a corresponding cavity—the zygantrum—in the adjacent surface of the next vertebra, whereby a most firm, and at the same time mobile, joint is secured. It is somewhat remarkable that a similar mode of articulation of the vertebræ is met with in the iguana lizards of America. As other lizards get on perfectly well without such additional facets, it is difficult to understand why they should be developed in the iguanas, unless indeed it is a foreshadowing of the serpent type. Not that I mean to imply that iguanas are the ancestors of snakes; but it may well be that those lizards from which serpents took origin had vertebræ of this complicated type. If this suggestion prove true, it would be very difficult for those who believe that unaided survival of the fittest has been the prime cause in animal evolution to explain why these ancestral lizards should have acquired a type of vertebræ apparently necessary only to serpents.

With the single exception of a small family of small snakes of partially burrowing habits—among which the beautiful coral-snake of tropical South America is the one most familiarly known—the boas and pythons differ from all the rest of their kind in retaining distinct vestiges of the pelvis and hind-limbs—certainly a most remarkable and, I may almost say, unexpected feature in a group which includes the largest members of the whole tribe. Externally, these indications of a descent from four-limbed reptiles are displayed by the presence of a pair of claw-like spurs on the sides of the vent, but in some cases these are so small as to be extremely difficult of detection, if indeed they are not altogether wanting. In other instances they are, however, comparatively large and conspicuous. Internally there are small rod-like bones on either side of the backbone representing the pelvis, in addition to which there may be other bones corresponding to the thigh-bone, or femur.

From the aforesaid family of small burrowing snakes—the *Ilysiidæ* of naturalists—with vestiges of the pelvis, the boas and pythons are readily distinguished by the circumstance that the scales on the under-surface of the body are enlarged so as to form transversely elongated shields, instead of being but slightly superior in size to those of the back.

The Old World pythons and their immediate relatives differ from the boas and

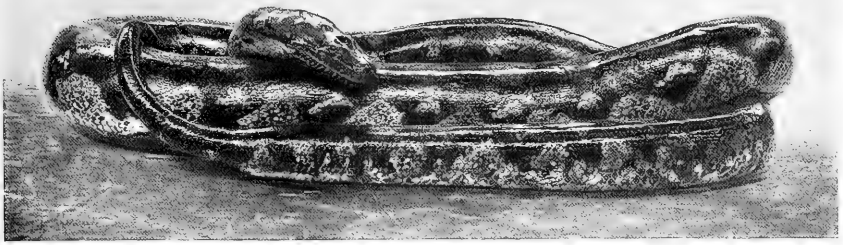


Photo by A. S. Rudland. MALAY PYTHON.

their allies by the presence of an additional pair of bones in the skull, known as the supraorbitals, as well as by the circumstance that in most cases the scales on the under-surface of the tail are arranged in a double instead of a single row. Moreover, in the pythons and their allies the foremost bones of the skull, or premaxillæ, are frequently furnished with teeth, whereas in the boas they are invariably toothless.

Of the true pythons (in which the aforesaid bones invariably carry teeth), the largest representative is the handsomely-coloured Malay python (*Python reticulatus*). Of this species a specimen measuring only one inch short of twenty-five feet is exhibited in the Natural History Museum at South Kensington, where there is also a second example of something over twenty-one feet (Fig. 2). Both specimens show the bold pattern of lozenges of bluish-black, bordered with yellow, characteristic of the species. Another characteristic feature of this species is the black line running down the middle of the head, flanked by other black lines from the eye to the angle of the mouth. It should be mentioned that the brilliant colouring of the Museum specimens is seen in nature only for a short time after the reptiles have changed their skin. It is admitted by naturalists that this species grows to thirty feet, and it is possible that it may attain even larger dimensions.

In India and Ceylon the group is represented by *Python molurus*, in which the middle line of the head shows a spear-shaped mark, while a brown stripe extends backwards from each eye. Although generally not much more than twelve feet in length, the Indian python is believed to grow sometimes to twenty feet. The late Sir Walter Elliot wrote indeed, on native testimony, of a thirty-footer, but as this monster was reported to have swallowed a young gaur, or wild ox, there may be some doubt as to the truth of the testimony concerning its dimensions. A third Oriental species, the red python (*P. curtus*), from Sumatra, Borneo, and the Malay Peninsula, which never seems to grow very large, is remarkable for the large amount of red in its brilliant coloration. It would be interesting to know with what particular feature in its surroundings this type of colouring is intended to accord; there being little doubt that the coloration of all pythons is of a protective nature, conspicuous as it may appear in a museum or menagerie.

The two African pythons or rock-snakes (*P. sebæ* and *P. regius*) are likewise comparatively small, seldom, if ever, much exceeding fifteen feet in length, and being generally smaller. The second, which is a native of the west side of the continent, is very handsomely marked, having a dark-brown stripe edged with black running down the middle of the back, from which are given off triangular or Y-shaped off-shoots along the sides. Of the still smaller species, it must suffice to mention the Australasian carpet, or diamond, snake (*P. spilotes*), easily recognised by the double row of yellow diamond-shaped lozenges on a dark ground running down each side of the body.

All the pythons and boas lay eggs. Those of the larger pythons are soft-skinned and of the approximate size of a cricket ball. In 1881 a female Indian python in the Zoological Society's Gardens laid a number of eggs, around which she coiled her own body during the period of incubation. Such a method of incubation is probably common to all the larger pythons. At one time the process was believed to be attended with a marked rise of temperature, but the observations made in 1881 showed that this was a mistake; and it would thus seem that the action is intended for the protection of the eggs, and not to aid their hatching. A similar habit occurs in certain species of the burrowing snake-like amphibians known as cecilians.

Photo by W. P. Dando, F.Z.S., Regent's Park.
BOA-CONSTRICTOR.

Turning to the boas, mention must first of all be made of one peculiar feature in their geographical distribution to which allusion has already been incidentally made, namely that while the great majority of the members of the typical genus *Boa* are restricted to Tropical America, two outlying species are met with in Madagascar. A precisely similar instance of discontinuous distribution,

as the phenomenon is called, occurs in the case of certain side-necked tortoises. And it is one of the puzzles of science to determine whether these peculiarities should be explained by a migration down different continents from the north, or by means of a direct equatorial land connection.

The true *Boa constrictor*, as already mentioned, is a comparatively small species, probably not much exceeding a dozen feet in length. On the other hand the giboa, or anaconda (*Eunectes murinus*), which differs from the true boas by the number and arrangement of the horny shields on the head, appears to be the largest of all living snakes, although we are yet in the dark as to its maximum dimensions. It is commonly reported to attain a length of thirty-three feet; but it has been well remarked that while there is no inherent improbability in such statements, the giant specimens seem to have a knack of keeping out of the way of the naturalist.

Thirty-three feet is, however, scarcely within measurable distance of the dimensions which have been tentatively assigned to the anaconda. Charles Waterton, for instance, mentions that when in Angostura he was shown part of a serpent's skin which, judging from its amazing thickness, he attributed to an individual which could not have been less than seventy feet. And Waterton was not given, knowingly, to romance! Possibly the real explanation may be that this abnormally thick skin belonged to an anaconda of unusual girth. And that such exist is testified by the following statement made by Mr. Paul Fountain in "Mountains and Forests of South America." This writer observes: "I shot an enormous boa, which, though only seventeen feet long, was fifty-two inches in girth in the thickest part, and this great size was not owing to the reptile having recently fed, for the stomach was empty."

Although we are not prepared to accept anacondas of seventy feet in length, it seems quite probable that specimens largely exceeding, either in length or girth, any yet known to science may occasionally be met with. To such overgrown monsters the Spanish inhabitants of South America, according to Waterton, apply the name Matatoro, or bull-killer.

This opens up the question as to the maximum size of the animals boas and pythons are able to kill and devour. On this point I may quote from Dr. Gadow, who, in the *Cambridge Natural History*, writes as follows:—"It is obvious that a large snake, twenty feet long, half a foot thick, and weighing several hundred pounds, can crush a tiger, a stag, or even a cow; but common sense tells us where to draw the line when it comes to the swallowing of the prey. Small game, although of

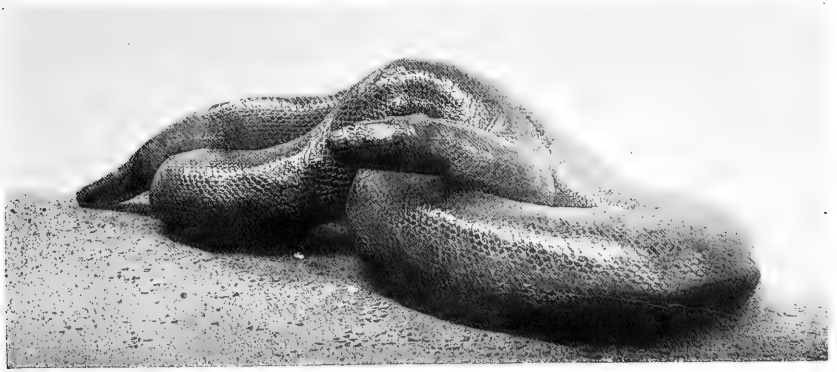


Photo by A. S. Rudland. ANACONDA.

bulk apparently far too big for the snake, is so crushed and mangled that it is turned into the shape of a sausage preparatory to the long process of swallowing."

With all due deference to the author, I venture to think that the size of the animal that a giant anaconda is capable of swallowing is just one of those things that common sense does not teach us. And, as in the case of the dimensions attained by these reptiles, we must await trustworthy and accurate observations in the field before we are capable of coming to a definite conclusion on this point, although it may be fairly granted that not even the greatest snake alive could swallow a tiger, let alone a cow. We may therefore dismiss as incredible the above-mentioned story of an Indian python having swallowed a young wild ox. On the other hand, the statement that a Malay python on board H.M.S. Alceste swallowed a goat, the horns of which distended its skin for many days after the meal, appears thoroughly well authenticated.

It is a common, if unfounded, belief that animals of past epochs exceeded their living relatives in corporeal bulk; and this belief may be thought to receive confirmation from the occurrence of remains of a very large species of snake in the Eocene deposits of Egypt. The vertebræ of this snake, which has been named *Gigantophis*, are stated by Dr. C. W. Andrews, its describer, to be much larger than those of any existing serpent. They were compared with those of the African *Python sebæ*, and inferred to indicate a snake of about thirty feet in length. As this is the length reputed to be attained by the Malay python, to say nothing of the anaconda, the comparison scarcely seems to justify the statement that the extinct Egyptian snake exceeds all the living members of the group in size. On the other hand, I believe that its describer has underrated the size of the fossil reptile, and that forty feet would be a nearer estimate of its length.

Side by side with those of the species just mentioned occur vertebræ of another very large although decidedly smaller snake, for which the name *Mœriophis* was at first suggested, although it subsequently turned out to be generically inseparable from an Eocene North American snake described as *Pterosphenus*. They are of quite a different type from those of *Gigantophis*, and from their compressed form and tall dorsal spine it is highly probable that they indicate snakes with compressed and wedge-shaped bodies more or less nearly related to the sea-snakes of the present day, although far larger. Remains of apparently allied snakes, of the genus *Palæophis*, occur in the London Clay and other Eocene deposits of our own country. If the vertebræ of *Gigantophis* indicate a snake of forty feet in length, those of the extinct Egyptian sea-snake would seem to have belonged to one of about five-and-twenty feet. As the largest of modern sea-snakes do not exceed five or six feet in length, the extinct Egyptian species seems entitled to be regarded as a veritable "sea-serpent," albeit one falling short of the popular estimation in point of size.

And this reminds me that an article on great snakes would hardly be considered complete without a word of reference to that more or less mythical monster. I shall, however, content myself with observing that, with the exception of the aforesaid Egyptian and English Eocene vertebræ, the former of which indicate, at best, but a very poor imitation of the popular ideal of the sea-serpent, naturalists are at present unacquainted with any living or extinct snake of marine habits and of dimensions at all approaching those generally assigned to that creature. Moreover, the sea-serpent is frequently described as being furnished with paddles and as swimming with the body thrown into vertical folds. Whatever, therefore, may be the nature of the supposed monster, there can be little doubt that it is not a snake.

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough, f.z.s., f.e.s., etc.

XV. THE MUNGOOSE.

NEARLY every day one may see advertisements in the various live stock and fancy papers offering ichneumons, or mungooses, as they are more commonly called, for sale, often with the recommendation that they are the best means of ridding a house of rats and mice. This is only true to a certain extent, as they cannot be given liberty to act as "mousers" as a cat can, for although small animals—smaller than a cat—they are most bloodthirsty little fiends, and would clear a house or garden of its live stock in less than no time. So a very sharp eye must be kept on a mungoose except during the time it is safely caged.

These animals being extremely quarrelsome, one is quite enough to have as a pet, since the yelping noise and squeaks made by a couple of ichneumons is enough to upset the equilibrium of the most even-tempered person. If two are kept together, even a pair, they never seem happy unless engaged in quarrelling with each other, and when they fight they inflict nasty injuries on one another, as they always endeavour to bite their opponents about the feet and legs until one succeeds in fastening its teeth in the other one's throat and thus finishes the affray; if they have been together from early days they do not squabble so bitterly. It often happens that when two or more mungooses are sent any distance they injure one another seriously unless kept in separate compartments.

The facilities of transport have increased so much during the last few years between Europe and tropical countries that the animals peculiar to the latter are exported in numbers, and nowadays the ordinary foreign animals cost no more than a dog does; the mungoose is so frequently brought over to this country that it can be bought for fifteen shillings, and often less, from almost any animal-dealer. Some care must be taken in selecting the one wanted to make sure it is a young one, as the writer has not yet succeeded in taming an old one. An adult specimen of these animals is nearly always nervous, morose, and irritable when captive, spending the greater part of its time in biting the wires of its cage, and running away at the approach of anyone into the farthest corner of its cage, especially if it can get under a heap of hay or straw to hide itself. Some ichneumons—and particularly the Egyptian species—when captured fully grown refuse to eat or drink anything at all. If the reader can get hold of a young one, it will speedily become quite tame and attached to its owner in a marked degree.

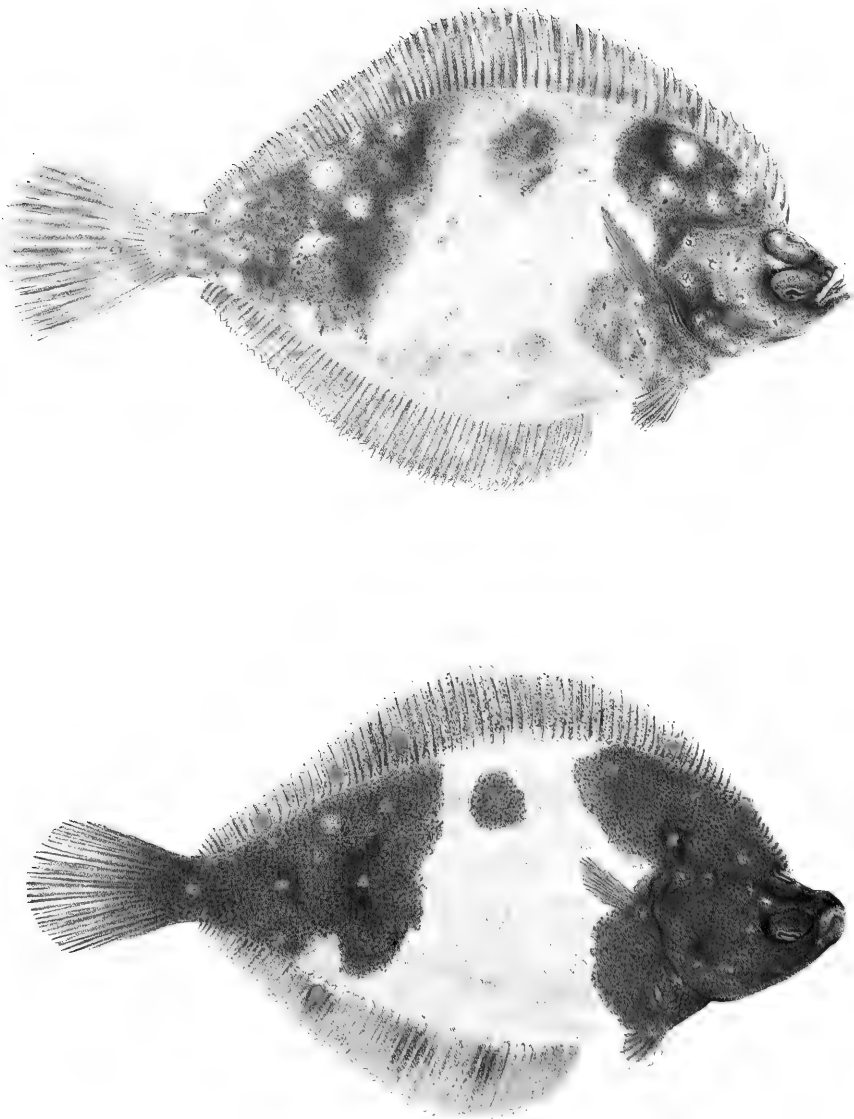
A box-pattern cage—that is, wired in the front only—is the most suitable, as it is not so draughty as the other kinds with the back or ends open as well; one four feet long by three feet in height and the same from back to front will be quite large enough; the wire-work must be strong, as the mungooses are powerful little animals for their size. A couple of doors are necessary, one at each end of the cage, so that every part of the interior can be easily reached. The floor of the cage may be covered with pine sawdust—which is an excellent deodorant—and a thick layer of straw on top; the straw and sawdust must be changed every day. There is no need to partition off any part of the cage for a sleeping compartment, as a small box full of hay or straw is just as serviceable, with the advantage that the whole of the cage is under observation if required; a small round cheesebox can be bought for a few pence at a grocer's, and will be found just the thing.

Although mungooses are such splendid little hunters, they must not be permitted to rely solely on their earnings for food, but must be regularly and properly provided with their meals. Meat, raw or cooked, chopped finely; eggs, raw or boiled, small birds and mammals, reptiles—they are particularly fond of frogs, in common with many other of the smaller carnivores—bread and milk, can be given; some specimens are fond of fruit, such as a plum or banana.

If the bough of a tree be placed diagonally in the cage from an upper corner to the opposite lower one, it will afford the animals some amusement, as they are often fond of climbing up and down this branch; it must be a "dead" branch, in case they get nibbling at the live bark. It is rather interesting to watch an ichneumon with a raw egg; if it be a small mungoose and a large egg, with a shell too hard for the teeth to pierce through, the animal will take it up between its forepaws and dash it violently to the floor of its cage to break it, so that it can lick up the yolk and white. If, however, the animal can pierce the shell, it makes a hole at one end, through which the contents are sucked with much gusto. The ailments of these animals are few—generally diarrhœa or cold from wet and draughts—but nearly always fatal in consequence of the obstinacy of the creatures. When they become attacked by disease nothing can be done, as they always get morose and treacherous, refuse to touch their food, and bitterly resent all attempts to interfere with them, even though it be to give them medicine to alleviate their sufferings. They sometimes, when wounded in a quarrel, will permit their owner, if they are on very friendly terms with him, to put a little ointment on the injured place, which they generally amuse themselves by licking off as soon as it is on. Damp and draught are two things these little creatures are very impatient of, although they are not by any means delicate animals. If they are kept out of doors it will be as well to provide a canvas covering to drop over the front of the cage during wet weather, as although the woodwork may be quite watertight, the rain beating in through the wire front of the cage wets the sawdust and straw, and often causes illnesses which are otherwise preventible. Any desire on the owner's part to tease must be restrained, as they are very touchy little animals, especially if feeding; at mealtimes they generally carry their food away into the darkest corner of the cage to be free from interruption.

The word ichneumon is Greek, and means "a tracker." The ancient Egyptians kept these animals and permitted them to have the free range of their homes and paid great attention to them, even going so far as to deify them and embalm their bodies after death.

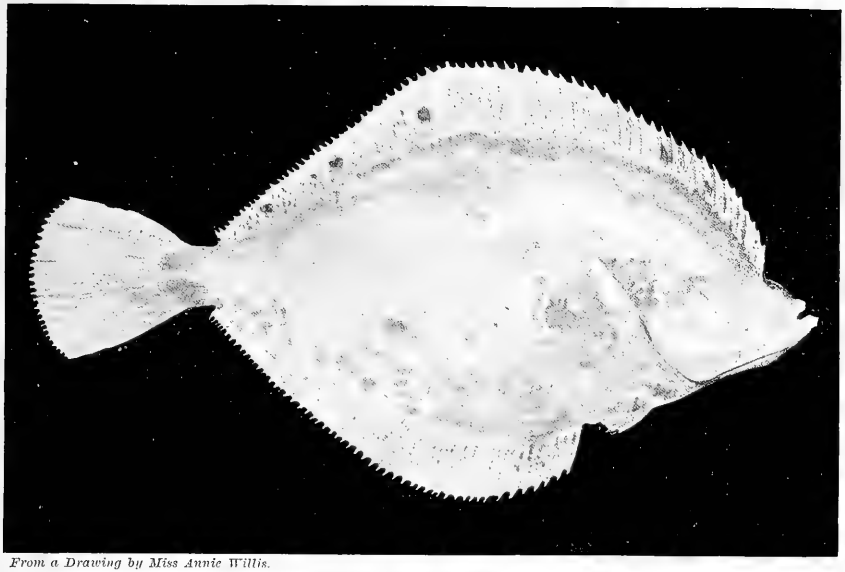
As a delightful pet for ladies the Suricate is pre-eminent. It is only generically distinct from true mungooses, but is smaller and gentle in its habits; a native of South Africa, it is very frequently advertised for sale under the name "Meerkat." Meerkats are much more confiding and trustworthy than the true ichneumons and are very sociable, so that a number can be kept in one cage, which may be precisely similar to that for a mungoose. More liberty may be allowed the meerkat than the ichneumon, as it is not so bloodthirsty as the latter animal; it gets tame remarkably quickly, and in a very few days behaves as if it had been brought up in captivity from a baby. Plenty of exercise is essential for these little creatures, as they are rather liable to fits. They may be fed and managed in all respects exactly similar to their larger relatives, but they are especially fond of birds' eggs and insects. The meerkat is full of quaint antics, and its funny little ways, if taken out of its cage and left to run about the room, will interest the onlooker for hours. If a dog is kept, nothing will please the meerkat better than to strike up an acquaintance, and it has been repeatedly noticed what a keen sympathy exists between these two animals if kept in reach of each other's society.



ABNORMAL PLAICE *(PLEURONECTES PLATESSA).*

Drawn from life by Miss Annie Willis.

The lower figure shows the original condition of the specimen when captured; the upper figure shows the condition after the *lower* side had been exposed to the light for six months.



From a Drawing by Miss Annie Willis.

Fig. 1. LOWER SIDE OF A PIEBALD PLAICE.
Showing the pigment developed after six months' exposure to light.

A PIEBALD PLAICE.

By J. T. Cunningham, M.A., F.Z.S.

IT is well known that the plaice and other fishes of the family of Flat-Fishes or Pleuronectidæ are normally coloured on the upper side and white on the lower. The whiteness of the lower side is due to the absence of black and coloured pigments and the presence of a white substance in the skin. For convenience in description we may restrict the term "pigment" to the colouring-matters, excluding the white substance. Specimens of plaice and other flat-fishes are, however, occasionally obtained which show more or less colour on the lower side, varying from small patches to complete pigmentation of the whole surface. Conversely, specimens also occur in which pigment is entirely absent from part or all of the upper side, the lower side being white as usual. The colourless area in such specimens is usually sharply defined, and there is no gradual transition from the coloured region to the uncoloured. The lower figure of the coloured plate represents a living piebald plaice which came into my possession at the Plymouth Laboratory a few years ago. It was caught by a seine-net in the Hamoaze, the estuary of the river Tamar, and was kept alive in the aquarium.

The occurrence of such specimens seems at first to disprove completely the hypothesis that the absence of colour from the lower side in ordinary flat-fishes is due to the fact that no light falls upon that side. At the Plymouth Laboratory I carried on for some years experiments to ascertain whether pigment would be developed on the lower sides of flounders when those sides were exposed to the light. For this purpose the fish were

kept alive in large bell-jars, or in a wooden tank fitted with a glass bottom, and light was reflected upwards on to the lower side of the fish by means of large mirrors. A photograph of the apparatus is reproduced in Fig. 2. The result was that after some months more or less pigment was developed on the lower side of the fish, and in some cases where the experiment was continued for a long time on the same fish, the lower side became almost as much pigmented as the upper.

In the case of the specimens which occur in nature having either white areas on the upper side or coloured areas on the lower side, there is no evidence that these peculiarities are due to the action of light. We have no reason to believe that when a white patch occurs on the upper side, that patch has been covered or shaded in any way. A plaice could not very well pass the whole of its life beneath a stone with only its head and tail exposed, nor could it stay in one spot with only the middle of its body buried beneath the gravel or sand. There is in fact nothing to indicate that white patches on the upper side have been less exposed to light than the coloured parts of the skin. Conversely, it is not probable that coloured patches on the lower side have been exposed to the light more than the white parts of that side, or more than the whole side in normal cases. In the coloration produced in my experiments, the boundary of the coloured areas was not sharply defined as in the natural variations, but there was a gradual transition from the coloured region to the white. In some cases in nature a certain amount of light may reach the lower side, especially in the case of flounders which live on hard ground in shallow water, and I believe pigment is sometimes produced on the lower sides in this way. But this does not apply in the case of sharply-defined coloured areas, which must be regarded as spontaneous natural variations.

Thus there is an apparent contradiction between these natural variations and the results of my experiments. In the latter, exposure to light caused the formation of pigment in the skin, and yet a white patch on the upper side in the piebald plaice is continually exposed to light without any pigment being produced. I have maintained that the absence of pigment in normal cases is due to the absence of light, and yet specimens occur in which the lower side is coloured like the upper, and these fish lie on the ground like other flat-fishes and the skin is pigmented in spite of the absence of light. Double or ambicolorate specimens of this kind are not uncommon in the turbot, and the condition when fully developed is associated with a malformation or abnormality of the dorsal fin, the base of which is detached from the head at the anterior extremity of the fin, so that the end of the fin projects forwards in a kind of hook. How are these apparent contradictions to be explained? How can the results of the experiments, which seem to support the view that the absence of colour from the lower sides of flat-fishes is due to the absence of light, be reconciled with the occurrence of these spontaneous variations?

The occurrence in nature of pigmentation on the lower side of a flat-fish is often regarded as an instance of reversion. The ancestral flat-fish was doubtless equally coloured on both sides, like an upright fish such as the John Dory, and when the flat-fish is equally coloured on both sides, or partially coloured on the lower side, it is natural to conclude that it has reverted more or less completely to the ancestral condition. But on the other hand, when the upper side is partially white, this cannot be due to reversion, for it is impossible that both of the variations in opposite directions can resemble the ancestral fish. Therefore it is by no means certain that the occurrence of pigment on the lower side is due to reversion, and in fact both kinds of variation may be regarded simply as variations in opposite directions.

Now these variations in both cases are variations of an asymmetrical animal towards symmetry—that is to say, either side may in individual cases more or less completely imitate the other, instead of differing from it. Such variations are known to occur

in all animals in which the two sides are normally different. From this point of view the white patch on the upper side of our piebald plaice may be regarded as imitating the lower. Then if the lower side is white in consequence of absence of light, the white patch will imitate it although itself exposed to light. So also may be explained the fact that, when pigment is present on a part of the lower side, it persists in spite of the fact that there is no light to affect it. It is there because part of the lower side is imitating the upper, is developing in the same direction as the upper, instead of in its own proper direction.

We may then, as it were, regard the white patch as belonging physiologically to the lower side, and these curious questions arise: If the lower side in this specimen were exposed continually to the light, would it develop pigment as in the experiments with ordinary flounders? And secondly, what would happen to the white patch on the upper side? Would that develop pigment too?

This experiment was actually tried. The specimen lived in the aquarium from October 3rd to the month of December without showing any change in the lower side or in the white patch on the upper. It was then put into a large glass bell-jar, under which was a mirror, opposite a window. On June 17th following the fish was carefully examined. It was then seven inches long. On the lower side, where previously no pigment could be seen, there were numerous small patches of colour, as seen in Fig. 1, which is a copy of a drawing made from the living fish. Exactly similar coloured spots had also appeared in the white patch on the upper side, as shown in the upper figure of the coloured plate.

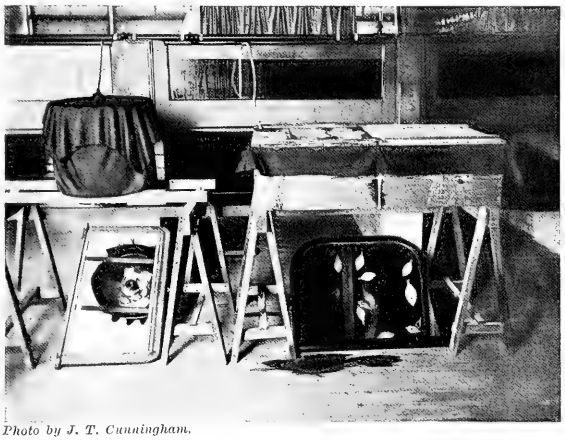


Photo by J. T. Cunningham.

Fig. 2. Apparatus for exposing the lower sides of flat-fishes to light reflected from mirrors.

This experiment, therefore, supports very strongly the view explained above of the meaning of these variations. The variations themselves, whether consisting in the presence of pigment on the lower side or the absence of pigment on the upper, are not due to special conditions, but are spontaneous. But when white occurs on the upper side it is not a case of albinism, like the white in a piebald horse or mouse, but is connected with and dependent upon the absence of pigment on the lower side; and when the lower side is exposed to light, pigment appears both on that side and in the white area of the upper side.

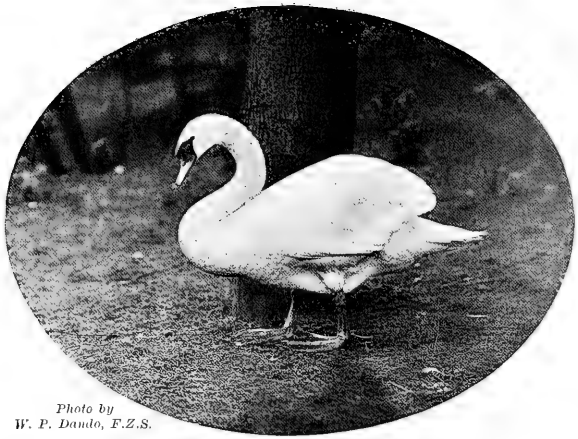


Photo by
W. P. Dando, F.Z.S.

MUTE SWAN.

ZOO NOTES.

Mute Swan.

A SWAN ashore is not seen by any means at its best, but, as the photograph shows, the common or mute species (*Cygnus olor*) still retains a certain amount of dignity on *terra firma*. This is largely due to the graceful curve of the neck and the knobbed forehead and black face, which give such a characteristically haughty appearance to this species. It will be noticed that the primary quills are missing from the wing seen, the bird having been pinioned. This operation is really quite unnecessary, for if the bird is kept in a small enclosure it can easily be caught up at moulting-time to have its wings clipped, while swans on a large piece of water are far better left full-winged, when the fine spectacle of their flight can be enjoyed, as at the celebrated swannery of Abbotsbury in Dorset. The mute swan is certainly by far the finest and most stately of all the swans, and has long been cultivated as an ornamental bird in England; indeed, it is said to have been introduced by Richard Cœur-de-Lion. It may, however, occur here as a wild bird, as it breeds in a wild state no further off than south Sweden.

Mediterranean Peregrine Falcon.

THE present bird is one of several specimens benefitted by the new *régime* at Regent's Park, having been removed from the dreadful little cell which it formerly inhabited, like other unhappy hawks, in the so-called Northern Aviary, to the somewhat more commodious quarters furnished by the Kites' Aviary; the kites being now removed elsewhere. To be kept properly, however, falcons should be tied up with jesses and leash to a block, and allowed out to fly daily. Of course they would require to be trained for this, but there would be no more difficulty in training the falcons to come to the lure than in breaking the zebras to the saddle, as is being done at the time of writing this.

There would be no danger to the waterfowl in giving the falcons some exercise of this kind, as the latter could be kept well fed, and would, besides, not be likely to attack ducks on the ground or water. With goshawks the case would be different, and these fierce birds could not be let out wherever there were weaker species in the open.

Australian Rail.

THIS beautiful bird (*Hypotænidia philippensis*) takes in Australia the place of our land-rail (*Crex crex*), which it much resembles in habits. It is also of about the same size, but has a longer bill and is very much more beautifully coloured; even the photograph displays the zebra-like markings of black and white on the under-surface and the white spotting of the upper, while there are contrasts of cinnamon, slate and olive of which the camera takes no account. This rail has a very wide range; it is found not only in Australia, but in New Zealand and the islands of the Pacific, and in the other direction, westwards, as far as the Philippines and Celebes. Like the rails generally, it bears captivity well and makes a nice aviary bird; although not an aquatic species, it likes its bath, and, as the photograph shows, is not averse to getting its feet wet.

MEDITERRANEAN PEREGRINE FALCON (*Falco punicus*).

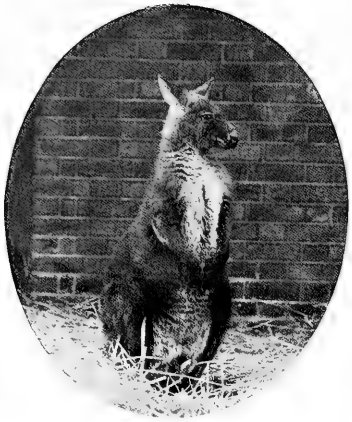
AUSTRALIAN RAIL.

Manchurian Crane.

OF all the Cranes this fine species (*Grus japonensis*) is probably the most familiar to the public in general, since the Japanese have long fully appreciated its beauty and constantly introduce its form into their art. It certainly merits this distinction, for it is not only one of the largest species and inferior to none in grace of form, but the contrast of the white hue of the general plumage and the glossy black "tertiary" plumes of the wings is unusually striking. The Manchurian Crane is an ideal park or menagerie bird; it is perfectly hardy and bears our winter well out-of-doors, while it is more ready than any other crane to breed in captivity. As with cranes generally, only two eggs are laid, and the young are clothed with a buff-coloured down; they are carefully tended by both parents. The Zoological Society's specimens are now located in the fine new paddocks on the north

Photos by W. P. Dando, F.Z.S.

MANCHURIAN CRANE.



WALLAROO.

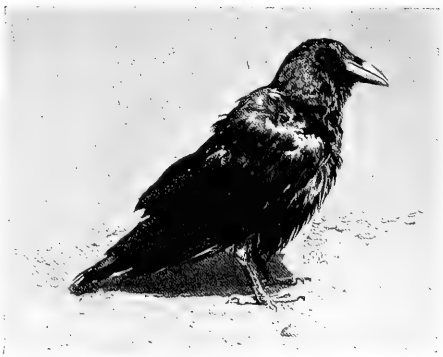
bank, in company with some peacocks and another favourite of the Japanese, the white-necked crane (*Pseudogeranus leucauchen*). No more effective birds could have been chosen for the position, and they seem very happy in their commodious and picturesque quarters. The wild cranes of this species will probably find their equanimity considerably disturbed by the present war, for their headquarters are in Eastern Siberia, and they are also found in Corea and Japan.

Wallaroo.

This animal (*Macropus robustus*) is one of the largest Kangaroos, and frequents mountainous situations; it will, therefore, particularly benefit by the use of the hilly run which by the time the present notes appear will have been enclosed at the back of the kangaroo sheds. This new playground will give ample scope for exercise for even the larger kangaroos, since they do not seem disposed, even when space is allowed, to make the very long leaps of which they are capable when hunted. But, of course, their present quarters are ridiculously small, and it is gratifying to find that the Society has taken the advice tendered in the "Saturday Review" a year ago and utilised the shrubbery-covered hill for a kangaroo playground.

Ravens.

Ravens are always represented at the Zoological Gardens, but they do not thrive there remarkably well, not attaining to that length of days for which they are proverbially famous. Probably their quarters do not afford sufficient scope for exercise. These used to be one of the large compartments at the ends of the crows' cages, now being adapted for monkeys. But when the smaller members of the crow tribe were removed to the fine new aviary on the canal bank, the ravens were not transferred there also, as their behaviour among weaker species of birds was considered rather too doubtful a quality. They are accordingly lodged in the small structure formerly devoted to the eagle-owls, near the Eastern Aviary and polar bear's den. This, however, is not quite all that is required for such fine birds, and it is to be hoped that the Society will ere long be able to provide a third great aviary wherein ravens, the carrion-feeding hawks, the larger gulls, the storks, and similar birds with carrion-feeding propensities and a prudent objection to tackling anything of their own size, may be associated together. The Raven and the Caracara Hawk of South America can certainly be kept together, as the present writer has seen both at Clifton and in Paris, and the various kites and buzzards would doubtless be far better off in a large aviary together than in the small compartments of the new Kites' House, which is not so well adapted to its tenants as most of the Society's new buildings, although it would do well for the smaller owls.



Photos by W. P. Dando, F.Z.S.

RAVEN.

REED-BUCK.

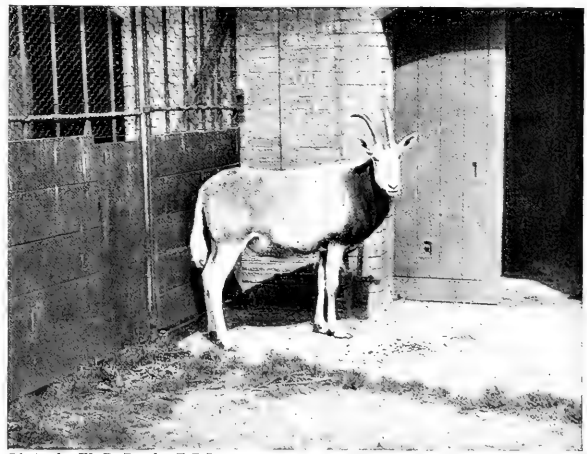
ALTHOUGH only about a yard high at the shoulder, and thus not a large animal, the Reed-Buck (*Cervicapra arundinum*) is still a striking antelope on account of the beauty of its proportions and the graceful curve of its moderate-sized horns. Its colour is also attractive, being a warm fawn, while the rather large tail is mostly white and decidedly bushy. When retreating from an enemy, the animal jerks it up so as to show the white under-surface, after the rabbit fashion. As its name implies, the reed-buck haunts reedy ground, and hence the vicinity of water, like the water-buck (*Cobus ellipsiprymnus*), to which it has some affinity; but unlike that animal, it is not given to entering the water, and will leave its haunts when they become flooded.

Reed-Buck.

Opinions differ about the quality of its flesh, Messrs. Nicolls and Eglington considering it scarcely palatable, while Capt. Crawshay places only that of the impala and eland above it. The range of this antelope in Africa is southerly, but extends to Angola on the west and Mozambique on the east side. It is said not to do well in captivity, but the present specimen has been in the Gardens since April, 1897, and still looks well, so that we may anticipate for it a different lot from that of the few specimens the Society has previously possessed, all of which died early.

THE remarkable antelope which is known by this name at once attracts attention by its somewhat horse-like shape and curved horns, the other equine-looking antelopes of the genus *Oryx*, such as the Beisa, being straight-horned. They are all exceedingly handsome animals, but fierce and dangerous in disposition. Their formidable nature was known to the classical ancients, and is a matter of common observation to-day. The present species is conspicuous by reason of the contrast between its chestnut neck and

White Oryx.



Photos by W. P. Dando, F.Z.S.

WHITE ORYX.

light-coloured body, which, together with the absence of dark markings, distinguish it from the other oryxes as markedly as do its curved horns. It inhabits the interior of North Africa, and, though a stock flourished for many years in the London Zoological Gardens, specimens seem to be rare in collections nowadays, even the British Museum not possessing a perfect skin in 1900.

Large Greaved Tortoise.

The second qualifying adjective applied to this tortoise used formerly to be spelt "grieved" on the Society's tickets, but this error has now been set right and the proper word, which refers to the greaves or armour-plating of the legs, substituted. The poor tortoise, if it considered the lot of its species, would have a good deal to be grieved about nowadays, for persecution has cruelly thinned the numbers of this most useful creature in its native Amazons. *Podocnemis expansa*, as this tortoise is scientifically called, is the "turtle" of Amazonian voyagers, who testify to its great excellence as an article of food. But the abundance which Bates found in his memorable voyage will be a thing of the past, as he found that the turtles were diminishing. The latest accounts state that the wasteful destruction of the eggs for making oil—which could be got just as well from the tortoises themselves—still continues, although no less than three thousand eggs must be sacrificed to make twenty-four pounds of oil. The animal illustrated is quite a baby one, the adult greaved tortoise having a fair claim to the title "large," since it reaches a yard in length and will provide three days' meals for a family of six.

Photo by W. P. Dando, F.Z.S.

BABY LARGE GREAVED TORTOISE.

Glass-Snake.

The Glass-Snake, like our Blind-Worm, is really a snake-like lizard, and a close inspection of the head will show that this is still thoroughly lizard-like, and will easily distinguish *Ophisaurus apus* from a real snake. The glass-snake grows to more than a yard in length, but two-thirds of this is tail. As in its relative the blind-worm (*Anguis fragilis*), this tail is very brittle, a character common to many lizards. The food of our present subject consists of various small animals, from snails and insects to young birds and vipers. These it does not gorge whole like a snake, but chews up and swallows piecemeal. Although a good biter, it is said not to use its jaws when caught. It is found in South-East Europe, Asia Minor and Morocco, where it frequents bushy localities. It may be here mentioned that one conspicuous difference between these snake-like lizards and snakes is the possession of distinct eyelids by the former. Their eyes, indeed, are like those of ordinary lizards, and the name "blind-worm" seems not to refer so much to supposed blindness as to the harmlessness of the creature, on the same principle as the dead-nettle is sometimes called the "blind" nettle. The word "worm," of course, anciently included all snake-like creatures.

White-spotted Burrowing Snake.

On a later page (358, *et seq.*) reference has been made to certain blind and burrowing mammals. The manifold advantages offered by such a mode of life (if we exclude its apparent dulness), as exemplified by security from foes and an abundant supply of food, have

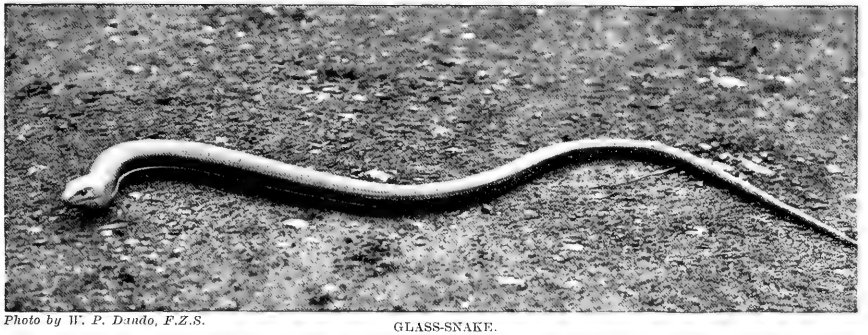


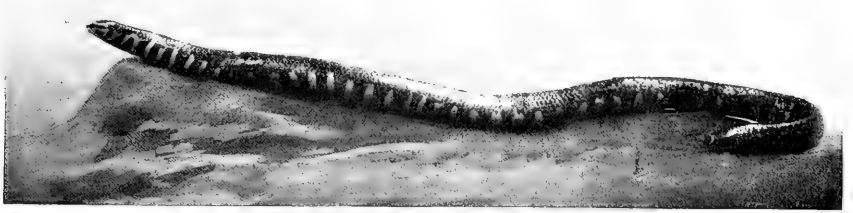
Photo by W. P. Dando, F.Z.S.

GLASS-SNAKE.

induced certain kinds of snakes to take to a subterranean existence. Most of these have become completely blind, but the species represented in the accompanying photograph, together with several more or less nearly-allied kinds, still retains small functional eyes, from which it may perhaps be assumed that it has taken to burrowing at a later date than its blind relatives. Possibly this idea is supported by the circumstance that, in the white-spotted burrowing snake and its immediate relations, the underside of the body is covered by shields approaching in size those found on this surface in ordinary snakes, whereas in other burrowing snakes the body is covered all round with small scales like those on the back of snakes in general. A further peculiarity of these particular snakes is to be found in the extreme shortness and bluntness of the tail, as is well shown in the illustration. Nor is this all, for, in common with pythons and boas, they retain vestiges of the hind-limbs and pelvis, visible externally as small spine-like processes, and internally represented by rudimentary bones. These snakes lead a partly burrowing life, feeding largely upon earth-worms and insects.

The most beautiful member of the family is the West Indian coral-snake, marked by alternate bands of shining black and coral red, and growing to a yard in length. The West Indian ladies use these snakes as boas, but for the purpose of keeping themselves cool instead of for warmth.

Of the other three families of burrowing snakes, all the members of which are totally blind, one group, the so-called shield-tails, take their name from the abrupt and oblique truncation of the tail, which looks as though the tip had been sliced off with a knife and a patch of scaly skin pasted over the surface thus made. It is said that these snakes burrow by means of this truncated tail;—certainly it cannot much matter to a blind snake which end goes first!



WHITE-SPOTTED BURROWING SNAKE (*Cylindrophis*).

EXTRACTS FROM THE DIARY OF A BLUE-TIT.

Edited and Illustrated with Photographs by HERMANN LEA.

I FEEL I must preface these extracts with a few remarks just to let the reader know who and what I am. In the first place I am a Blue-Tit (*Parus cæruleus*) of the male gender, and in age—but no, there cannot be any need for excessive candour—suffice it that I am no fledgeling. I reside in the parish of Lynch Mullen, and spend the greater part of my time in the garden of a cottage which stands a short distance away from the village. The garden, with orchard attached, covers some two acres, and is comfortably provided with shelter in the shape of trees and shrubs.

The story that these extracts tell is absolutely true, all "padding" has been avoided, and the only help I have received is in the writing. This has been undertaken for me by the occupier of the cottage and garden.

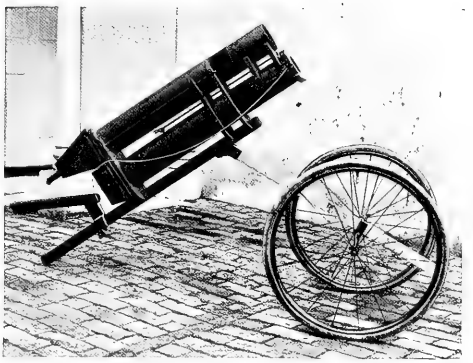
Being naturally of a retiring disposition I should not have given my history to the tender mercies of carping critics but for the fact that I am led to suppose it *may* do some amount of good in preventing the further persecution of my species, and of my descendants in particular. So much has been said, so much has been written about our family—by people, too, who ought to know better—that I think it only fair to clear up one or two points on which there is a good deal of misunderstanding. For these mis-statements, this economising of the truth, have influenced many against us, and I trust anyone reading these pages will do me the justice to enquire on any point which seems to them ambiguous; and further, that they will not merely shout "twaddle," but will try to realise that these are facts and not fiction.

To begin with, there exists a superstition that we do a lot of harm in the fruit garden; in fact, not to mince matters, that we pick out all the gooseberry buds. This is a libel; we only pick out those which contain insects. Do we eat peas? No, we don't, though I could tell you who does—only I don't want to get anyone else into a row. Do we eat ripe fruit? Yes, now and then; but the remedy is obvious—*net it*. And even if we do spoil a few pears and apples, you may take my word for it that if we had not killed thousands of insects in the spring there would not have been many fruits left to have been eaten by anybody. As to seeds, we do not care for them unless we are in an absolutely starving condition—and that would not happen if you were to give us a few scraps in the hard weather.

It is a fact that each member of our family—and I am not ashamed to own it—destroys hundreds of thousands of insects every season; so that, even if we did a trifle of harm now and again, you ought to remember that the good we do outweighs the harm a hundredfold. I could give further instances, but I feel sure enough has been said to show we ought to be helped and encouraged instead of being harassed and driven from pillar to post, and so I will now proceed with the extracts from my diary.

December 14th.—Whilst I was doing a solitary ramble this morning round the boughs of the old elm tree that stands on the lawn, I noticed a huge van come in at the gate. From this was unloaded a lot of strange things of apparently very little

use, and, horror! among them was *a gun!* I saw it plainly; there was no mistaking it, though it was the largest of its kind I had ever seen, and looked different from most. We have had good reason to know the look of a gun for many generations, and I promptly went into the orchard, determining to keep a sharp look-out and not show myself too much.



"Horror! among them was a *gun!*"

December 25th.—This is Christmas Day. Since my last note the place has been simply unbearable; an incessant noise of hammering goes on all day. Once or twice the new people—a man and woman and a dog (the dog seems to spend most of his time watching a hedgehog which also came with them)—have walked round the garden, but I have carefully kept out of sight. This morning, however, all was quiet, and I ventured to come into the fir tree in front of the house. Hanging from a stick on the lawn was a round thing which I could not make out, but on drawing nearer I found it to be half of a cocoanut. "Is that for a decoy," I said, "a thing to lure me to destruction?" I went closer to inspect it more narrowly, and at last, as nobody was to be seen, I boldly flew on to it and made a good breakfast. I should mention that, up to the present, I have seen nothing more of that gun.

January 12th.—Every day I come and get some nut—several times a day when the weather is cold—but this morning I had a shock; chancing to look at the lower window, the one nearest the nut, I saw the gun inside the room! It was pointed straight at the nut, and behind it was the man! I promptly slipped away unperceived, and shall keep dark for a time.

January 15th.—To-day I summoned up courage to have a turn at the nut. I looked at the window, but nothing was to be seen. I flew on to the nut, and lo! it was empty. Now this was strange, because I had left quite a large piece. Has the man's woman been at it, I wonder? As I sat ruminating there was a flash of wings, and one of those coarse, vulgar greater tits—quite distant connections of our family—swooped down and hung on to my nut; the brute must have found it out in my absence. I sat on in the fir tree, thinking things over generally, when the door opened, and the man came with another nut, which he hung on the stick in place of the empty one.

"The dog spends most of his time watching a hedgehog."

In a few minutes that vulgar greater tit was down and gorging himself at my nut. I was about to expostulate, when, glancing at the window, I saw the gun in place and the man behind. I am sorry to say I felt pleased when I saw the man pull the trigger, and hoped the big brute would be shot. But nothing of the sort happened; the gun made no noise, and *Parus major* sat on eating. Again the man pulled the trigger; again nothing happened. Then I saw him look up at me, call his woman, and say to her, "Look, there's a blue-tit." Now this struck me as a particularly sensible remark, seeing that I *was* a blue-tit and was there. Moreover, most people call me "a bird what be after the fruit buds"—an unkind, untrue aspersion of character.

January 25th.—The weather has been unpleasantly cold, but as a sort of balance the man has placed a lot of food about on the grass and gravel and also on the window-sill—apples, baked and raw, junks of bread, boiled potatoes, corn, and all sorts of different foods; also some pans of water, for natural supplies are frozen hard. And don't my remote cousins, the blackbirds and thrushes, just enjoy those apples? The homely sparrows are rather a nuisance; they do gobble up things so fast! but, thank goodness, they are afraid to venture on the window-sill, and, excepting for a couple of robins, I have the sill pretty much to myself. A marsh-tit comes occasionally, but he is a nicely-behaved retiring bird, and does not attempt any familiarities or interference. *Parus major* monopolises the cocoanut, and has brought another one with him—another greater tit I mean, not another cocoanut. Presumably this is to be his future wife.

"A Marsh-Tit comes occasionally."

March 10th.—Since I last wrote confidences in my diary nothing of much moment has happened. We had a dreadful spell of cold in February, but the weather has much improved the last week. This improvement reminds me that it is about time I began to look out for a wife! So to-morrow, if all's well, I will start off for a round of visits and see if I can not come across someone likely to be suitable for the purpose.

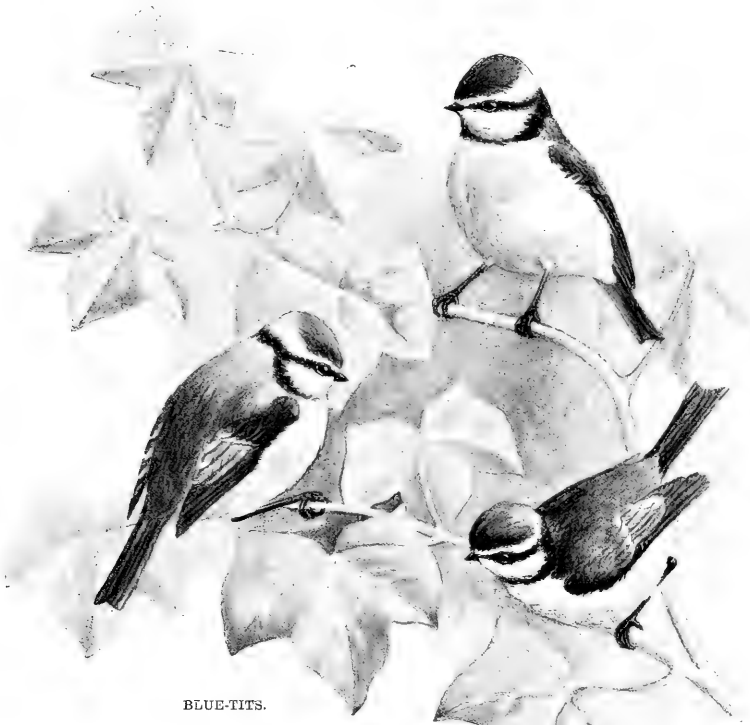
March 15th.—Eureka! I have found a perfect gem of a help-meet. (You must please pardon my enthusiasm, but to one's diary one says things one otherwise would not—not even to one's wife!) I have been very busy this morning showing her round my favourite haunts. It was nearly dark when we arrived last night, and as she was tired I took her straight to the eaves, where I always roost. The first thing I showed her this morning was the cocoanut; she was charmed with its flavour, never having tasted it before. Then I showed her all round the garden and orchard and took her to all my favourite trees—including a special half-decayed fir tree, where such numbers of insects are to be found! And then, last of all, I showed her the old apple tree in the kitchen garden, with a hole in the trunk, just the very place to build a nest in! I wanted to start work at once, but she laughed at me, and said, "Don't be a silly, we can't think of such a thing for quite a month yet."

April 15th.—I did not forget the date—*one month from the time of our arrival*—and this morning I reminded my wife of what she had said about beginning to build the nest. Here I made a huge mistake. It is not wise to do this sort of reminding without the greatest tact. Another time I shall know better. However, at last I got her into a more pleasant frame of mind, and we started by thoroughly cleaning out the hole of old bits of grass, moss, and other débris. Then, in the afternoon, she declared herself satisfied and flew away, leaving me to guard the house. In the course of a few minutes she returned with a beakful of fresh moss and darted into the hole with it. The next time she flew off I went with her and brought some

dead grass, but she would have none of it, saying moss was the proper thing for a foundation; neither would she allow me to take any active part in the building, though I was graciously permitted to go with her and carry what she selected.

April 22nd.—Our nest progresses satisfactorily, and if all goes well will be finished in another week.

April 23rd.—Oh, woe is me! This morning when we went to the nest after breakfast we found half of it pulled out and lying on the ground; a cat must have put its foot in and dragged it out quite early this morning, or else in the night.



BLUE-TITS.

There was no doubt whatever that a cat was the culprit, for her claw-marks were clearly visible on the trunk of the tree. I was mad. I used a lot of unnecessary language, swore loudly, lamented, wept copiously, and acted altogether in a most extravagant manner. Meanwhile my wife sat on a bough overhead with a bad attack of "the blues," sighing heavily from time to time. At last she roused herself and said, "Well, there, it's no use crying over spilt moss, and after all it's far better now than later, when our babes will be in the nest." We turned our backs on that tree with savage despair in our hearts.

May 1st.—So disgusted did we feel that for a week we have scarcely been near the place, and to-day my wife has decided to start a new nest in the wall of a garden

further down the road. I protested greatly, as I wanted to rear our brood in the man's garden, where I felt sure we should be safe,—at least from human persecution—but nothing availed; she would have her own way. To my consolation, however, I would not do a stroke of work to help her, and rambled off on my own.

Insects are beginning to get plentiful again, and I went off to hunt my favourite trees in the man's garden. There, sure enough, I found things going to rack and ruin; some of the gooseberry bushes were simply swarming with caterpillars. In the orchard things were in much the same condition; but a pair of long-tailed tits, who had built their nest in a furze bush, were hard at work foraging. On coming round to the lawn I saw something new. On several of the trees were fastened boxes with a hole cut in the front, and as I sat wondering what they might be for I saw a starling fly out of one. "At least it cannot be a trap," I said, and I forthwith proceeded to fly round and investigate. The boxes were of different sizes, and had various-sized entrances; in one were a few pieces of straw—this was the one from which I had seen the starling fly. In another was a robin's nest, half finished. "Here we are," I thought, "just the very thing!" and I inspected the remaining boxes carefully. Of them all, the best one to my mind was fixed to the big elm tree, about six feet from the ground.

I hastily returned to Josephine and told her about it. She pooh-poohed the idea, but was evidently curious, and at last agreed to come and look. Albeit she pretended not to think much of it, I could see she was delighted, and in the afternoon she said of her own free will (I had learned by this time that it is more politic to let her make suggestions), "We shall have to give up this place; several boys saw me after you left this morning, and I heard them talking about cages and traps." I behaved well, did not move a muscle, though I admit I grinned inwardly. I could see she wanted me to suggest going into the man's garden, but I was equally determined that the suggestion should come from her. And in the end it did!

Just as it began to grow dusk she started off without a word, and made straight for the elm tree, entered the box, and remained there for quite a long time. Then she came out and, without a look or sign of approval, went straight to our old roosting-place under the eaves.

May 2nd.—I must have overslept myself this morning, for when I awoke it was broad daylight, and madame was gone. I flew up into the fir tree to preen myself, and looking towards the elm I saw her fly into the box with a beakful of moss! After breakfast she seemed much better-tempered (I hope she will never read this), and invited me to help her, even going so far as to allow me to place some of the materials in position.

Whilst we were both inside the box I heard a noise, and flying out, who should I see but the man and his woman, standing close to us watching the box. Now I was not in the least bit alarmed, since I knew I could trust him—even when he had that gun—and I just called out and told Josephine who it was and went off to gather more moss. He and the woman were still standing there when I returned, and they remained for a long time watching us—not very good manners I thought, to stare so hard. At first Josephine was a little perturbed, but she soon got as fearless as I was, and took no more notice of them than if they had been a couple of posts.

In the afternoon *Parus major* loafed up and wanted to inspect the nest. "No, you don't," I said, "an Englishman's house is his castle; I'll see you drowned first." Of course, he is much stouter built than I am, and twice my weight; but if he had not decamped I would very soon have proved to him that "pluck" has to be reckoned with as well as brute force.

May 10th.—We have been awfully busy the last few days; the nest is practically finished, and is, I think, a model one in every respect. Every day the man and his

ROBIN.

woman come and peer into the box (the woman is too short to see in and has to be lifted up). I expect they are jolly curious to see the first egg; I hope to goodness they won't take it. I know very well that they eat some birds' eggs, especially plovers. I call this a shame, and it is very stupid, too, for whatever charge may be laid at the door of some birds, for robbing fruit or doing other harm, no evil can be said of the "peewit," who does nothing but good—more good than the majority of people ever do. I have talked this matter over with Josephine, and we have decided to cover up the eggs as they are laid and thus avoid putting temptation in his path. When they are once sat upon it will not matter, for he does not eat them in this condition—if he can help it.

May 12th.—The nest was finished last night, but Josephine refused to let me even go to look at it this morning, saying she wanted to put a few finishing touches by herself, and that if I would go and hunt up caterpillars she would join me in half-an-hour. At the end of the half-hour she arrived and told me to come to the nest, she had something to show me; without waiting for a reply she flew off again and I followed. Glancing into the box I saw a sight which took my breath away, so totally unexpected was it. In the nest lay a most beautiful egg, pinky-white, with minute red dots and blotches! Having looked at and admired it for some time we were alarmed at hearing a noise, and hastily covering it over we flew up into the fir tree. There was the man coming over the grass, and we chuckled mightily as we saw him just glance in and then go away. So far our treasure was safe.

May 21st.—This morning the tenth egg was laid, and madame began her task of hatching them out. About midday the man came out and looked in the box; Josephine did not move, and he went away without disturbing her. In the afternoon I begged her to let me take her place while she went to get some food. This she refused to do, however, saying I was too clumsy and might break some of the eggs, but that they would not hurt if left for half-an-hour or so. I was to stay near by in case anything tried to disturb the nest, and was to call her if

anybody came. She also told me that it did not matter leaving the eggs a long time during the first few days, nor the last few—that the most critical time was in the middle of the period.

Josephine had not been gone more than ten minutes when the man appeared, walked straight up to the box, and looked in. I promptly called Josephine, and together we watched with strained eyes to see what he would do. When he took his face away from the box I could see he looked surprised; he called his woman, and she came and looked in too. They did not stay long, and Josephine soon returned to her post.

June 4th.—All yesterday Josephine refused to come out to feed, and I had to bring flies and chips of cocoanut and drop them down to her; but this morning she came out and bade me look in—the first egg had hatched, and there was a tiny red pipe visible as our firstborn stretched his neck up for food.

YOUNG CHAFFINCH.

"Seemed surprised to see us."

June 5th.—Two more babies are out of their prisons.

June 6th.—All the eggs are hatched save one. We are half afraid about this one, but shall not give way to despair for another day.

June 7th.—Hurrah! Ten babies are in the nest and I feel as proud as Lucifer, although after all I have not had very much to do with it.

THREE BABY LONG-TAILED TITS.

June 26th.—The last few days have indeed been busy ones—not a minute to spare even to write up my diary. From daylight till dark, bring, bring, bring; ten mouths to fill—and hungry mouths they are, too. Insect after insect, grub after grub, caterpillar after caterpillar, crumb after crumb—ten hungry babies are no joke.

June 28th.—This morning the man came out with his camera, took six of our babies out of the nest, and placed them all in a row on a twig. They were not really frightened, because we had told them all about him and his woman and the gun, which proved to be nothing but a new sort of camera. They were too young to fly yet, and after he had taken some photographs of them the woman replaced them carefully.

July 4th.—Early this morning we coaxed the whole family out of the nest and took them into the orchard. A young chaffinch stared hard as we passed; one of *Parus major's* sons seemed surprised to see us; and three baby long-tailed tits sat in a row in the sunshine, two of them pretending to be half asleep. There is plenty of cover there now, and any number of insects. We shall get away to the woods directly the young rascals are strong enough, and we intend bringing the babes back to the man's house in the winter, when insects are scarce, in the hope of finding cocoanuts hung up ready.

Photo by
Lewis Medland, F.Z.S.

GREY LEMUR.

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. WELLINGTON FARMBOROUGH, F.Z.S., F.E.S., etc.

XVI. THE LEMURS.

A CONSIDERABLE amount of attention has been directed by the Natural-History-loving public to these animals by the exhibition of one at the Crystal Palace Show lately, when it was described as a Madagascar Cat. As a result of this a more keen interest has been taken in this group or, more correctly, sub-order of animals by the pet-keeping section, in respect to their suitability for captivity.

Lemurs are more uncommon as pets than their higher-placed relations the true monkeys, but have several advantages over the latter—they are comparatively slow-moving animals, they are not destructive, neither do they get treacherous in their old age. Against this, however, there is the disadvantage that lemurs require more attention than the commoner varieties of monkeys, as they are not so hardy and require a temperature of not less than 65° F., and preferably 75° to 80° F. They are extremely impatient of the slightest variation of temperature, and the greatest care must be exercised to keep them away from all draughts. Lemurs, speaking generally, suffer from very few maladies, the principal ones being inflammation of the lungs, congestion of the liver and, occasionally, skin disease. Every case of the two former diseases due to the self-evident cause of getting a chill, either by a variation of temperature or by being placed temporarily in a draught, results, according to the writer's experience, in a fatal termination; whilst those lemurs which unfortunately have been afflicted with skin diseases are better destroyed, as it often happens that the disfigurement is permanent unless taken in hand and proper veterinary advice sought at the very outset in order that the disease may be checked and got rid of before it has obtained a firm hold of the system. Apart from the disadvantages pointed out, lemurs are no more trouble to keep than the common monkeys—less, in fact.

The cage for a lemur must be very carefully put together of well-tongued and grooved matchboarding, free from knots and any other flaws in the wood. The cage should be of the box pattern,—that is, one that is open only in front—and may be constructed either with or without doors. In the latter case the entire front

Photo by
Lewis Medland, F.Z.S.

YELLOW WHISKERED LEMUR.

takes out, either by swinging open on hinges like a door, or by tightly fitting into the body of the cage and being fastened by bolts so that the animal is unable to play with them to get them undone. This method is much better than having a fixed front and small doors which open into the cage, either at the back or sides, as they are usually made sufficiently loose to permit a draught working through. The wire front can be of *very strong* wire netting of an inch or an inch and a half mesh. The size of the cage depends on the space the owner can spare, but the larger the better; four feet in width, two feet from back to front, and six feet in height is the most useful size. It must be placed indoors. And here let me remark that for animals or birds that suffer from variations in temperature, an ordinary sitting-room, where they are usually placed, is about *the most unsuitable* place that can be selected, and for this reason: in cold weather during the daytime the temperature of the room, owing to the closed doors and windows and the nicely-burning fire, is comfortable and all that can be desired; but when the family retires to rest the lights are turned off and the fire, after an hour or two, goes out, with the result that the temperature of the room falls from perhaps 80° to something like 40° F., and in very cold weather to much less. The temperature of the room does not rise again to its former level until an hour or two has passed, so that whatever is living in the room passes about twelve hours a day during the winter months at about 70° to 80° F., and the other hours at a temperature somewhere near freezing-point, and then people wonder what gives their pets chills! If a lemur or any other creature to which variations in temperature are serious is kept in a room, care must be taken to see that the temperature remains the same, or within five degrees, during the whole of the twenty-four hours—that is, by night as well as by day.

A sleeping-box about eighteen inches square should be arranged at the top of the cage, with a small branch of a tree placed diagonally against it from the floor so that the lemur can have a little exercise. This retiring-box can be filled with sweet hay and the floor of the cage covered with the same, as these animals are very curious in their ways, forsaking the proper sleeping-box provided and curling themselves up on the floor for several days in succession until the fit takes them to again use the box. Swings and mirrors and the other usually necessary adjuncts to a monkey's cage are not needed for lemurs, as they are not given either to admiring themselves in looking-glasses nor to disporting themselves on swings. The food-vessels need not be of metal for these creatures, and white china is preferable, as the lemurs are very careful and gentle and rarely break a china vessel.

Cleanliness with lemurs is an imperative factor, and the cage and food-vessels must be cleaned out every day and the floor scrubbed with boiling water and a disinfectant soap once a week. This must be done by seizing an opportunity when the lemur is asleep in its retiring-box, so that the floor can be dried before it comes down. The drying can be expedited by strewing hot sawdust over the floor after it has been wiped as dry as possible with a cloth; this sawdust can be used over and over again for the purpose.

The chief articles of diet for the various species of lemurs are bread and milk, fruit and eggs; bananas are usually considered a very special tit-bit, but raisins and vegetables may be given. Lemurs are almost entirely nocturnal in their habits. They sometimes, but not always, adapt themselves to taking their meals in the day-time. Usually, however, the food, unless it be some tit-bit, is left untouched if placed in the cage during the day, and is nearly always used up in the night hours. About eight in the evening is the hour when lemurs get lively and commence feeding. They do not commence their meal before they have thoroughly cleaned themselves. After this process is over they begin to think about their food; the choicest morsels are nearly always picked out first and the inferior portions left till later on.

It occasionally happens, when a pair are kept together, that they breed in a state of captivity, but it must be admitted that this is a very uncommon event. Only one young is produced at a birth. Should any of my readers be fortunate enough to have such an event happen in their menagerie, they must at once take the male away for at least three months, and take every care that neither the mother nor the young is disturbed or alarmed from any cause. The young lemur will not leave its parent for at least six months, and will only come down from her to stretch its limbs and make essays at independent movements when there is no one near. Should its owner come near, it will at once return to its former position on the back of its mother, where it clings tightly by means of its prehensile tail and by embedding its hands and feet well into her fur, by this means holding on so well that the mother can climb up and down the wire front and tree-trunk of her cage without the young one showing the slightest fear or losing its grasp.

Lemurs are not so intelligent as their relatives the monkeys, but they are easily tamed and soon get used to human society, becoming very affectionate to their owners after a short space of time. If two or more be kept, they are very sociable one towards the other, and may generally be noticed huddled up together, evidently to keep themselves as warm and comfortable as possible. They must be very gently handled, as they are rather nervous animals and are rather given to biting. The ring-tailed species seldom uses its teeth but strikes out with its hands, scratching so vigorously that it often inflicts very nasty wounds with its claws. Possibly it is this feline characteristic that has led to it being called the Madagascar Cat.

The price of these animals varies from two or three pounds upwards, the ring-tailed lemur being the cheapest and easiest to procure and the most hardy.

Photo by Lewis Medland, F.Z.S.

CROWNED LEMURS.

A NATURALIST'S NOTES FROM THE BUSH.

By Cyril Grant Lane, with a photograph by the Author.

V. THE MAGPIE.

I BELIEVE that in the length and breadth of Victoria no bird is better—perhaps so well—known than the Magpie. Its fearless, undaunted nature probably has much to answer for in this matter, since the bird takes up its abode without evincing the slightest timidity wherever there is conspicuous evidence of the presence of man; indeed, seems to specially favour such localities.

At the present moment, while engaged writing these few lines—I am sitting beneath lofty blue-gums which gently sway in a honey-scented atmosphere, seeming to keep time with the gurgling music of an adjacent creek as they slowly rock to and fro—I see a fine cock magpie perched upon a straggling limb of a yellow-box tree, and its presence awakens in my mind various points of interest attaching to it.

The bird at almost all times is a conspicuous object owing to extreme colouring, dominating mien, active, energetic disposition, and an undoubtedly pugnacious nature. A more appropriate name than "magpie" could not be chosen for it, since a better study in black and white would be difficult to obtain. The white patches upon the neck, wings and under-part of the tail are of the most snowy whiteness, the remaining portions of the body a perfect black. The beak—and it is a dreaded, powerful weapon responsible for the death of many a bird—is of a slaty hue, and exceedingly hard. The wing and tail feathers are stiff to a degree, causing something of that whistling sound so well known in the flight of wild duck when the birds pass swiftly overhead. The legs and feet are black, armed with claws as sharp and strong, though not so curved, as those of a hawk. The eye is jet black, bright and full, and remarkably keen. The plumage of the hen magpie is blackish-brown in colour, rather sombre-looking, possessing little of that attractiveness due, in its mate, to diametrically opposed colouring.

Just a word in respect of the magpie's power of flight. I know of no bush-birds outside the hawk families which descend from great heights with such extreme velocity, or are capable of rushing so rapidly among the tree-tops in pursuit of offending birds chancing to approach too near to its jealously-sentinelled preserves. The ability of small, and often large birds too, to dodge with greater dexterity than their pursuant often alone saves them from a sudden and undeserving death, for the enraged magpie, boring its way through the air with constant snaps of the beak, rapidly gains upon the object of its annoyance and not infrequently wounds, if not kills, the retreating bird with its strongly-built well-balanced bill.

Should an eagle chance to raise the displeasure of these pugnacious birds by a calm disdain for their presence, a melee invariably ensues and generally terminates in the discomfort of the kingly bird. Strident cries and whirring wings are heard in all directions. A few cocks perch upon the highest tree-tops, whistling defiance, while others, with a notable zigzag flight, rush upwards towards the apparently oblivious eagle. In the twinkling of an eye the eagle is surrounded by a shrieking, madly excited mob of birds, all aiming their blows, abuse, and snapping beaks at one common centre, and that centre a gracefully-sailing, totally unconcerned "king of all birds

that fly." As a rule, however, even the long-suffering scornful endurance of the eagle at length wears out, and with exquisite leisure those huge pinions slowly fan the atmosphere, sweeping their majestic owner far away to regions of silent solitude among the mountain heights, where the perplexing onslaught of magpies is an affliction rarely experienced. Now that the cause of excitement has departed, black objects, like stones, are seen dropping from the sky, and such a hilarious chorus of magpie vocalism fills the air that one might well think the eagle had been gloriously conquered, struck to the earth and done to death, instead of proving with withering dignity its disgust for such garrulous proceedings by quitting a locality thus contaminated. However, the jubilant magpies are thoroughly satisfied with themselves, as the loud note of victory in their long-continued song plainly suggests.

No bushman will refute the remark that the sweet notes of the magpie are scarcely excelled by any bird which flies at large midst the Victorian forests. The

YOUNG AUSTRALIAN MAGPIES IN NEST.

principal attractions of its vocal efforts, which never fail to install the bird in a position of high rank among bush songsters, are the sweetness of its full-toned notes, the pleasing variety of flute-like warblings, and the interesting faculty, possessed in a more or less pronounced degree, of learning to imitate the whistled instructions of its owner. Among the river-gums at break of day, shortly after the ringing laughter of the great kingfisher has heralded the rising of the sun, the dulcet warblings of the magpie are voiced to perfection, all their truest notes being heard to advantage owing to the unending miles of silent bush offering no sound which might disturb the oft-repeated melody.

During the nesting season the magpie develops a determined aversion for the presence of the human race, and with unparalleled ferocity vents its insidious attacks upon every man, woman, or child daring to venture within a given radius of its nesting-place.

Verily I am convinced that the wedge-tailed eagle guards its offspring with no greater vigilance, nor for their innocent sakes jeopardizes so often the safety of its own life, than does the handsome, stout-hearted magpie.

Some years ago, while riding up the old Tambo River track, I was suddenly attacked from the rear by a vicious magpie. My horse—a youngster, well versed in the art of buck-jumping—was as greatly surprised as I by the unexpected rush of wings and double snapping of beak, and within an ace succeeded in getting rid of his rider. Speedily righting myself, however, I put the animal to a quick canter, hoping to leave the angry bird in sole possession of its chosen locality. But I was not to escape so easily, for the next moment I received a blow on the head which knocked my felt hat over my eyes. One glimpse only I caught of the magpie, crouching upon the turfy track, dishevelled and half stunned; then away went my startled neddy, pig-rooting and side-lashing at every other stride. While ascending the next rise at a respectable pace, I removed my felt in order to ascertain the cause of a certain smarting sensation on the crown of my head, and but a moment sufficed to prove that "maggie's" sharp beak had not only penetrated my felt hat, but drawn blood from my scalp as well.

It would be difficult to estimate the number of magpies annually shot during the close season merely on account of their fierce attacks upon all passers-by. Dogs are by no means exempt from such furious visitations of wrath, and so are frequently subjected to persecutions borne with but an ill grace. On several occasions I have "spotted" the stealthy movements of a fox or cat entirely owing to the noisy expostulations of indignant magpies, roused to a sense of their danger by the approach of these recognised marauders of the bush.

The magpie exercises no special caution in its selection of a nesting site, generally choosing a tree of medium height and placing a compact collection of dead twigs in some convenient fork. When completed the nest is fairly cup-like inside and almost entirely composed of sticks and twigs, just a little interior lining being of sheep's wool or tufts of cattle-hair.

The egg of the magpie is considerably elongated towards the smaller end, and varies in actual appearance to a great extent according to locality. One specimen from the Angora Ranges, Gippsland, is sea-green in the ground-colour, olive-grey in markings. Another, from the banks of Maclane Creek (tributary of Little River, Upper Goulborne), is almost blue in the ground-colour, with but few light-brown markings, while a specimen taken in the vicinity of the You-yangs (Werribi district) is mostly ashen-grey.

The magpie is more frequently to be seen as the bushman's pet than any other bird excepting perhaps the Lorry Parrot, and becomes in such confinement docile, clever, and unquestionably affectionate.

EDITORIAL NOTE.

It may be well to remind our readers that the bird which Mr. Lane, following colonial usage, calls a "Magpie" has nothing to do with the species to which that name properly pertains. The so-called Australian Magpies, of which there are four species, constitute the genus *Gymnorhina* of ornithologists, and are commonly known in this country as "piping crows," or "crow-shrikes"; while one species (*G. hyperleuca*) is frequently termed in its native land "organ-bird." Loud, piping notes are, indeed, characteristic of all the four species. Much uncertainty still prevails as to the systematic position of these birds and their relatives of the Australian genus *Strepera*, some ornithologists placing them in the crow tribe, while others consider their proper position to be with the shrikes. The species most commonly seen in this country is *Gymnorhina tibicen*, which ranges all over Australia. *G. leuconota*—the white-backed piping crow—is, on the other hand, confined to South Australia; while *G. dorsalis* is found in Western Australia. Tasmania is the home of the above-mentioned *G. hyperleuca*.

NOTES AND COMMENTS.

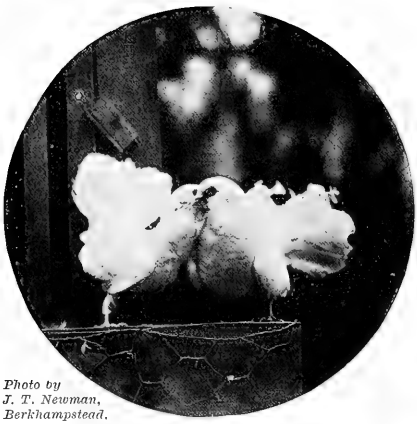


Photo by J. T. Newman, Berkhampstead.
A PIGEON FEEDING ITS YOUNG.

A Unique Photograph.

Baby pigeons are not fed in the usual bird way, but they thrust their bill into the parent's throat and the old bird injects the food which he or she had previously swallowed, at the same time working its head up and down with a pump-like action and at such a rapid rate that it was only after many trials that this photograph was obtained by Mr. J. T. Newman, who sent it to us for publication.

Photo by J. T. Newman, Berkhampstead.
AN EGG WITHIN AN EGG.

An Egg within an Egg.

To the same gentleman we are indebted for the photograph of a curious freak in the shape of a double egg which was discovered by Master Percy Dickins, of Guinscote, Northants. The outside egg was of ordinary size, and contained inside a complete but smaller egg properly covered with a shell.

Bare-necked Fowls.

Mr. Finn writes: "The accompanying photograph illustrates one of the most remarkable variations to which the domestic fowl is subject — absence of the neck-feathering. This particular hen was reared by Mr. W. Barrick, of Walthamstow (who sent the particulars and photograph to Mr. G. A. Doubleday), and was the only bird so characterised reared out of a sitting of eggs. When killed, it was six months old and weighed four pounds. At the last Crystal Palace Poultry Show two hens showing this curious variation were exhibited; they were very similar to the bird in the present illustration. There would seem to be a breed which truly transmits this somewhat unsightly peculiarity, for on the chronicling of the appearance of the present bird in the 'People' newspaper, Professor A. L. Lavault wrote from Nevers to say that at 'L'Allemande,' a large farm in the department of the Nièvre, there was a truly-propagated race of bare-necked fowls. These came originally from England, and I have seen a statement in an English poultry-book that a bare-necked breed

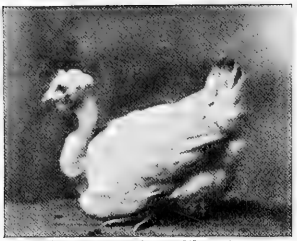


Photo by C. P. Davis, Walthamstow.
BARE-NECKED FOWL.

is known, but comes from (so far as I remember) Austria. As a matter of fact, the peculiarity has no doubt appeared independently in several instances and countries. In Calcutta I saw some cocks which were even more bare than the hens above alluded to, as there were no feathers even on the head. The skin of the neck in these was brilliant scarlet and granular-looking, while in the two hens I saw at the Crystal Palace Show it was fleshy in colour and merely wrinkled, much like that of an aged human being. The birds I saw in Calcutta were quite different from the European specimens in general type, being of the tall big-boned type of the Malay; they were called "Saigon Game," and were imported. In their case the baldness was confined to the cocks, as the hens had feathers on their necks; I was told that during part of the year the cocks possessed some neck-feathering also, which makes their extreme nudity at other times more remarkable."

Woodcocks skulking.

INCREDIBLE as it may seem, there exist, we are informed, persons who do not believe in the protective purpose of the colouring of animals, or, at all events, of such animals as deer and antelopes. It would be interesting to ask such persons, we may remark incidentally, how they explain the marked general uniformity of type prevalent in the colouring of such animals; that is to say, why they do not meet with antelopes having white backs and black bellies. Putting such questions aside, we are curious to learn their views with regard to the object of the colouring of such birds as woodcock and snipe, which presents such a perfect harmony with their inanimate surroundings that it is hard indeed to believe there can be anyone who will not admit its protective nature. And yet, if this point be conceded, the whole case of the objectors is practically given away, for there is an almost complete gradation from such obvious instances of protective adaptation as are afforded by the coloration of the woodcock and the snipe to the less apparent types displayed by antelopes and zebras. The harmony prevailing between the warm orange-brown flecked with black of the woodcock's plumage and the russet-red of fallen leaves, broken by patches of deepest shade in the interspaces, has been too often described to stand in need of recapitulation on this occasion. A similar harmonious blending of colour and pattern is presented by the resemblance of the elegant livery of the snipe to the broken grass and rush stems (in this case divided by long lines of black shade) of its favourite haunts. In the swamps, or "jhils," around Calcutta the present writer has put up hundreds, if not thousands, of snipe within a yard or two of his feet, and yet he never succeeded in detecting one on the ground before it rose—so perfect is the resemblance between the bird and its surroundings.

A Burrowing Fish.

A REMARKABLE habit on the part of a Malay estuarine fish is recorded in the second part of the Zoological section of "Fasciculi Malayenses." Throughout the Indo-Malay region fishes commonly known as "mud-skippers" are abundant on the mud of estuaries and creeks, where they are noticeable not only on account of their hopping movements, but from their large goggle eyes. The species in question (*Periopthalmus phya*) is, however, specially noteworthy from the circumstance that it constructs a more or less permanent burrow, in which it takes refuge when alarmed, and where it remains in permanent seclusion during bad weather. This burrow is frequented, apparently, by both sexes, and may be employed as a nursery, although this latter point is not definitely ascertained. The larger burrows, which have funnel-shaped entrances, are always situated in a pool of

Photo by O. N. Mavroyeni, Smyrna.

WOODCOCKS AT REST.

water between tide-marks; the water being retained in the pool by means of a wall of mud from four to six inches in height and with a diameter of about eighteen inches, this wall being constructed by the fishes. Outside the wall are a number of small holes, which may or may not lead into the central burrow and are employed as retreats on ordinary occasions. When, however, the fish are thoroughly alarmed they skip on to the wall, where they sit for a time before diving into the pool and seeking safe refuge in one of the large burrows, which always run in an oblique direction. According to native reports, the fishes collect the mud or clay of which the wall is built by diving to the bottom of the pool and bringing up a mouthful at a time. This statement is confirmed by the appearance of the wall itself, which is formed of pellets of clay differing in character from the surrounding surface mud, and of such a size and shape that they might perfectly well be casts of the mouth-cavity of the fish.

A Lizard Book.

We have received from Mr. George A. Morton, of Edinburgh, a copy of Dr. Gerald Leighton's new book, "The Life History of British Lizards," uniform with the same author's "Life History of British Serpents" published two years ago by Messrs. Blackwood. These two volumes are perhaps the best from a popular point of view, as they certainly are the most recent works on the reptiles of Great Britain. The book on lizards is written more especially for field naturalists, and although the introductory chapter deals with the distribution and so on of lizards generally, and another with their anatomy, the zoologist who wishes to probe more deeply and in greater detail into the scientific study of this sub-order must make for a less interesting work. But if Dr. Leighton's book will not satisfy museum students, it will certainly appeal to a larger public than if it had left alone the life histories and characteristics of animals whose native home is the same as our own. Perhaps Dr. Leighton will next turn his attention to amphibians, and thus give us a trilogy on two orders of very interesting animals. The illustration reproduced herewith is a good specimen of the large number which add an interest to an already interesting book, not the least merit of which is its moderate price, 5s.

FEMALE OF THE COMMON LIZARD (*Lacerta vivipara*).

Great Mole-Rat.

If we except our own Mole (familiarity with which has made us in a great degree oblivious of its strangeness and peculiarity), one of the most remarkable of the numerous mammals which have taken to a subterranean mode of existence, and have thus to a greater or less extent lost the use of their eyes, is the Great Mole-Rat (*Spalax typhlus*) of Eastern Europe. Unlike the mole, which, as we all know, is a member of the Insectivorous or insect-eating group, the mole-rat, as is well shown in our illustration, possesses a single pair of large chisel-like teeth in the front of the jaws,

which at once proclaim that it belongs to the rodent, or gnawing, order. The creature is in fact a rodent mole, fully double the size of the true mole. With that animal it agrees in the rudimentary condition of the eyes, which are reduced to mere specks covered with a film of skin, as it also does in the reduction of the ears to mere tubercles, and likewise by the fur bending readily in either direction instead of sloping backwards as in ordinary mammals. The feet and claws are, however, of a totally different type, being very similar to those of many other burrowing rodents. In colour the soft and thick fur is yellowish brown, with a strong tinge of ashy grey on the head and back.

Photo by A. S. Rudland,] A PAIR OF MOLE-RATS. *[Edgware Road, W.*

Formerly there was supposed to be but a single species of mole-rat, with a range extending from South-Eastern Europe through Mesopotamia, Persia, and Syria to Egypt, but it is now ascertained that there are several distinct forms.

Like the ordinary mole, the mole-rat constructs subterranean tunnels, the course of which is marked above ground by the well-known heaps of earth thrown up at intervals by the industrious excavator. Instead, however, of burrowing in search of earth-worms, the mole-rat drives its tunnels for the purpose of obtaining the bulbs and succulent roots which form its food. Great stores of these bulbs are, indeed, accumulated by these rodents, at all events in Egypt, in chambers specially constructed for their reception; the chambers being generally placed at a considerable distance below the surface.

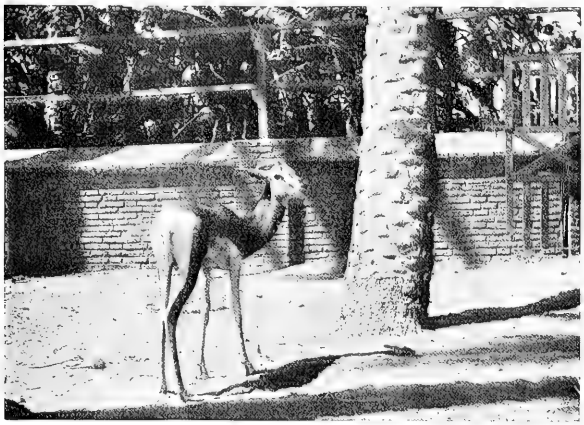
Several other members of the same family of rodents have taken to a subterranean mode of existence; the largest being the strand-mole (*Bathyergus maritimus*) of Cape Colony, which measures nearly a foot in length, and is chocolate-brown in colour. Another Cape species (*Georychus capensis*), in addition to its inferior size, differs by the front teeth being smooth, instead of grooved, on their exposed surface. Stranger than all are the hideous naked sand-rats (*Heterocephalus*), which are about the size of a long-tailed field-mouse, and have bare, warty skins of most repulsive appearance. They construct shallow tunnels in the burning sand of Somaliland and other parts of North-East Africa.

Whether all the foregoing burrowers are descended from a common ancestor which had taken to a subterranean life, or whether they have acquired their tunnelling habits independently, may be an open question. It is, however, certain that this mode of existence has been adopted by different kinds of rodents independently of one another. For instance, there are the nearly blind zokors, or mole-voles (*Ellobius* and *Siphneus*) of Eastern Europe and Central and Northern Asia, which, as their second name implies, are near relatives of the voles, as exemplified by the water-rat and short-tailed field-mice.

ANIMALS AT KHARTOUM.

By Captain S. S. Flower. Illustrated with Photographs by the Author.

THE Zoological Gardens at Khartoum, though one of the youngest and smallest of these institutions in the world, is well worth a visit. The collection of animals, though necessarily limited from reasons of finance, is very interesting, the specimens being all from the Sudan, and the locality where each was caught being known in nearly every case. The collection is the property of the Anglo-Sudanese Government, and is looked after by Mr. A. L. Butler, the Director of the Sudan Game Preservation Department. On the 1st February, 1904, there were living in the Khartoum collection two lions, two leopards, one serval, one caracal, one chita, five ril, one Dorcas and one Korin gazelle, one white oryx, one Wau ram, several giraffes, two ostriches, one secretary bird, one spur-winged goose and several crowned cranes, ultramarine- and fire-finches, weaver-birds, etc., also some animals on deposit belonging to the Egyptian Zoological Gardens, which have since been moved to Giza. There is also at Khartoum a Shoebill (*Balæniceps rex*), but it is kept at the Governor-General's palace, and not in the public gardens, being rightly much valued by its fortunate possessors.



BUCK RIL OR ADDRA GAZELLE.

DOE RIL AND FAWN.

The Ril or Addra Gazelle (*Gazella ruficollis*) is a species very seldom seen alive in menageries, and till the re-opening of the

KHARTOUM HUMPED BULL.

CAMELS AT KHARTOUM.

BUCK KORIN GAZELLE.

On the 5th February an Agricultural Show was held in the Khartoum Gardens and the pick of the local domestic animals gathered together for exhibition—a most interesting event, as, so far, the local breeds are untainted by would-be "improvements" from crossing with imported European cattle. The photograph shows a typical Khartoum bull, at first sight not unlike an Indian Zebu, and in its small horns very different from the great-horned Nuer cattle from the southern parts of the Sudan, a fine specimen of which is shown in another photograph.

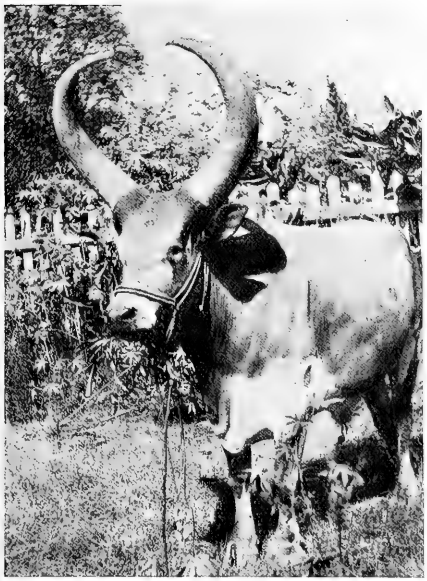
The Korin Gazelle, of which the picture shows a buck, is a fine animal and the commonest gazelle along the White Nile. It is usually called *G. rufifrons*, but whether it is identical with the West African gazelle bearing the same scientific name appears unsettled.

There are several giraffes in the Khartoum Gardens. The photograph depicts two of them. The variation of their spots is at once apparent.

Sudan very rarely represented even in museums. Photographs are given showing a buck and a doe with her fawn. The latter was born late in 1903 at the Khartoum Gardens. These photographs indicate how the coloration varies in different individuals, and how the rufous colour on the sides of the thighs and legs may be continuous with that of the body; in fact the buck, if from Morocco instead of Kordofan, would be called *Gazella mhorr*, and it seems probable that *G. ruficollis* and *G. mhorr* both merge into *G. dama*, and are without doubt closely allied to the Ariel *Gazella sœmmerringi*.

The Dorcas Gazelle in the Khartoum Gardens is a fine buck, and could be matched by specimens from Egypt, where the horns are of one type; while in the Sudan this species appears to become dimorphic, some individuals retaining the typical Dorcas horns, others assuming the inwardly-bent-tipped horns which have caused them to be made into a so-called different species—*Gazella isabellina*.

GIRAFFES AT KHARTOUM.



NUER HUMPED OX.

The sheep about Khartoum are of the usual Sudan type, with Roman noses, long pendent ears, long tails, and hair instead of wool; as a rule they are hornless, but there is a white ram in the gardens which has thin twisted horns.

The photograph below depicts some goats of Khartoum. The males grow to a large size, and are very fine animals. The photograph shows how they differ from the sheep of the same neighbourhood by the absence of the "Roman nose," while, curiously, further north the goats assume this peculiarity and the sheep lose it.

EDITORIAL NOTE.

Our readers can scarcely fail to be greatly interested in Captain Stanley Flower's notes on the domesticated animals of the Khartoum district; and it is a matter for regret that nothing is done at the present time in this country for exhibiting to the public living specimens of the more important of such breeds from all parts of the world. Formerly the London Zoological Society took domesticated breeds under its cognisance; but for some time this practice, with a few occasional exceptions, has been in abeyance. Of the reason for this we are unaware; it may be want of space, it may be want of funds. There is, however, no doubt that an exhibition of this nature would be very popular and attractive; and we commend the matter to the attention both of the Zoological Society and of the Royal Agricultural Society.

As an indication of how little is known with regard to domesticated animals, it may be mentioned that in all descriptions of domesticated breeds of sheep will be found the statement that in these animals the tail is always long. And yet so long ago as 1870 the late Edward Blyth, in "The Field," pointed out that the Hunia, or fighting, rams of India have naturally short and deer-like tails.

While thanking Captain Flower for the loan of his photographs, we may take the opportunity of mentioning that another view of the Nuer Ox has previously appeared in this journal (Vol. I., p. 412). Here we may likewise point out that we are indebted to Mr. C. N. Mavroyeni, of Smyrna, for the photographs in our last issue of the "Garden Spider and Nest" (p. 314), and of the "Scorpions Fighting" and "Scorpions at Rest: Male and Female" (pp. 315-316), as well as for the fine picture of "Woodcocks at Rest" in the present number.

CORRECTION.

The Editor of Animal Life much regrets that the issue for April should have contained a mis-statement respecting the death of "Jimmy," the popular Chimpanzee at the Zoo. The Editor is glad to say that "Jimmy" is not only alive to-day, but extremely well. The photograph was of another specimen.

KHARTOUM GOATS.

ANIMAL ANECDOTES.

Befriended by the Elephant.

VERY quaint and touching is the story of the friendship between Bolivar, a big circus elephant, and a stray kitten. The kitten, chased by a dog, ran into the tent, and in its terror climbed the elephant's leg and took refuge on his back. The big animal saw at a glance how matters stood, and, seizing the dog in his trunk, flung it to the end of the tent and then turned his attention to the kitten, which he reached down from its perch and held in front of him. The little creature began hissing and spitting, after the manner of cats, but Bolivar paid not the slightest attention to these demonstrations, and after eyeing it attentively replaced it on his back. From that time the kitten and Bolivar became great friends, and the elephant, which had previously been a sullen and irritable beast, began to take a new pleasure in life. He showed the liveliest interest in the gambols of the kitten, which he fondled with his trunk, and sometimes lifted on to his back that it might amuse itself by biting and scratching at his great ears. When desirous of descending, it would stand at the edge of his back and mew, whereupon the great trunk would ascend and lift it down. But one unlucky day the kitten met with an accident and, after lying on Bolivar's back for some hours, expired. Bolivar was puzzled at its stillness, and at last, growing uneasy, lifted it down with his trunk. Seeing that it was still motionless he replaced it on his back, taking it down at intervals to see if it had revived. After a time the keeper, by stealth, removed the dead kitten, and on discovering its absence Bolivar became nearly frantic. Another kitten was procured, but proved useless. Bolivar would have nothing to do with it, and at last became so morose and dangerous to the people around him that he had to be kept in chains.

Objected to Teasing.

AN elephant which was publicly exhibited some time ago had a great affection for a dog. The spectators, trying to tease the elephant, amused themselves from time to time by pulling the dog's ears and making him bark. As soon as the elephant heard his friend's voice in distress, he gave the door of his shed such a hard knock that he sent the planks flying, causing a breach, through which he came to the dog's protection, and compelled his tormentors to beat a hasty retreat.

A Queer Race.

THE late Sir John Astley, who was fond of arranging curious animals' races, when quartered at Windsor expounded to his brother officers his plans for a great chicken race. He had bought from a farmer a hen and a brood of chickens. Each officer was to choose a chicken and mark it with a ribbon, so that he could easily recognise it. The chickens were to be placed about fifty yards away from their mother, and whichever one of them reached her first in answer to her cackle when food was thrown to her was to be adjudged the winner. The "Hen Derby" came off in the barracks at Windsor, and was witnessed by nearly the whole Brigade of Guards, who travelled down from London especially to see it. The race was such a success that it was arranged to repeat it the following week.

Three Orphans.

A COUPLE of men in America were doing some work when they caught sight of bear tracks. They followed for awhile, and then set a heavy trap. Later they returned, and they had a bear, sure enough. She was a large brute, with dumb, beseeching eyes, from which the tears rolled as they might have rolled from a human being. The men shot her, and then waited until the old bear, her husband, came in sight. He wasn't trapped, but he was killed just as expeditiously. Afterwards three little cubs appeared on the scene, and whimpered like sorrowful babies over the killing of their parents. One of them, about the size of a small shepherd dog, climbed to the branch of the tree on which their bodies were suspended, and looked down in wonder at the still, dead faces. Another little chap sniffed feebly at the swaying body of his mother, while the third put his paws trustingly and pathetically upon the knees of one of the men whose rifles had done the work.

TIGER IN THE JUNGLE.

UNCOMMON PETS.

A series of articles on the Care and Keep of Animals in Captivity.

By P. Wellington Farmborough, f.z.s., f.e.s., etc.

XVII. THE COATI.

An animal well worthy of the attention of those in search of the uncommon is the Coatimundi. It is hardy, can be kept out of doors if necessary in a small cage no larger than an ordinary rabbit-hutch, is easily looked after and, most important, is inexpensive to procure, there being usually plenty on the market at

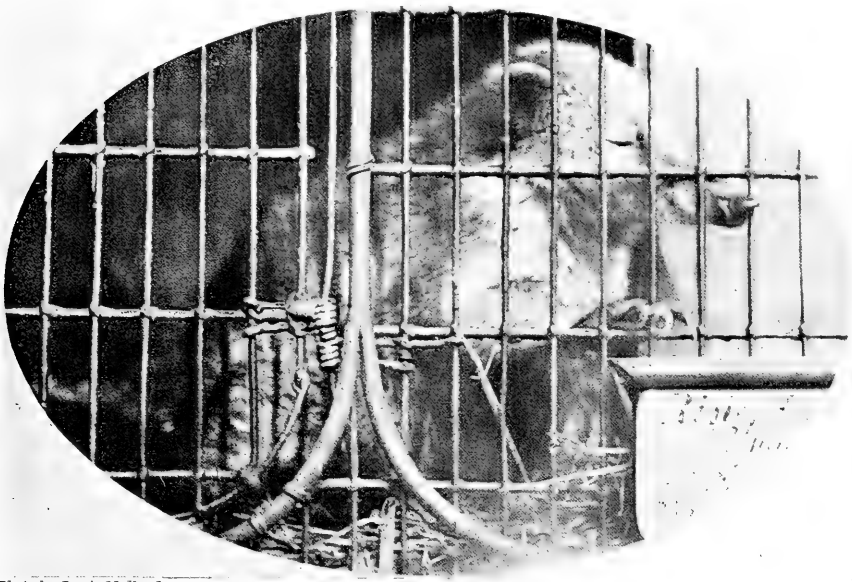


Photo by Lewis Medland. WHITE-NOSED OR RED COATI.

from twenty-five to thirty-five shillings apiece. There are two species, respectively known as the White-nosed and the Red Coati. They are both liable to considerable variations of coloration, one encroaching so much on the characteristics of the other that it is often a matter of difficulty to say which is which unless the specific characters are strongly defined. The most noticeable feature of the coati is the length of the nose, and its flexible snout seems engaged in ceaselessly ferreting out the corners of the cage all the time that its owner is awake. The German name—Rüsselbar—has reference to the long nose of the animal, and signifies "proboscis"-bear. Both species are natives of the American Continents, the red coati, ranging from the extreme north of South America as far south as Paraguay, being most common over

the Brazilian area; whilst the white-nosed species ranges further north, being mostly seen in Central America, although occasionally found in Mexico. In Guatemala it is almost the commonest of mammals, and is found pretty evenly distributed over all altitudes from sea-level to the top of the mountain-forests nearly ten thousand feet above that level. In those districts in which they are to be found, these animals are often kept as pets, either by being chained up to a pillar like a monkey or a dog or else having the free run of the premises.

The cage for a coati should be made of one-inch wood planed smooth, and a convenient size would be four feet long by three feet in height, and the same from back to front; galvanised netting is not strong enough for these animals, and $\frac{1}{4}$-inch or $\frac{3}{8}$-inch rod-iron is necessary. A loose closed-in box with a one-third opening serves as sleeping compartment, but will not be often legitimately used, the coati usually preferring to sleep on top in the space between it and the roof of the cage; but if no box is provided the animal does not like it, and is extremely restless over the matter. A portion of a tree-branch ought to be provided, as the coati is arboreal in its habits.

Like the Great Dane of dog-fanciers, coatis are very capricious in their affections, often being on bad terms with persons who have never done anything to upset them. They cannot bear being teased, and very quickly display marked symptoms of an irritable temper, usually by suddenly protruding one of their fore-limbs, or occasionally both, and endeavouring to scratch the hand or face of the offending individual. They are most lively creatures, and are always in a state of constant activity, ceaselessly trotting from one end of their cage to the other, or else climbing up and down the tree-trunk provided for their benefit, only stopping at the approach of their owner to put their backs against the wires of the cage for him to scratch—a thing they delight in. When properly tamed, and they have got quite used to their owner and the people about the house, they may, to a very limited extent, be allowed partial liberty and permitted to run about the house, provided always that there are no cage-birds or pigeons present; for if there are the coati will soon scent them out with his keen nose and make an enjoyable meal off them. In this respect these animals are worse than any cat, and if allowed out in the garden are much more artful in catching birds than the latter. A cat, even when adult, can often be broken of this habit; but, according to the writer's experience, the coati never can, the habit being so thoroughly ingrained into its nature as to be ineradicable. If the house is infested with rats or mice the coati will soon make them seek fresh quarters, being quite as good for this sort of thing as the mungoose. When annoyed these animals give vent to shrill shrieks of displeasure.

The food must be varied as much as possible and given perfectly fresh to keep these animals in a healthy condition, as they are liable to dysentery; stalky greens, potatoes, pieces of cooked meat—beef for preference—mice, rats, fruit, eggs, small birds, snails, frogs, and small insects, as well as rice and worms—in fact they are practically omnivorous—form the usual dietary. They are very fond of worms, and if allowed out in a garden usually commence scratching the ground in search of them, uprooting plants and often doing extensive damage unless noticed in time. It is well not to leave the water-vessels in the cage, as they are almost sure to get knocked over by the coati during its ceaseless movements; the liquid food may be conveniently given two or three times a day.

Owing to the carnivorous habits of these creatures perfect cleanliness is imperative, and the cage must be swept out every day. This operation, until the animal gets used to its owner or whoever else looks after it, is attended with difficulties. The door of the cage, having regard to the size of the animal, cannot very well be less than a foot or eighteen inches square, and the opening of this door is usually but

the prelude to an attempt at escape on the animal's part, or else the coati resents the intrusion of any implement used in the cleaning operation either by attempting to get it away from the person using it, or by inflicting scratches on the hands of whoever is doing the work. Whatever happens, the person must not lose his or her temper and strike the coati, as it will resent the injury in a moment and not forget the indignity it has suffered, but, on the contrary, will carefully treasure the occurrence in its mind as long as that person has to do with it. After a week or so the coati will get used to having its cage cleaned out and will give no further trouble.

Reference has been made to the artfulness of these animals, and in connection with this trait of their character, Belt—the traveller who explored Nicaragua—relates that they are in the habit of hunting the iguanas in the trees, and that when these reptiles saw the coati approach they would simply drop down from the bough on which they were resting to the ground, and then run up another tree, very often thus escaping their enemies. But the coatis usually go about in small troops or bands of about twenty, and their artfulness was displayed in the following manner;—they would divide themselves into two sections, one of which hunted the iguanas in the branches above while the other would follow their movements below, so that if any iguana or other prey thought to escape its danger by dropping to the ground, it simply found it had "jumped out of the frying-pan into the fire." It is rather curious that, although gregarious when wild, the coati is anything but a sociable animal in captivity, and it is only occasionally that two individuals even of opposite sexes can be kept in one cage, as their chief delight seems in fighting one another at every opportunity, inflicting nasty wounds with their sharp claws and filling the air with their shrill cries.

Their olfactory nerves are evidently very sensitive, and it is on record that a tame coati could always detect the one who touched him out of several persons, even when the head had been covered so that the animal could not tell by seeing. Most coatis relish perfumes, and if a few drops of scent are sprayed on a small piece of linen rag or old handkerchief and this be thrown into their cage, their delight is keen in the extreme. This being the case it can be readily imagined that their nose is most sensitive to injury, and they always take the greatest care of it; if frightened they nearly always scamper to the back of the cage and grasp their nose with their two front paws to protect it from accidental injury. When, too, the nose has been used in grubbing up garden soil in search of worms, the coati cleans it first with its fore-feet and then gives it a final polishing-up on the fur of the tail, rubbing it up and down as if it were being done on a knife-board.

If the meat is given to the coati in large pieces the animal tears it in pieces with its sharp claws, and often carries it to its mouth from the dish by sticking in one of its long claws.

If only pet-keepers were to give these animals a little encouragement and take precautions not to upset them during the first few days, they would be more often kept than they are at the present moment.

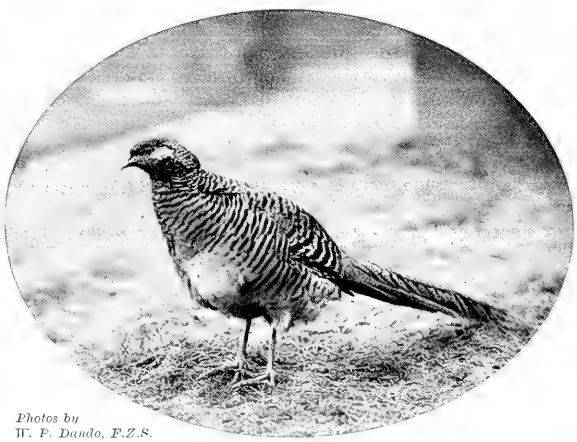
PRATINCOLE.

ZOO NOTES.

Pratincole.

THE curious birds belonging to this genus are better described by their Anglo-Indian name of Swallow-Plovers, showing as they do a curious combination of swallow and plover both in appearance and habits. Like the swallows they have long wings and wide mouths, and feed largely on flying insects captured on the wing, while like the plovers —to which they are really related—they have fairly long legs and run well on the ground, where also they nest, producing downy, active young.

The present species (*Glareola pratincola*) has bred in the Zoological Gardens, but the young were not reared. It occasionally turns up as a straggler in England, when it is of course at once shot down by unscientific people who are thoroughly alive to the market value of a "British specimen" of a rare bird. Its usual habitat, however, is Southern Europe, Central Asia, and North Africa, whence it moves southward in winter. At the Cape an allied species is much valued as a locust-destroyer. These birds have a most ingenious way of feeding on a flying swarm, part of which they enclose by forming up into a figure shaped like an inverted hollow cone. Then the outside birds continually dash inwards at their prey, which cannot escape from the living cordon, while the lower flyers are not soiled by the droppings of those above them. Having cleared off some of the swarm in this way, the birds break their ranks and reform round another portion



Photos by W. P. Dando, F.Z.S.

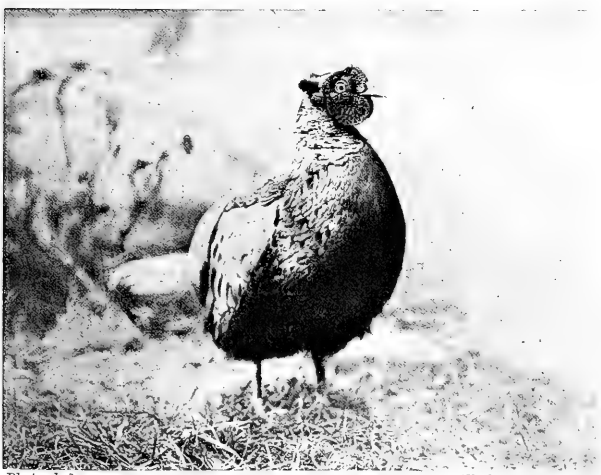
HEN GOLDEN PHEASANT.

of it, until they are satisfied or there are no more locusts available. On account of the service they thus render, the "Locust-birds," although fit for human food, are not molested by sportsmen in South Africa. As they do no harm whatever, and live well in captivity if properly fed, they would be good subjects for introduction into such parts of the New World as are subject to locust or grasshopper plagues; they do not occur there naturally, although ranging widely in the Eastern Hemisphere.

COCK GOLDEN PHEASANT.

Golden Pheasant.

For sheer brilliance of coloration no living bird excels the male of this species (*Chrysolophus pictus*), the silky scarlet of the breast forming, with the fiery orange of the ruff and pure golden yellow of the crest and lower back, a *tout ensemble* which puts even the birds-of-paradise to shame. Yet this magnificent creature is not a denizen of the tropics, but inhabits Western and Southern China, frequenting wooded mountains. It is, however, better known as a domestic than a wild bird, having been established in Europe more than a century ago. It is perfectly hardy with us, and would probably often be allowed to inhabit our coverts were it not for the fact that it is very pugnacious, and, although a smaller bird and less well-spurred, more than a match for the common pheasants preserved there, doubtless owing to its greater activity and spirit. Where no preserving is carried on, however, there can be no better ornament to a country seat than this species; and it is easier to rear than the common pheasant, while in captivity it thrives much better.



Photos by] JAPANESE PHEASANT. *[W. P. Dando, F.Z.S.*

The hen illustrated might belong either to this species or to the Amherst pheasant, for though the males are very different (the Amherst cock being mainly white and metallic green)

the hens of both species exhibit the plain zebra-barred plumage of black and brown so well rendered by the camera. The Amherst hen, however, is distinguishable by a patch of bare livid-coloured skin which surrounds the eye, and by her grey legs, those of the golden pheasant hen being pale yellow; while the golden hen is decidedly smaller and more yellowish in tone. Young cock golden pheasants have this barred-brown plumage at first, but during their first year their eyes become yellow—those of the hens remaining dark—and they also acquire a wash of red on the crown and lower back. They are thus early distinguishable, but they do not assume their full plumage till their second year. At the time of writing this (April), there are three young males in the transition state in the fine new aviary on the canal bank in the London Zoological Gardens, where also an adult male is shown. This bird, however, is not so fine a specimen as the one illustrated, which inhabits one of the compartments of the new Eastern Pheasantry. This is a nearly perfect example of the species, and much delights visitors by his frequent display of his plumage to the hens confined with him. In this display the golden pheasant shows much more judgment than the peacock, which frequently turns his back to the hen, while the present bird is always careful to keep his beauties well before her eyes whichever way she may turn.

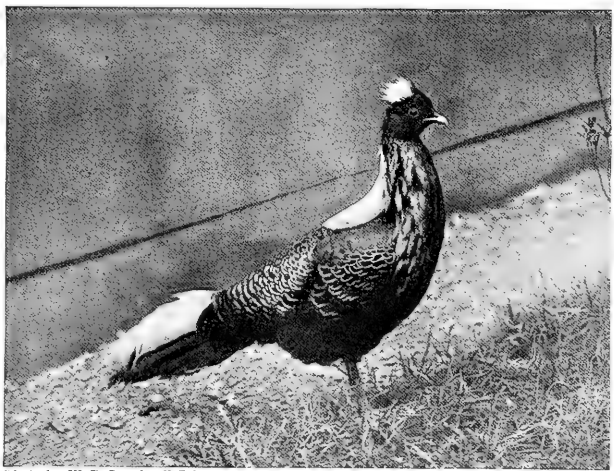


Photo by W. P. Dando, F.Z.S. SWINHOE'S PHEASANT.

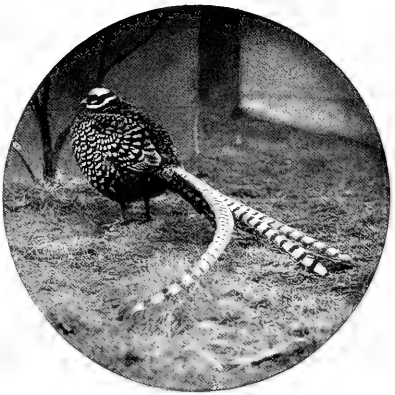
Japanese Pheasant.

Everyone will be able to recognise from the photograph the close relationship of this bird (*Phasianus versicolor*) to the common pheasant; but it shows considerable differences in colour, the whole of the under-parts being of a dark metallic green, while the flat of the wing and the lower part of the back are French-grey as in the Ring-necked Pheasant (*P. torquatus*) of China. The hen of the Japanese species is darker than that of the common pheasant, the black markings of the plumage being more pronounced, as may be seen in the fine specimens exhibited in the Northern Pheasantry in the Zoological Gardens. This species produces very fine hybrids with the common pheasants of our coverts, the cross-bred birds exhibiting a splendid gloss on their plumage. As is commonly the case with crosses between such nearly-allied species, the hybrids are quite fertile.

Swinhoe's Pheasant.

In this species (*Gennæus swinhoei*), a native of Formosa, we see a distinct difference in type. It belongs to the Kaleege group, of which the well-known Silver Pheasant (*Gennæus nycthemerus*) is a more familiar form. These birds are not suitable for the covert, but they do well in aviaries. Swinhoe's Pheasant has a very remarkable and beautiful plumage, the chief colour being black with tippings

of metallic blue. The crest, centre-tail feathers, and upper back are pure white, while the white back is flanked on each side by a patch of metallic maroon, and the face and legs are bright red. The hen has similar vermilion facings, and is prettily pencilled with brown, black, and buff. Swinhoe's Pheasant is constantly obtainable, but still rather dear.



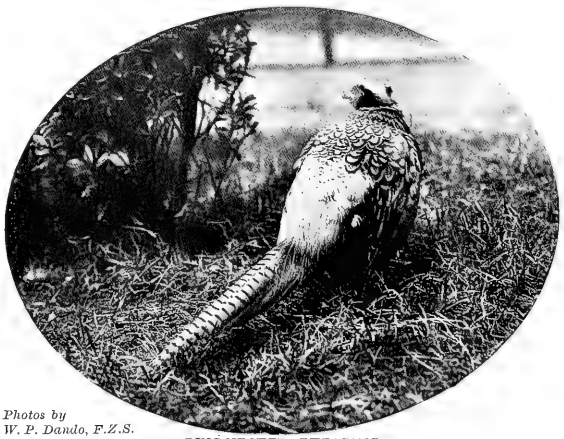
BAR-TAILED PHEASANT.

Bar-tailed Pheasant.

BETTER known as Reeves' Pheasant, the *Phasianus reevesi* of Northern China cannot nowadays be called a rare species here, as it is not unfrequently bred as a sporting bird, and occasionally appears in the poulterers' shops. Here the enormous length of the cock's tail attracts attention, this appendage in a fine specimen reaching the extraordinary length of six feet. The plumage, as the photograph shows, is extremely handsome in its markings, and as the light ground-colour is mainly a bright orange-yellow, the effect is remarkable. The hen has a tail of only moderate length and very beautiful, though plain, plumage, the markings being very intricate. Although this species belongs to the same group as the common pheasant, the relationship is not very close, and the hybrids are usually infertile.

Ring-necked Pheasant.

FAR otherwise is it with the Ring-necked Pheasant, which, turned loose in our woods considerably more than a century ago, has now become so thoroughly intermixed with the old "dark-necked" breed (*P. colchicus*) that a pure specimen of either is hardly to be found. For the benefit of those who may desire such information, it may be pointed out that the true ring-neck, in addition to his white collar and eyebrows, should have, as above stated, the flat of the wing and the lower back French-grey (the latter with a gloss of green), and be much lighter on the flanks than on the breast. The true old English pheasant (*P. colchicus*), on the other hand, should not only show no white on the head and neck, but have the flat of the wing pale brown and the lower back maroon, with no grey or green tinge, while the ground-colour of the flanks should be rich deep bay, like that of the breast, the mere absence of the ring being, by itself, no criterion of the purity of the strain. The hens are very hard to distinguish, although a ring-necked hen now in the Gardens is certainly very light in colour.



Photos by W. P. Dando, F.Z.S.

RING-NECKED PHEASANT.

Variegated Sheldrake.

KNOWN in New Zealand as the "Paradise Duck," this species (*Casarca variegata*) is confined, in the wild state, to that country, but, since it breeds well in captivity, has long been well known in Europe, though it cannot be called a cheap or abundant species. The bird in the photograph is a female, the drake having the head greenish-black instead of snow-white, while his plumage is almost entirely iron-grey, this hue in the duck being mixed with chestnut. This great difference in the sexes is unique among the sheldrakes, in which group drake and duck are usually very much alike. Another remarkable peculiarity in the New Zealand species is its very fretful, quarrelsome disposition. It cherishes an especial hatred for the Upland or Magellanic Goose (*Chloëphaga magellanica*), which warmly reciprocates the feeling. Yet the two birds can never meet in a natural state, since the goose is only found wild in southern South America, so that here we have a psychical peculiarity which certainly cannot be due to natural selection.

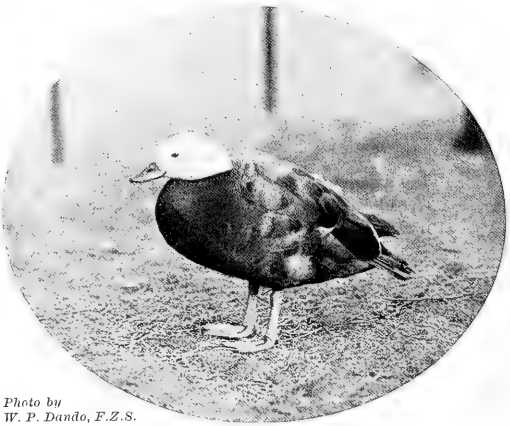


Photo by W. P. Dando, F.Z.S.

FEMALE VARIEGATED SHELDRAKE.

Common Sheldrake.

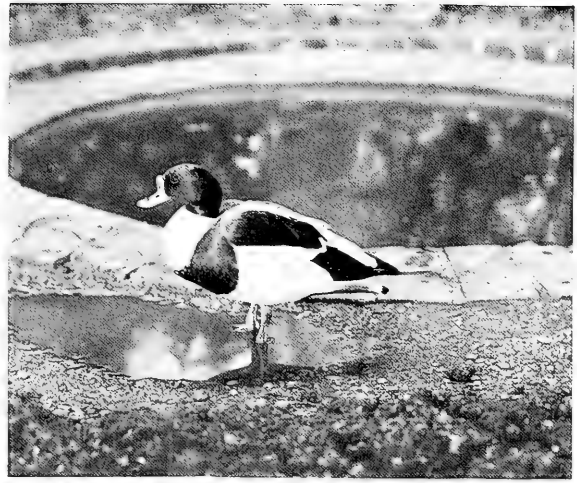
OUR common British Sheldrake (*Tadorna cornuta*) is the very opposite, in temper as well as in habitat, of the peevish Paradise Duck, for it is the best-tempered of all the sheldrakes, none of which are absolutely to be relied upon, at any rate when breeding. No duck equals this bird in startling contrasts of colour, for in addition to the black and white shown in the photograph, the band across the breast is bright chestnut and the bill scarlet. The knob on the forehead is only found in the drake, and is not fully developed except at the breeding season. This sheldrake has a wide range across the northern parts of the Old World, and, unlike most of the surface-feeding ducks, is almost confined to the sea-coasts. It breeds with us, nesting by preference in rabbit-burrows, whence it is sometimes called the Burrow-Duck. Another local name is "Bargander," a word probably akin to the German *Bergente* and Dutch *Bergeend*.

The name Sheldrake is derived from the old word "sheld," which means pied or variegated. This sheldrake is frequently kept as an ornamental bird, and is one of the best for that purpose, as it is handsome and graceful either on land or water, and both sexes are showy in colour. It is, however, not a very free breeder, but is more likely to go to nest if natural accommodation in the shape of a burrow be provided. In some parts of the Continent the wild birds are encouraged to nest by means of artificial burrows, which are robbed systematically both of the eggs and of the down in which these are bedded, which down is but little inferior to that of the Eider-Duck. Such profitable culture of this beautiful bird might well be attempted in suitable parts of our own coast; and as it is quite harmless and, owing to its rank flavour, very unfit for food, it might well be accorded especial protection all the year round.

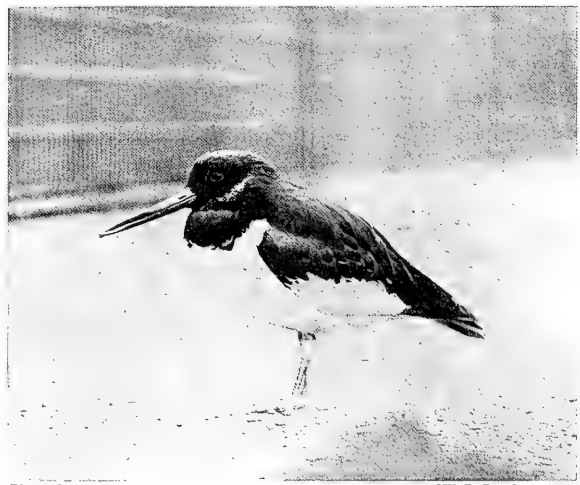
The Oyster-catcher.

THIS is another conspicuous pied bird of our coasts. Like the sheldrake's, its colours are bright black and

white, set off by a red bill and flesh-coloured feet. The species, known scientifically as *Hæmatopus ostralegus*, ranges all across the Old World, and, in several European languages besides our own, has received a name implying that oysters form its ordinary food. Yet it can rarely have a chance of feeding on these, although shellfish do form a large part of its diet and its hard chisel-tipped bill is well adapted for prizing them open. Other English names for it are "Sea-pie" and "Olive." Oyster-catchers do well in captivity, and two are at the time of writing exhibited in the Canal Bank Aviary, where they recently distinguished themselves by repeatedly pulling out the plug of the little pond and draining it dry, so that a heavy stone had to be placed on it to protect it against their investigations. One or other species of these birds is found almost everywhere on the sea-coast. The one inhabiting New Zealand, and there called the Red-bill, is much persecuted by gulls, which follow the industrious bird as he hunts for crabs with his long bill and annex the unearthed crustaceans for themselves. After this the gulls can hardly complain of the piracies to which they themselves are subjected by their own relatives the Skuas! The fact is that lapses from honesty are grievously frequent among birds, for with them opportunity all too often makes the thief. In England the common Laughing or Black-headed Gull (*Larus ridibundus*) frequently robs the Lapwing, and in India the present writer has seen even a Kingfisher practise piracy. The species was the White-breasted Kingfisher (*Halcyon smyrnensis*), a bird feeding much on land animals and not very expert at catching fish; his victim was a Dabchick, but he was apparently not often successful in robbing this clever little diver.



COMMON SHELDRAKE.



Photos by] OYSTER-CATCHER. [*W. P. Dando, F.Z.S.*

MIMICRY IN BIRDS.

By Frank Finn, B.A., F.Z.S.

EVERY student of the theory of natural selection is familiar with the wonderful cases in which some defenceless insect closely copies in its appearance a quite unrelated form, which for some reason or other—objectionable taste or exceptional means of defence—appears to be more immune from attack than the majority; but the cases of this "mimicry," as it is called, among birds are not so well known, and it is worth while here to review them in order to be able to gain an idea as to how these remarkable resemblances came about, in the case of birds at all events.

DRONGO, OR KING CROW.

The best-known instance of mimicry in birds, and the one most usually quoted, is the resemblance between certain Orioles and Friar-Birds in the islands of the Australian region. Friar-birds are large honey-suckers, forming the genus *Tropidorhynchus* of ornithologists. They are not attractive in appearance, being of a dull snuffy-brown colour, with some bare blackish skin about the eyes. They are, however, unusually well able to look after themselves. Being as big as blackbirds, with sharp, curved beaks and very strong feet and claws, and having besides a clannish disposition, they are inclined to band together and defend themselves against hawks and crows—are not, in short, the sort of quarry with which the average bird of prey cares to have to do. The orioles, on the other hand, are solitary birds with small weak feet, and bills which, though stout enough in their way, are not such efficient weapons as the nicely-curved and sharp-pointed bill of the friar-birds.

Now in certain islands where both friar-birds and orioles occur, it is noticeable that the local orioles, although belonging to a family which is usually brilliant in colour, at any rate when adult, are of just the same quakerish shade as the honey-suckers living with them. More than that, where the friar-bird shows a bald black patch round the eye, there the oriole will have a patch of dark feathers to match it; the friar-bird's ruff or cowl of reversed feathers will be copied by a light patch on the oriole's neck, and the high-ridged bill of one friar-bird is imitated by its corresponding oriole having a similar Roman nose. The sum total of these remarkable resemblances is that the birds are so well-matched that naturalists getting hold of their skins easily mistake the orioles for honey-suckers; I know I did myself when I first saw one of these "mimicking" orioles in a drawer full of oriole skins, thinking that some one who did not know his business had been confusing the collection I was inspecting; and many years ago a mimetic oriole (*Oriolus bouruensis*)

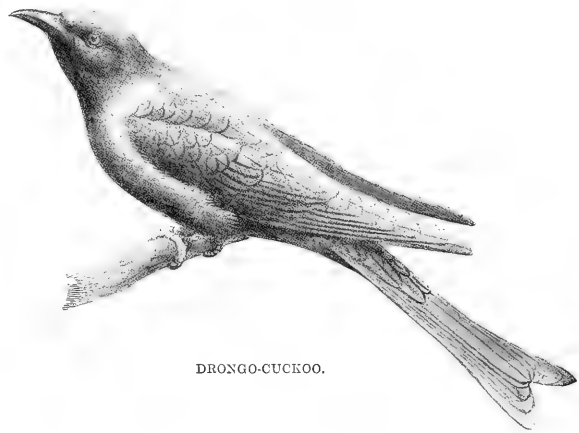
was actually described in a scientific publication as one of the friar-birds. It is accordingly presumed that hawks make the same mistake about the living birds, and let off the orioles when they meet them, for fear of getting a whole brotherhood of friars about their unlucky heads.

Another case, even more striking than this, because the birds concerned in it are not so nearly akin—both friar-birds and orioles being Passerines—is that of the Drongo and its mimic, the Fork-tailed Cuckoo. The drongo (*Dicrurus ater*) is familiar to all residents in the East as the King Crow; he is a black bird about the size of a starling, with short legs and a conspicuously forked tail, who spends most of his time sitting on telegraph-wires or dead boughs and dashing out at passing insects. Such time as he has to spare he bestows on hustling out of his vicinity various predatory birds, especially crows and kites, for, being remarkably nimble in the air and very sharp of bill and claw, he can make himself respected by species of very much larger size.

Now in the Indian region, where the drongo is one of the very commonest birds, there also occurs a small black cuckoo with a forked tail (*Surniculus lugubris*), which at first sight is so like the king crow that it may easily be taken for it, the pair-toed feet of a cuckoo not being a point which is likely to be noticed unless the bird is actually in hand or very near. As drongos have been seen feeding the young of this cuckoo, it presumably lays its eggs in their nests, which would be an excessively risky proceeding for a bird which they could easily recognise as not one of themselves. As it is, the cuckoo gets found out at times, for some drongos have actually been seen to peck one of these birds to death.

In spite of this, however, it is probably of general benefit to this extra-fraudulent cuckoo to wear the livery of the "Kotwal" (superintendent of police), as the drongo is called in the Deccan; for at any rate the criminal classes are likely to treat him with more respect in the police uniform than if they could see he was only a poor vagabond cuckoo with the usual weak bill and feet of his family.

The parasitic cuckoos have, indeed, a general tendency to look like something else—generally a hawk, as is well known to be the case with our own familiar species. But an equally familiar Indian cuckoo carries the hawk-like appearance much further. This is the bird well known, and thoroughly disliked, as the Brain-Fever Bird (*Hierococcyx varius*); its note resembling the word "brain-fever" repeated time after time in a continually higher key. This scale it will go over again and again, even at night, and as it calls in the hot weather, when it is hard enough to get to sleep in any case, its blood is sought, although usually in vain, by the Anglo-Indian. The natives, however, like the noise, as they do that produced by beating on a kerosene tin in default of a tom-tom!



DRONGO-CUCKOO.

Now the brain-fever bird is the most wonderful feather-copy

imaginable of the Indian Sparrow-Hawk or Shikra (*Astur badius*). All the markings of the hawk are reproduced in the cuckoo, which is also of about the same size, and of similar proportions in the matter of tail and wing; and both hawk and cuckoo having a first plumage quite different from the one they assume when adult, the resemblance extends to that, too. Moreover, their flight is so much the same that unless one is near enough to see the beak, or can watch the bird settle and note the difference between the horizontal pose of the cuckoo and the erect bearing of the hawk, it is impossible to tell them apart on the wing.

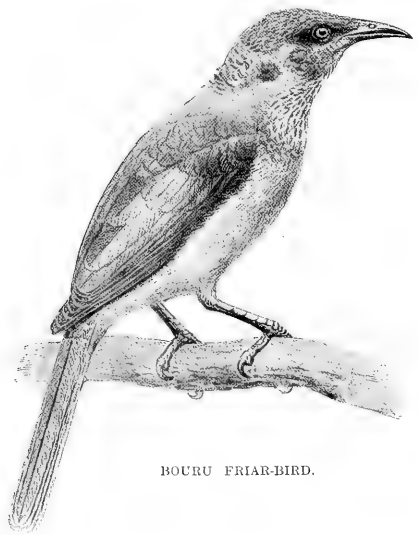
The Hawk-Cuckoo is parasitic upon the Babblers (See Animal Life, Vol. II., page 196), and it has been observed that when it appears these birds absent themselves as speedily as possible, so that it has every chance of depositing its egg, which is blue like theirs, in security. Moreover, like the drongo-cuckoo, it no doubt profits in a general way by resembling a bird much stronger than itself.

Dr. A. R. Wallace draws attention to the fact that one of the large ground-cuckoos of the East (*Carpococcyx radiatus*) bears a resemblance to a pheasant, and suggests that this similarity is useful to the bird. But the resemblance is not very close, and as this cuckoo is not parasitic and has a very strong bill of its own, there seems to be no reason why it should not be able to maintain itself without a disguise.

Another set of small Eastern cuckoos have barred brown plumage, at any rate when young, which is much like that of young shrikes, and there are a cuckoo (*Penthoceryx sonnerati*) and a shrike (*Lanius tigrinus*) which always keep their zebra plumage. As shrikes are fierce little birds and uncommonly hard biters, and also wary and intelligent, the cuckoos may profit by wearing their livery.

In Madagascar we find shrikes copied by other Passerine birds, much as the orioles resemble the friar-birds. The shrike, *Xenopirostris polleni*, is exactly copied by the harmless Bulbul, *Tylas eduardi*, and it is particularly noteworthy that both birds vary in the same way, the breast of each being indifferently white or buff.

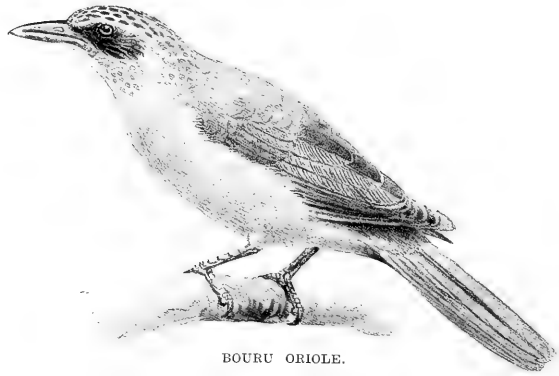
Having considered the cases in which a weaker bird copies a stronger one, we may turn to the "aggressive" mimicry of harmless birds by birds of prey which would be given a wide berth if their real character were known.



BOURU FRIAR-BIRD.

The oldest known case of this kind is that in which a harmless insect-eating Hawk (*Harpagus diodon*) inhabiting the neighbourhood of Rio de Janeiro is copied in that particular district by a Sparrow-Hawk (*Accipiter pileatus*), which there has a reddish-brown wing-lining like its model's, but elsewhere a white one. This is a good instance, and there are several equally striking ones. In Celebes one of the fierce Hawk-Eagles (*Spizäetus lanceolatus*) exactly resembles in both young and adult plumages the harmless Honey-Buzzard (*Pernis celebensis*) of the same country.

In India a small but fierce Eagle (*Hieräetus pennatus*) much resembles in size and colour the lazy carrion-feeding Pariah Kite (*Milvus govinda*), though it has not the forked tail of that bird.



BOURU ORIOLE.

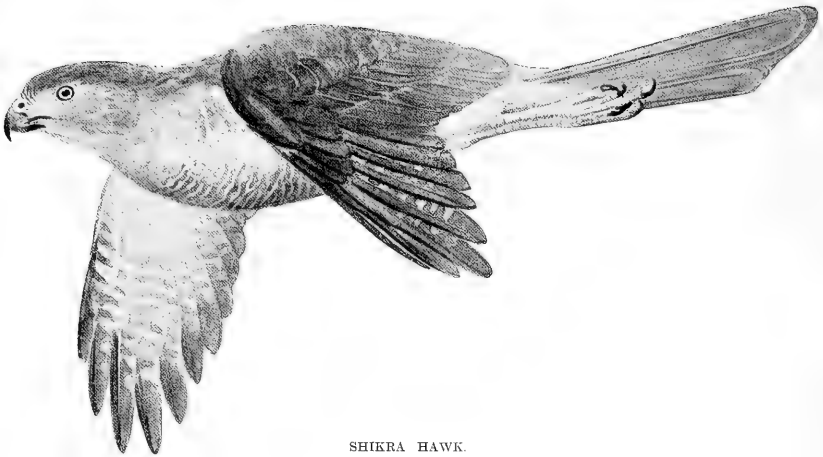
Moreover, all round the world in warm climates are found the hawks of the genus *Elanus*, which in their delicate grey plumage, long narrow wings, and lazy flight most remarkably resemble gulls and terns. Mr. W. H. Hudson, in his delightful book "The Naturalist in La Plata," mentions the resemblance of the *Elanus* to a gull, and says that the birds seem less afraid of it than of other hawks. And in India the species of *Elanus* found there (*E. cæruleus*) is called by the natives "Jungle Tern"; I have seen it myself and taken it for a tern at first sight, so similar is the colour to that water-bird's, and so different the slow swing of the pinions from the sharp decisive stroke one associates with the flight of most hawks.

As every falconer knows that half the battle is to get the hawk near enough to the quarry to prevent the latter having a long start, it seems very obvious that these deceptive birds of prey profit by their resemblance to more or less innocent species just as much as, in another way, appear to do the birds mentioned above as resembling creatures less liable to attack than the majority of birds.

As to the method by which these remarkable likenesses have been produced, I cannot agree with the theory current with regard to the similar cases in insects, that the resemblance of the mimic to its model was only slight at first, and was gradually perfected by the escape from destruction of those specimens which exhibited it in the greatest degree, until, by the continual preservation of such and their descendants, the resemblance was, so to speak, bred into the mimicking species. This seems to me to require too many mistakes on the part of the other creatures concerned, and I much prefer Darwin's view, that mimicry must have commenced between forms pretty much alike to start with, so that natural selection was only needed for the finishing touches. Thus it may be doubted whether, in the case of birds, the resemblances, though probably useful enough now, were not altogether accidental to start with, for there are just as many startling resemblances where no theory of mimicry will suffice; the birds do not even live in the same country in many cases.

Thus, as Sir Walter Buller and Mr. F. E. Beddard have pointed out, the one in his work on the "Birds of New Zealand" and the other in "Animal Colouration," the large cuckoo of New Zealand (*Urodynamis taitensis*) is indeed very like a hawk, but the species it most resembles is not a New Zealand one, but Cooper's Hawk of North America (*Accipiter cooperi*)! And it may be added that our own cuckoo more resembles some of the tropical hawks of the genus *Baza* than any British hawk. Several kinds of *Baza* have the plain grey breast of the cuckoo, and they are even called "cuckoo-falcons" from their resemblance to that bird, while the English sparrow-hawk is barred on the breast; the barring on the cuckoo not reaching up so high, which renders its likeness to that hawk decidedly imperfect.

The Great Skuas (*Megalestris*) show a singular resemblance to birds of prey in their dark-brown plumage streaked with tawny on the neck, which recalls that of many eagles, while the white patch at the base of the primary quills reproduces the



SHIKRA HAWK.

similar marking in buzzards. Yet these are fierce predaceous creatures themselves, so that the resemblance is pointless; besides which, two of the four known species live where they themselves are the only birds of prey.

The remarkable plumage of the male American Red-winged Troupials (*Agelæus*) is well copied by the male of a shrike (*Campephaga phœnicea*) which has the same black body-colour and scarlet epaulettes, but, as it lives in Africa, cannot profit by the resemblance. It is true that several African Weaver-Finches show the same style of coloration, but if the shrike (not one of the more predatory forms) mimics these, what do the American troupials mimic?

Many of this same troupial family (*Icteridæ*) bear a great resemblance to orioles, having the black-and-yellow pied plumage which characterises most of those birds; indeed, they are commonly called orioles in America. Orioles, however, they are not, but close allies of the starlings and weavers, and none of them occur in the Old World, nor any orioles in America.

One of the American finches, the Red-eyed Bunting or Towhee (*Pipilo erythrophthalmus*) bears a close resemblance to the Indian robin-like bird known as the Shama (*Cittocincla macrura*), both birds having long tails and short wings, black upper plumage and chestnut flanks; while in the hens of both the black upper-parts are replaced by brown. The resemblance is quite near enough for mimicry, yet under the circumstances it can be of no avail, even if there were any reason why one of these species should imitate the other.

Several other less striking instances of this false mimicry could be given; thus, the American Oven-Bird (*Furnarius rufus*), made so familiar to us by Mr. Hudson's works, exactly resembles our Nightingale in plumage, although a bigger bird and rather differently shaped; while our Magpie is well copied in colour by two much smaller birds, the Dhyal or Magpie-Robin of India (*Copsychus saularis*) and the Magpie-Tanager (*Cissopis leveriana*) of South America. Morover, the beautiful starling of the Andamans (*Sturnia andamanensis*) so resembles a gull in the arrangement of its colours,—white body, grey back, black quills, and yellow bill and feet—that *if* only it were bigger, and *if* gulls were common in the seas around its home, it might be set down as a mimic too!

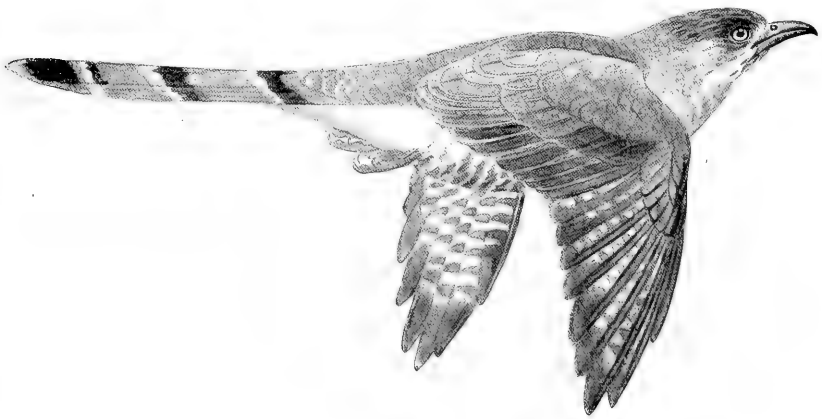
Our common domestic birds show by their casual variations the great changes in appearance, by variation alone, which might produce under favourable circumstances a serviceable mimetic resemblance; thus the common fowl often exhibits a variety in which the body is white and the primary quills and tail black, a coloration very characteristic of many large and powerful birds.

Applying this to the stock case of the Orioles, we may compare the hypothetical ancestor of these birds with the known Canary. This bird is normally, in its wild state (and often in domestication), of a streaky olive-green, somewhat like the young of many orioles; it frequently produces a cinnamon form, and (very rarely) a brown one, which may be compared to the mimicking orioles, and everyone knows its yellow and pied variations, one of which, the nearly extinct "London Fancy" breed, has dark quills and tail, and so very closely approaches the Golden Oriole's plan of coloration.

Now there is one oriole, the Australian *Oriolus viridis*, which is throughout life green and streaky, and may be taken as representing the ancestor; and this shows not the slightest resemblance to the common Australian friar-bird (*Tropidorhynchus corniculatus*), which has the usual snuffy-brown of his relatives, and a head altogether bald and black; in fact he is the typical friar.

He is evidently a hopeless model for the green oriole, although as warlike, and therefore as desirable in that capacity, as the insular members of his family; but even if a brown variation occurred in Australian orioles they would have nothing to pass off as the friar's bald black head. Possibly, too, the brown variation has never occurred, so the orioles have to get along on their own merits. The mimicking species in the islands further west have evidently been more fortunate, as the friar-birds there not being bald-headed, their garb was more easily counterfeited.

Further west again the range of the friar-birds ceases, and here the orioles blaze out in black and gold, and even black and scarlet; nature not having bred them to a dingy model the natural tendency of a green coloration to sport into yellow, and of brown to produce red (as shown in the brown Kaka Parrot (*Nestor meridionalis*) of New Zealand) has had free play. It is noticeable that these richly-coloured orioles have longer wings than the dull mimetic forms, so that increased power of flight has

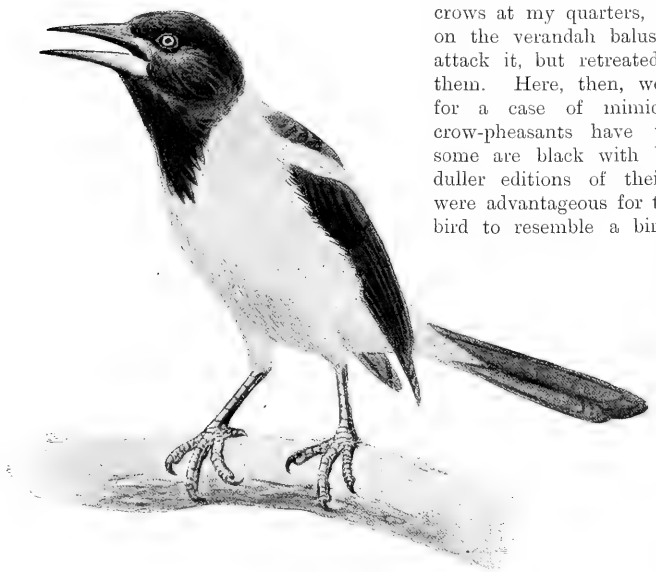


HAWK-CUCKOO.

evidently proved an ample means of protection where there was no chance of shuffling. Indeed, in Yarkand, Golden Orioles (*Oriolus kundoo*) have been seen to drive off a big Jungle-Crow as boldly as the friar-birds which their shabby relatives copy.

As a further instance of the essentially fortuitous character of these resemblances, attention may be profitably directed to the particularly beautiful one of the Brain-Fever-Bird to the Shikra. We can see why it pays this cuckoo to look like the hawk, but there is a very curious little point which makes the fortuitousness of the "mimicry" almost certain. Many hawks have a little tubercle just inside the nostril, and this is reproduced in the brain-fever-bird. But setting aside the improbability of a terrified bird stopping to notice whether the object of its fear had tubercles in the nostrils or not—in which case, too, it could not fail to see the different beak—it so happens that the shikra itself does not possess this little nasal prominence! Thus the possession thereof by the cuckoo is a mere chance coincidence, and if this be the case with such a small detail why may not the resemblance of plumage and form be so likewise?

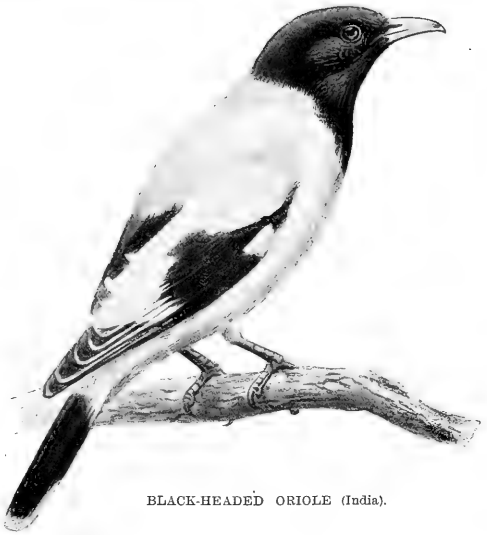
As a matter of fact, the cuckoos as a family are very prone to show resemblances to birds of prey. For instance, a common Indian non-parasitic ground-cuckoo (*Centropus sinensis*), whose want of resemblance to a hawk when adult may be judged from its popular name of "Crow-Pheasant," is usually, when young, barred across with black and white and black and brown, and with its strong curved bill and bright eyes distinctly recalls a young bird of prey. Birds also appear to notice the resemblance, for when once in the Calcutta bazaar I approached a cage of guinea-fowls with such a young cuckoo perched on my hand they shrieked hysterically and stared shrinkingly at it in such a way as to leave no doubt that they regarded it as a dangerous raptorial character. When I took the "crow-pheasant" home I found that it created much excitement among the crows at my quarters, although when placed on the verandah balustrade they dared not attack it, but retreated when it charged at them. Here, then, we have the requisites for a case of mimicry. Not all young crow-pheasants have the barred plumage; some are black with brown wings,—simply duller editions of their parents—and if it were advantageous for this strong and plucky bird to resemble a bird of prey, no doubt these precociously-plumaged youngsters would be killed off and only the barred ones survive, until the barred young plumage was the only one found. As this is not the case, we may assume no mimicry is necessary.



TROUPIAL (S. America).

It should, however, be observed that there is no gradation between

the two forms, and so, if the barred plumage became of mimetic value, it would have done so without the gradual evolution of a more and more marked resemblance insisted on by entomological theorists on this fascinating subject, but by the natural utilisation of a resemblance already existing; for a barred plumage in young cuckoos is so very common that we may fairly take it in the crow-pheasant as the normal one, and the self-coloured young birds as more recent offshoots, since there is a strong tendency in birds for the young to drop their immature plumage and assume at once that of the adult when this can be done with safety.



BLACK-HEADED ORIOLE (India).

That, although a merely general resemblance is enough to make an impression, details would need to be added in some cases is shown by the fact that where it is a matter of life or death to birds to know one similar species from another, they can distinguish them even where there is a considerable initial resemblance. Thus, the small kite-like Eagle mentioned early in this article is distinguished at any rate by the House-Crows and Grey Babblers (*Argya malcolmi*) of India. This bird would possibly succeed as an imitation of the kite if it had the forked tail of that bird, and then might expect to deceive some species, though crows and babblers would probably, from their social and raptor-hating instincts, give warning against the unusually vicious kite they would deem themselves to have discovered.

But all birds are not equally intelligent, as I found when experimenting with their tastes in regard to "warningly-coloured" butterflies and their mimics, and no doubt many a species, both of birds and insects, has had its fraudulent career as a mimic nipped in the bud by having to do with enemies or prey which were too observant to be long taken in by anything except an absolutely perfect imitation.

OUR COLOURED PLATE.

A TIGER IN THE JUNGLE.

That a Tiger in an Indian grass-jungle harmonises as regards coloration with its surroundings may be taken as an undoubted fact. The curious circumstance connected with this resemblance is, however, the fact that the animal is not an indigenous native of India, but an immigrant from the north, although not at such a comparatively recent epoch as has been suggested by a writer in the Zoological Society's "Proceedings." The original home of the tiger is undoubtedly Korea, Mongolia, and Siberia; the occurrence of its fossilised remains in the New Siberian Islands demonstrating that at one time its range extended far within the Arctic Circle. In Korea, at any rate, where I am told tigers frequent scrub-thickets, the natural surroundings are quite different from those of an Indian grass-jungle; and it is possible that much the same holds good with regard to Siberia and Mongolia. Evidently, then, the tiger's stripes were not specially evolved in order to harmonise with the giant grasses in an Indian jungle. The true explanation is probably to be found in the circumstance that these vertical stripes, like those of the zebras, are for the purpose of breaking up the general solid form which would be presented by a uniformly orange-coloured body, and that their effect in affording concealment is equally good in either the open or in covert. Possibly the more numerous black stripes, which I think generally characterise the Indian race, may be a special minor adaptation to its environment.—R.L.

NOTES ON THE HEDGEHOG.

By W. Royal-Dawson, F.Z.S.

FEW British mammals are more familiar than the Hedgehog. This inoffensive little creature has, from the earliest times, been regarded as vermin of the deepest dye by the farmer, though his reason for complaint is not obvious; for, so far from doing mischief, the hedgehog benefits the farmyard, since it devours worms, maggots, and also insects which are noxious to the cattle. If anyone has reason to complain it is the gamekeeper, for the hedgehog is very partial to gamebirds' eggs. In captivity it is very fond of bread and milk.

Photo by Oxley Grabham.

HEDGEHOG UNROLLED ROOTING FOR WORMS.

The hedgehog is very audacious, for it is not infrequently known to attack adders, and it almost invariably comes off the victor, its opponent having lacerated itself on the spiny armour which characterises typical *Erinaceidæ*. In addition to its ordinary diet, viz., worms and insects, the hedgehog will sometimes devour small mice, but never by preference so long as its proper food is abundant.

The well-known means of self-defence of *Erinaceus* is rolling itself into a ball. This method is generally effective so far as man is concerned, though with the fox and the badger it does not go very far. The advantages of the spiny coat are various; for, besides being the only means of defence, it will break a fall owing to its elasticity.

The hedgehog produces from three to six young at a birth, generally in August. The parent builds a capacious nest of twigs and leaves for the accommodation of her offspring. As Gilbert White points out in his "Natural History of Selborne," the new-born hedgehogs are like puppies in that they are blind for some days after birth. The spines are also soft, but soon begin to harden.

Photo by Oxley Grabham.

HEDGEHOG ROLLED UP.

The common hedgehog presents some variety in its coloration, but as a rule is a dull buff colour, the spines being light at their bases and tips, darker in the middle. Albinos are occasionally recorded. Like the majority of our British mammals, the hedgehog is largely nocturnal in its habits. It can run with great rapidity. There still lingers in some parts the old fallacy that hedgehogs climb fruit-trees and carry away fruit on their spines, but as they subsist on animal, and not vegetable diet, this belief is too absurd to need comment.

In conclusion I may say a word about the hedgehog as food. It is not eaten in England, unless by gipsies; though in France, like most things, it finds its way on to the dinner-table.

THE BOA-CONSTRICTOR.

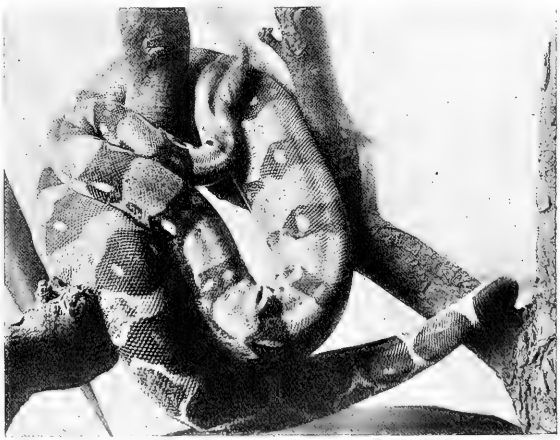
By H. George F. Spurrell, with Illustrations from Photographs by the Author.

AMONG the vast variety of snakes which inhabit the warm parts of the globe three main types are distinguishable. There is the slender type, with a hard, cylindrical body, of active habits and preferring small prey and frequent meals. Snakes of this type are not usually poisonous. There is the short, rather soft type, with a flattened body and sluggish habits. Most of this latter type make feeding an easier business by being venomous and first killing their prey. And, finally, there is the type which is built for strength, of which the Boa-Constrictor is a good example.

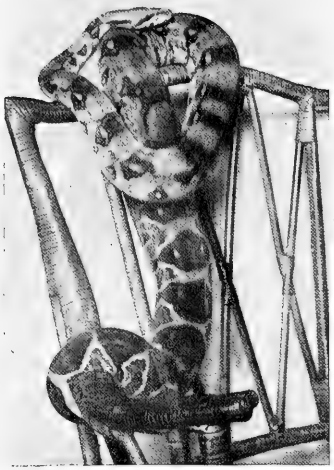
These constricting snakes have a thick body and usually a comparatively short tail. They are deliberate in their movements, and generally lie in ambush for their prey. But they are extremely muscular, and feed principally upon warm-blooded animals and birds, large and active prey, which they kill almost instantaneously by rolling them up in their coils. Their heads are small in comparison to the thickness of their bodies, but the bones of the skull are so articulated that the jaws will open out and allow the snake to swallow an animal much thicker than itself. Thus, feeding upon nourishing food and getting a big meal at a time, they grow very quickly. The boa-constrictor from which the accompanying photographs were taken was only twenty inches long and weighed only a few ounces eighteen months ago, when he first came into my possession. He is now just six feet long and about eight pounds in weight.

The original snake type has developed along several different lines. There are snakes which are adapted to living in trees, underground, in rivers and lakes, and even in the sea. The vipers represent the highest stage of development along one line, the constrictors along another. The vipers lie in wait for their prey, kill it by poison, and then swallow and digest at leisure. The constrictors avoid wasting energy in another way. They kill a big meal at a time by their strength, and then do not exert themselves until they want another.

My own boa-constrictor has illustrated this principle admirably. The first mouse he ate lasted him a fortnight, and as it digested he grew. Then he changed his skin and ate again, and the next mouse did not last so long. By the time he was big enough to eat three or four mice in succession he could manage a sparrow.



AT REST ON A BRANCH.



EXPLORING THE FURNITURE.

Then the laborious task of catching, killing and swallowing did not have to be repeated so often to get enough food for a meal. The more he ate the faster he grew; the bigger he got the more he was able to kill at one time. It soon became no effort to eat a rat. Then it became less trouble to eat a guinea-pig than two rats.

These constricting snakes are so coloured that they melt into their surroundings. The boa-constrictor, with his arrangement of yellowish-brown tints growing in depth and strength towards his tail till the bars across his back shade off into patches of chestnut-red with black edges, is almost invisible upon the moss-covered branch of a tree with the shadow of the leaves falling on his skin. He is most at home when climbing, and chooses a tree near water for his ambush. He selects his victim from the animals which come to drink, and catches it by the nose when it raises its head after drinking. The animal is probably dead before it can realise that it has been caught; for with a powerful twist of its neck the snake rolls it over and over, so that its body is wound round with the coils. Death is due to the sudden compression of all the internal organs, especially the heart and lungs; the bones are not necessarily broken. Then comes the most painful part of the business. The snake has to swallow its prey whole, as its sharp-pointed teeth are not capable of dividing it. The boa has to keep advancing its upper and lower jaws alternately over the dead animal's body until it has been crammed down its throat. It is no wonder that these constricting snakes grow large in order that they may be able to eat large prey at long intervals. These great exertions are not to be lightly entered upon. The South American boa, from which these photographs were taken, only reaches the length of twelve feet, but some of the pythons grow over twenty feet long and can devour creatures as large as sheep and pigs, and can then go for months without food.

When not eating, these snakes are lethargic. My boa, who knows that his food comes to him, would lie coiled up without moving from meal to meal if I did not frequently take him out of his cage. Then he is interested in exploring the chairs, book-shelves, in fact everything that is climbable. In this way I keep him exercised. He is quite tame, and has only once resented being touched. Fortunately, however, these snakes are not really dangerous. When angry they bite. Their terrible crushing-power is only used against animals which they mean to eat. My boa is extremely humane. If he is not hungry he will crawl round and round his cage to get away from a guinea-pig that tries to nibble his scales. I have never known him bite any animal he did not mean to eat except myself, and that was when he was changing his skin, during which process all snakes are inclined to be irritable. Some of the pythons, however, are less forbearing, and seem to kill small animals from pure destructiveness and then leave them. Yet in a state of nature they are probably the most merciful of the carnivorous creatures. They say the soldier never sees the bullet which kills him. The victims of these snakes likewise never know the manner of their death.

NOTES AND COMMENTS.

The Koala.

THE Koala is a marsupial, widely distributed over Australia, and is generally called by the colonists the "Native Bear." Robustly made, it has stout limbs and powerful claws, but is entirely destitute of tail. Leaves are its chief food. Its fur is of a fawn colour, very thick and soft, and when full grown it is about 24 to 30 inches long. In character it is mild, retiring and inoffensive, generally sleeping in the gum-trees during the day and waking to activity as night approaches. It has a rather melancholy cry, somewhat resembling that of an infant, which it pathetically utters when shot, often raising the pity of the skin-hunter. The mother bear generally carries her young on her back, to which it clings until it is old enough to shift for itself. At one time this little animal was found very plentifully throughout the bush, but has now in some parts completely disappeared owing to the inroads made by skin-hunters, who find a ready market for the hides in Sydney and Melbourne. Being of such a quiet and gentle nature, the young ones are frequently reared by the bush people, as they make charming little pets. The hide generally fetches from 5d. to 1s. each in the Sydney markets, and is used for commercial purposes, the fur, owing to its density, being practically of no value.

Giraffes at the Natural History Museum.

IN connection with the article on the local forms of giraffes published in an earlier number of ANIMAL LIFE, and likewise with the communication on the same subject recently read by Mr. Lydekker before the Zoological Society, it may be appropriate to direct the attention of our readers to the fine series of mounted skins of these animals now exhibited in the Natural History Branch Museum. Not many years ago the exhibits included only an old bull of the southern race presented in the "forties" by the then Earl of Derby, and consequently in a much faded and dilapidated condition, and the head and neck of a younger and consequently lighter-coloured bull of the same sub-species from the Kalahari Desert, presented by Mr. H. A. Bryden. The next addition to the series was a specimen of the head and neck of the Somali or Netted Giraffe (*Giraffa reticulata*), presented by Lord Delamere. The very marked distinctness of this giraffe—the only one, in fact,

THE KOALA.

which is specifically different from *G. camelopardalis* — was first pointed out by Mr. Rowland Ward in the columns of the "Field," although little or no attention was paid at the time to his letter. Some time later the Museum acquired the mounted head and neck of a young giraffe from German East Africa characterised by the curiously jagged, or almost star-like, form of the spots, and hence referable to the Kilimanjaro race (*G. camelopardalis tippelskirchi*) of the common species.

Next followed the head and neck of a fine old bull of the "five-horned" or Baringo race, from the Mount Elgon district, presented by Sir Harry Johnston. The most important addition to the series is, however, the fine male and female of this race (*G. c. rothschildi*) killed by Major Powell-Cotton in the Baringo district, and presented by him and Mr. Rothschild to the Museum. The remarkable difference in the colour and pattern of the markings in the two sexes is very striking. Equally noteworthy is the circumstance that, while in bulls of the age of Major Cotton's specimen the entire face is spotted, in older animals, as exemplified by Sir H. Johnston's Mount Elgon example, the spots disappear from the front of the face owing to the darkening of the ground-colour. The acquisition of the two complete Baringo specimens rendered it necessary to remove the old Cape bull from the exhibited series; and that race is now only represented by Mr. Bryden's specimen of the head and neck of a younger male. A complete specimen of the Cape giraffe, which differs from the northern forms by its spotted legs and absence of a third horn, is therefore a desideratum.

The typical, or Nubian, race of the species is represented by the head and neck of a young bull, recently living at Woburn Abbey, presented by the Duke of Bedford.

Quite recently the exhibited series has been enriched by two mounted heads and necks, the one from the south of Lado, presented by Major Powell-Cotton, and the other from the Northern Transvaal, given by Mr. Rowland Ward. In the paper referred to these have been made the types of two distinct races, severally named after their respective donors. The South Lado race is allied to the one from the Baringo district, but distinguished by its markings and colour, as well as by the presence of a horn over the right eye (if this be a constant feature). The North Transvaal race (of which the entire skin is brown), on the other hand, is a relative of the Cape animal, from which it differs by its markings and the enormous size of its posterior, or occipital, horns.

All these specimens are now exhibited side by side in the Eastern Corridor of the Museum, so that sportsmen may judge for themselves as to the validity and value of the characteristics by which the local races enumerated above are distinguished. It may be safely said that nothing approaching such a fine show has ever before been got together.

In addition to the above, a giraffe (from Angola) in Mr. Rothschild's Museum at Tring has been made the type of another race, allied to the Cape form, under the name of *G. c. angolensis*. Yet another race (*G. c. congoensis*), from the Congo, is typified by a bull in the Congo State Museum at Tervueren, near Brussels, which combines the frontal horn of the northern races with the spotted legs of the southern. Finally, the unusually tall Nigerian giraffe (*G. c. peralta*) is at present known only by the skull and limb bones.

Scarce Swallow-tail.

The Scarce Swallow-tail (so named from a purely insular point of view) seems now to have ceased to be a British butterfly, although there are legends that it formerly visited our islands as a straggler; it is therefore rightly excluded from the British list in Professor Hulme's volume in the *Woburn Library*. From the common swallow-tail this handsome butterfly is readily distinguished by the pattern and colouring of the wings, as well as by the shape of the latter, and their longer tails. In the mountains of Southern Europe it is a comparatively common insect, and may be seen any day in spring in the Rhone Valley. Both species of swallow-tail have suffered severely at the

From a Photo by C. N. Mavroyeni, Smyrna.

THE SCARCE SWALLOW-TAILED BUTTERFLY.

hands of modern entomologists in the matter of scientific names. By Linnæus the common kind was called *Papilio machaon*, and the scarce species *P. podalirius*; and it is satisfactory to find that Prof. Hulme (following the lead of Dr. D. Sharp, in the *Cambridge Natural History*) is content to let them retain these well-known names. Not so a writer in another work (*The Concise Natural History*) issued by the publishers of this journal, who terms the one *Eques machaon* and the other *E. podalirius*, at the same time changing the family name *Papilionidæ* to *Equitidæ*. But this is not all, for in a later work (for which Messrs. Hutchinson are not responsible) Mr. Kirby, the aforesaid writer, calls the one *Achivus machaon* and the other *Iphiclides podalirius*. And yet there are still unsuspecting people in the world who innocently ask for *the* scientific name of an animal. No wonder the editor of "Living Animals" cried "a plague on your so-called scientific nomenclature," and said that he would have none of it!

Young Willow-Wrens.

It is hardly necessary to mention here that the Willow-Wren is not, properly speaking, a wren at all, but one of the small Leaf-Warblers, scientifically known as *Phylloscopus trochilus*; for it is one of the commonest of our summer migrants, found everywhere where trees grow, whether in the lonely moorland valley or in the smoky suburbs of a large manufacturing town. Its slender graceful form and olive-green and yellow plumage make it a pretty bird, and its habits present several points of interest. The position of the nest on the ground, as shown in the illustration, is one of these, for the bird itself is essentially a percher, and seldom comes to earth except when nesting; this habit of building low being usual among the leaf-warblers. Another remarkable thing about this delicate-looking bird is the great distance it traverses on its migrations, for in spring it reaches the northern extremity of the continent of Europe, and in winter goes to the extreme south of Africa, thus crossing nearly half the globe.

NEST OF YOUNG WILLOW-WRENS.

A NATURALIST'S NOTES FROM THE BUSH.

Written and Illustrated with Photographs by CYRIL GRANT LANE.

VI. THE FANTAILED FLYCATCHER, AND THE ROLLER OR DOLLAR-BIRD.

THE Fantailed Flycatcher is certainly one of the most engaging small birds of the bush. The grace of movement and spirited activity of a creature of such diminutive proportions serve to render it a conspicuous object. For ever on the move, and continually chirping out a penetrating twittering song, the bird is speedily discovered and easily studied.

While the spring birds all put in an appearance, the little fantail also arrives, generally settling in the same spot every year to hunt insects and construct one of the most superb little nests, formed of lichens, spiders' webs, hair-like rootlets and fine animal fur, wherein are laid three eggs of a whitish ground-colour having about the larger end several brownish spots. One of the most interesting features in connection with the nest is that, at its base, a long pendant hangs, composed of the superfluous shreds of bark and hair neatly bound together with webbing. This pendant is not present in every nest, which fact gives rise (among some) to doubt whether it really exists at all. My photograph, which I secured when the light was fading at sunset, thus accounting for its realistic obscurity, will, however, suffice to settle the question so far as my readers are concerned.

NEST OF FANTAILED FLYCATCHER.

Like most flycatchers, the Fantail is richly endowed with indefatigable energy, never still a moment, even when not on the wing. Rising suddenly in the air, to meet a passing insect, the bird appears to perform a complete somersault as it actually captures it, immediately returning to the identical spot it had left, head first, there to remain for a brief moment, perpetually bobbing about, turning round and round, ducking its bright-eyed head, and in turn raising and half spreading its nervous-looking little wings and fanning the air with its tail. Then, with a suddenness quite astonishing, the bird has gone, and the twittering, sprightly song heard in an adjacent tree discovers our little friend giving vent to his superabundance of spirits in a new quarter. The nest is always built comparatively low, and usually so constructed that twigs pass through the walls or a small fork serves as a support. The cock bird is almost black, with a few whitish markings here and there; the hen, more sombrely attired, is brown. The breast and under-parts, however, are greyish-white.

Some time ago, when wandering among the dense scrub-belts bordering the River Goulbourne, I heard repeatedly a short grating note which, from its rasping tone, reminded me somewhat of the Corncrake's harsh call. Being unfamiliar with the sound I forced my way through the scrub with due caution, and was eventually successful in obtaining a good view of two Dollar-birds perched upon an old lichen-covered wattle. Both birds were sitting in an upright, alert posture, and without any show of fear seemed to be dividing their attention between two points of attraction, viz., the unexpected appearance of a human being among the scrub, and the tempting fruit of numerous wild raspberries growing beneath them. I have frequently seen them since in the same neighbourhood, and various other specimens in country of a similar nature.

ROLLER OR DOLLAR-BIRD: WINGS PARTIALLY EXPANDED.
From a museum specimen.

These birds seem to fly about in pairs rather than flocks during their visit to Victorian territory. They usually appear during the early summer months, remaining throughout the hot weather, and inhabit the flat, open country bordering rivers and extensive lagoons, where much of their time is passed among the tops of the stately river-gums. Their flight is rather singular, the long, irregular flaps suggesting a clumsiness which is far from real, for when viewed from a distance the rapid propulsion resulting from so few flaps of the wing is surprising, the very irregularities of its motion seeming to possess a system of their own.

A COCK ROLLER OR DOLLAR-BIRD.
From a museum specimen.

The plumage of the Roller, although not exactly gorgeous, is rich in lustrous shades of green. The bird is about ten inches in height, while the expanse of its wings is twenty-four inches, or slightly over. The wings are rather narrow and very long. The beak, which is very wide at the base and well hooked at the tip, is bright orange-red, the feet and legs of the same colour. The darker portions of the wing-feathers, as seen in the illustration of this bird on page 390, are deep violet, the light patches varying in hue (according to the position from which they are viewed) from the palest of blue to a delicate green tint. The underside of the tail-feathers and a patch upon the throat are of the same deep purple colour as the wings. The general appearance of the bird strikes one as very neat and trim, the head rather large proportionately, the feet small.

NOTE—Thanks to the courtesy of Mr. D. Le Souëf, Director of the Melbourne Zoo, I learn that these birds are considered rare in Victoria, but in Northern Australia are numerous. They lay their eggs—four in number—in hollow branches, and are named "Rollers" on account of their peculiar motion when on the wing, and "Dollar-birds" because of the white markin s on the wings representing the American coin in size.

BIRD-WINGED BUTTERFLIES.

By Captain H. Cayley Webster, f.z.s. With a Photograph by the Author.

THE Ornithoptera, or Bird-winged Butterflies, are some of the largest, and certainly the most beautiful, of all the Eastern Lepidoptera. They are found in New Guinea and the surrounding islands. There are several species of the genus, the most notable being *Ornithoptera paradisea*, *O. pegasus*, *O. victoria*, *O. priamus*, and *O. d'urvilliana*. This latter species emerges from the chrysalis clothed with bright green colouring, and only assumes that brilliant blue for which it is famous an hour or two after birth.

Ornithoptera paradisea was one of my earliest captures. Only one specimen had reached Europe before then, and I felt at the time that it was worth the whole of my journey to New Guinea to see this truly superb insect lying glistening in my hand.

Of *Ornithoptera pegasus* (a species closely allied to *O. priamus*, with such an expanse of wing exhibiting a profusion of green and gold and so eagerly sought after by collectors) I captured and bred as many as one hundred and fifty specimens. The habits of these insects are interesting. The egg is deposited on the underside of the young leaf of a certain vine only to be found in the depths of the primeval forests abounding in the countries where it occurs.

After the space of a few days the young caterpillar is hatched, and at once feeds voraciously on the tender shoots, growing rapidly until in a few weeks it attains a length of about three inches. Then, when the time draws nigh for it to pass into the transitory stage of the chrysalis, it becomes exceedingly restless, and for some days roams about hither and thither ever hunting for some suitable place where the necessary change may take place, and eating little or nothing. At length, having found a likely branch or sturdy twig, it commences to bind its stern firmly to it with a very fine mucous thread.

Having accomplished this self-confinement, it proceeds to wind a noose of the same substance round its own neck and attaches it to the branch to which its other end is made fast some few inches higher up. When sufficient threads have been spun to carry the weight of the body it suddenly lets go, and thus hangs itself, as the stern end is only fastened to prevent the wind from blowing it away. In this self-gibbeted state it remains for about six or eight weeks, when suddenly the part which had once been the strangled head opens like the lid to a box, and from the interior crawls the new insect, which has now assumed the form of the butterfly with all its delicate velvety wings wrapped close, to be opened out an hour afterwards, producing the glorious creature as it is seen in the cabinets of fortunate collectors, complete in all its magnificence.

On one of my excursions far into the virgin forest at Etna Bay, Dutch New Guinea, where now lie the bones of three of my best men, killed and eaten before my eyes by the ferocious and bloodthirsty cannibals who so savagely attacked my little party, I captured a female Ornithoptera which I at once thought to be a new species. I extracted an egg from its body, and after the lapse of a week the young caterpillar was born. Then it was that, had I had any doubt before, it was dispersed and I saw that it was a "*Spec. nov.*" The white stripe common to all previously-known Ornithoptera caterpillars was missing, the red spikes were not there,

From a Photo by Capt. Cayley Webster.

DIFFERENT STAGES OF A BUTTERFLY OF THE GENUS ORNITHOPTERA.

1. Caterpillar one week old.
2. Caterpillar at three weeks.
3. Full-grown Caterpillar.
4. Chrysalis.
5. Male Butterfly.
6. Female Butterfly.

and the insect itself was very much larger. I managed after a vast amount of searching to secure the right food, and nursed it most carefully until it turned into a chrysalis. Everything went well until a month or so afterwards, when I arrived at a port on the north coast of Australia and was invited by His Excellency the Governor to stay at Government House. Of course I took my treasure on shore with me, as by that time I was expecting it shortly to hatch out and assume its final shape. Placing it in a small open box in my bedroom I suspended it from a beam so as to ensure that it would remain perfectly still and undisturbed. Alas for all my hopes! Imagine my horror at being awakened in the middle of the night by a strange noise, and on jumping up beholding a huge rat, which had climbed down the the cord holding my precious possession and was even then making off with it in its mouth! That was the last I ever saw of what I by that time knew to be a male of a new species. Only one has since been discovered, and it proves to be far more beautiful than, though not unlike, *Ornithoptera paradisea*.

ANIMAL ANECDOTES.

A Brave Terrier.

THERE is something noble in the way a white bull-terrier, "Jack" by name, met his death recently while performing a heroic deed to save four youngsters from the attacks of a vicious bull. The children had gone into a field to look for wild flowers, and "Jack," only a year old, invited himself to join the party. The youngsters didn't see the bull which was in the meadow until he was close upon them, and then there was no time to escape. Down into their midst rushed the fierce animal, with lowered head and a roar that froze the blood of the children; but "Jack" met the enemy half-way, and was nearly gored at the first plunge. Having checked the sudden onslaught, however, "Jack" made a quick circuit to the rear, where he seized one of the bull's hind legs just above the hoof. High into the air kicked the bull, and "Jack" rose and fell again with a thud, but not for an instant did he relax the grip he had taken upon the leg of his big enemy. Snorting and bellowing, the bull pawed and ripped the earth with his front feet, stood on his hind legs, tried in vain to reach the terrier with his horns, and finally turned and ran away with the dog still hanging in a deadly grip to his heel. It was indeed a deadly grip for "Jack," but it saved the lives of his four human friends, and no doubt "Jack" gave up his life gladly to save the children whom he loved so well. Around and around the enclosure the now crazy animal plunged, dragging the dog behind him. "Jack," silent and determined, set his teeth the closer—and thus he died!

"Jack's" body was picked up and taken home, where it was buried with real grief by the youngsters.

Mice as Horses.

"As an illustration of what mice can be taught, several years ago, while staying at the house of a friend in Yorkshire," writes a Blackpool correspondent, "I was shown six mice which had been kept in a box for several months. They were well fed, and so did not attempt to gnaw their dwelling. My friend had a kind of cart for them with bone buttons as wheels, and a packthread harness. On being taken out of the box, they remained quite still while the harness was put upon them, and when that was done, they started at full gallop along the top of a large table. At first they had to be turned back again when they got to the end, but they soon learned to turn of their own accord, and performed their journey with as much regularity as well-trained horses."

A Cheerful Widow.

NELTJE BLANCHAN, the well-known American naturalist, tells the following story about a sparrow:—"A pair of these prolific little pests began to build in the shutter of a New Jersey country house. The ornithologist who lived there shot the male,

but in less than an hour the widow returned triumphantly with his successor. He likewise was promptly killed, and so were the third mate and the fourth, and so on until sixty cheerful volunteers had been ensnared to their death through the charms of the equally cheerful widow. Of course, the ornithologist claims that he did this execution purely in the interests of science!"

A Good Rat Trap.

In Brazil rats have multiplied to such an extent that the inhabitants are obliged to train a certain kind of snake to exterminate them. This snake is the Giboa, or Boa Constrictor. When night comes on it makes its way to every part of the house with great caution and cunning. It even manages to creep up between the rafters of the roof, and under the floor. If a rat appears it is doomed. With one bound the snake is upon it, catches it by the nape of the neck and crushes it. As snakes seldom eat, even when at liberty, the giboa does not kill the rats on account of hunger, but solely from instinct, and in this way is of incalculable service.

A Sense of Humour.

An old Indian, says Mr. Joaquin Miller in his "True Bear Stories," was terribly frightened by an old monster grizzly and her half-grown cub one autumn, while out gathering berries. It seems that, while he had his head raised and was busy gathering and eating berries, he almost stumbled over a bear and her cub. They had eaten their fill and fallen asleep in the trail on the wooded hillside. The old Indian had only time to turn on his heel and throw himself headlong into the large end of a hollow log, which luckily lay at hand. This was only a temporary refuge; but he soon saw, to his delight, that the log was open at the other end, and, corkscrewing his way along toward the farther end, he was about to emerge when he saw the old mother sitting down, quietly waiting for him. After recovering his breath he elbowed and corkscrewed himself back to the place at which he first entered. But lo! the bear was there, sitting down, half smiling and waiting to receive him. This was repeated time after time till he had no longer strength to struggle. He turned on his face, whereupon the bear thrust her head in, touched the top of his head gently with her nose, and then drew back, took her cub with her, and shuffled away.

Corn-curing extraordinary.

At the New York Zoological Gardens one of the alligators suffered so severely from corns that an operation was deemed necessary. As a preliminary the water was drawn from the tank and the animal coaxed on to the operating-table, to which he was bound securely with ropes, while a great canvas sack was drawn over his head. Three ounces of chloroform were administered before he became submissive and showed no feeling of pain; then the corns (which weighed about half-a-pound each) were extracted, and an antiseptic dressing used for the wound. It was ten minutes before the alligator regained consciousness, and then he set his feet down squarely for the first time in weeks, surprised and bewildered, but happy.

Partners.

To the corner of a disused pigstye filled with straw a cat once brought one by one her tiny kittens, a few hours old. When the cat left the kittens a hen left her nest and sat on the kittens until the cat returned, when the hen immediately got out of the way. This went on for a fortnight, when the hen refused to leave the kittens; but the kittens went to the mother when she came at intervals to see them, though the old hen objected pretty loudly when the cat came anywhere near. Of course, when the kittens grew up they left their faithful nurse.

A Hen and her Foster-children.

A true story is told of a hen that drove a cat away from her kittens every day and took entire charge of them for several hours, looking after them carefully and guarding them even against their own mother, who naturally resented this intrusion into her family affairs. The kittens, however, were quite satisfied to remain with their foster-mother, and played round her unconcernedly. They even mounted her back, as they might have done in the case of their own parent, and the group formed a thoroughly happy family.

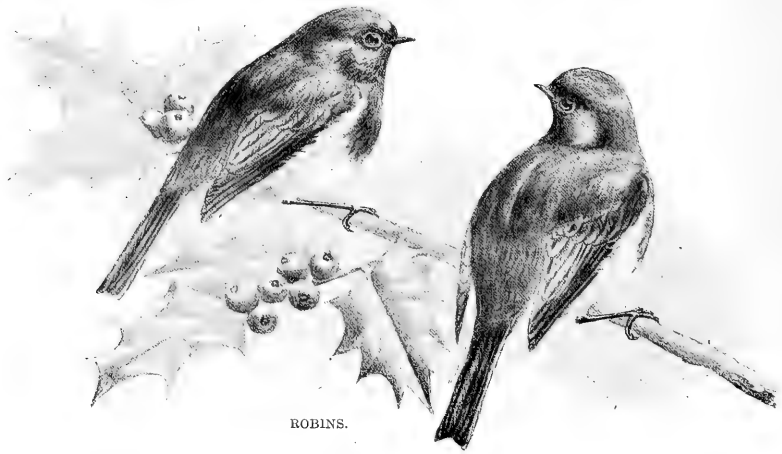
The Snail's Strength.

The extraordinary strength of snails was first discovered by two young French schoolboys. They kept snails for racing, and derived much pleasure from the pastime, until one of them became possessed of an animal which invariably romped home an easy winner. Like true young

sportsmen they decided that the favourite must be handicapped; but how to do so was the difficulty. At first a weight was attached to the shell, but as this was not easy to keep in position it was decided to make the snail draw it, and a tiny carriage was harnessed to the animal by means of a piece of elastic. The result was astounding. It was found that the snail could draw comfortably a weight of several pounds. Proceeding with their experiments, the boys next attempted to ascertain the maximum weight that a snail could pull, and, discarding the degenerate snail of the Parisian back garden in favour of the plump and well-fed variety which comes from the vineyards of Burgundy,—that is, the edible kind—they found that five or six harnessed together could draw a weight of 25 lbs. a distance of seven or eight inches, when presumably their strength gave out. The final experiment was made with a baby carriage, in which a child sat and was drawn by a team of fourteen snails for several inches.

Mother-love.

One of the most affecting displays of maternal love in animal life is given in Mr. Frank Bullen's "The Cruise of the Cachalot." Whale fishing was the business of the ship, and after anxious search an expected victim had been found. The excitement and the peril on such occasions were intense. When struck by the harpooner the whale usually rushed below and away at a fearful speed, coming up again for air, and its rapid and unexpected contortions through pain often put the whalers in fearful and imminent danger of death. Describing his first whale, Mr. Bullen says: "As we *crawled* up into the wind the whale went into convulsions befitting his size and energy. He raised a gigantic tail on high, threshing the water with deafening blows, rolling at the same time from side to side until the surrounding sea was white with froth." Now for the contrast due to a mother's love! After stealthy searching the whale was found, "a pale, shadowy column of white shimmering against the dark mass of the cliff." The "harpooner rose, darted once, twice, then gave a yell of triumph that rang re-echoing all around. . . . . But, for all the notice taken by the whale, she might never have been touched. Close nestled to her side was a youngling of not more, certainly, than five days old, which sent up its baby spout every now and then about two feet into the air. One long, wing-like fin embraced its small body, holding it close to the massive breast of the tender mother, whose only care seemed to be to protect her young, utterly regardless of her own pain and danger. . . . . While the calf continually sought to escape from the enfolding fin . . . . . the mother scarcely moved from her position, although streaming with blood from a score of wounds." Once as a deep-searching thrust entered her very vitals, she raised her massy flukes high in the air, in agony, "but even in that dire throe she remembered the possible danger to her young one, and laid the tremendous weapon as softly down upon the water as if it were a feather fan. So with scarcely a writhe she died, holding the calf to her side until her vital spark had fled."



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AND THE WORLD OF NATURE

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THROUGHOUT THE WORLD

ACCURATE

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ILLUSTRATIONS DIRECT FROM PHOTOGRAPHS, ETC.

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ANIMAL LIFE

And the World of Nature.

CONTENTS, JULY, 1903.

60 Drawings and Photographs.

The Editor will be glad to consider any Contributions of a suitable nature for ANIMAL LIFE, *and provided they are accompanied by a sufficiently* STAMPED AND ADDRESSED ENVELOPE, *he will endeavour to return promptly MSS. and photographs of which he cannot make use, but he cannot hold himself responsible for accidental loss, though every care will be taken to secure their safe return.*

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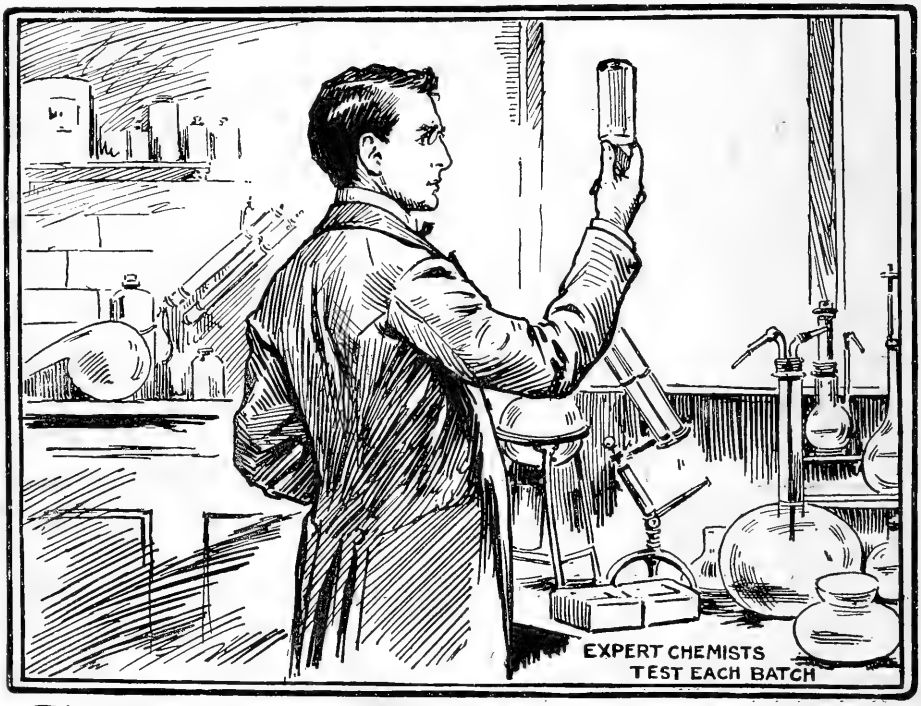

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CONTENTS, AUGUST, 1903.

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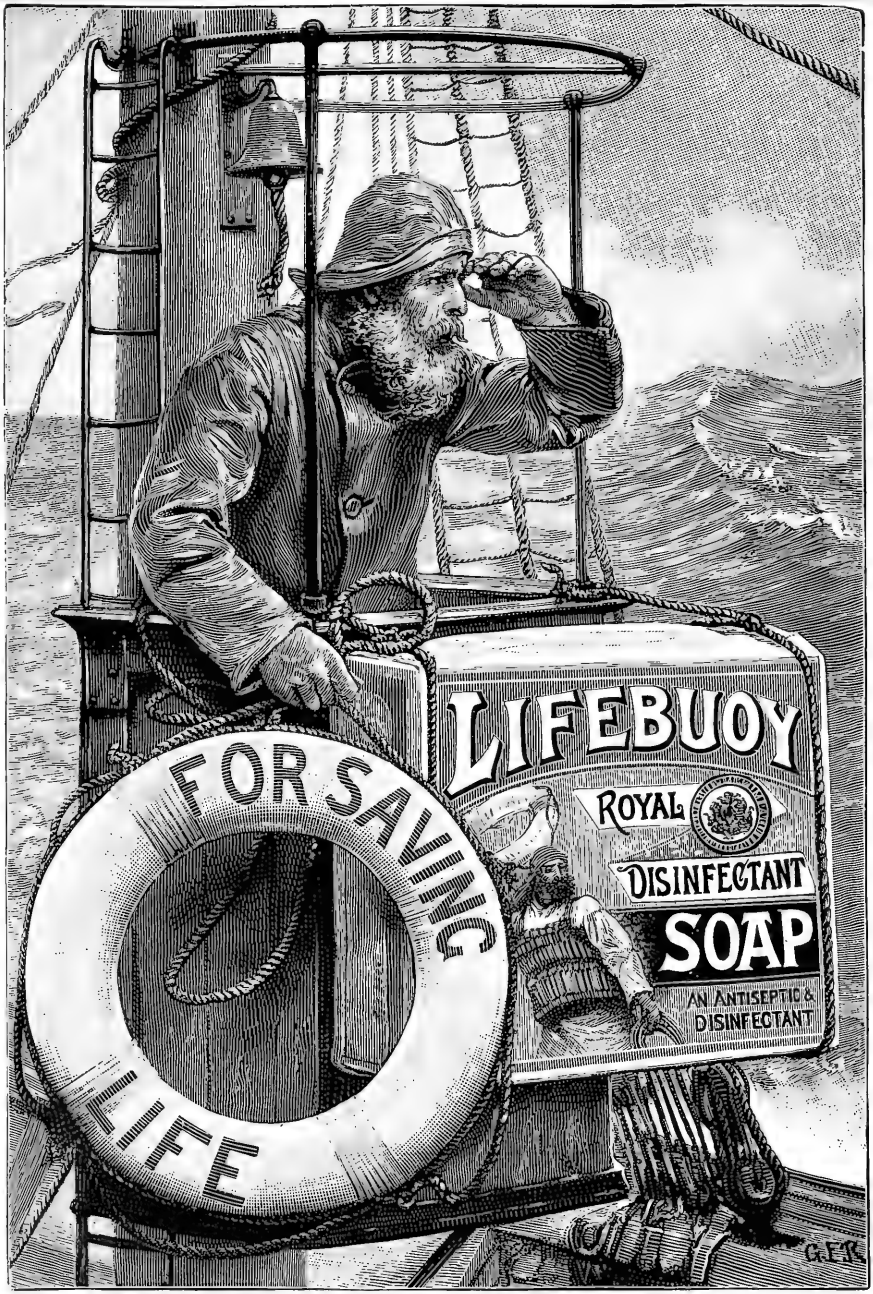

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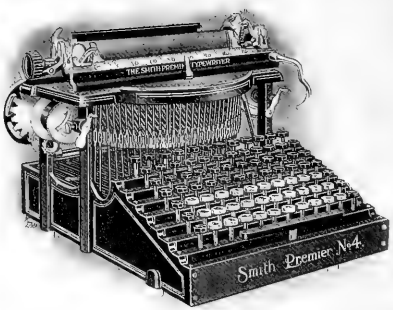

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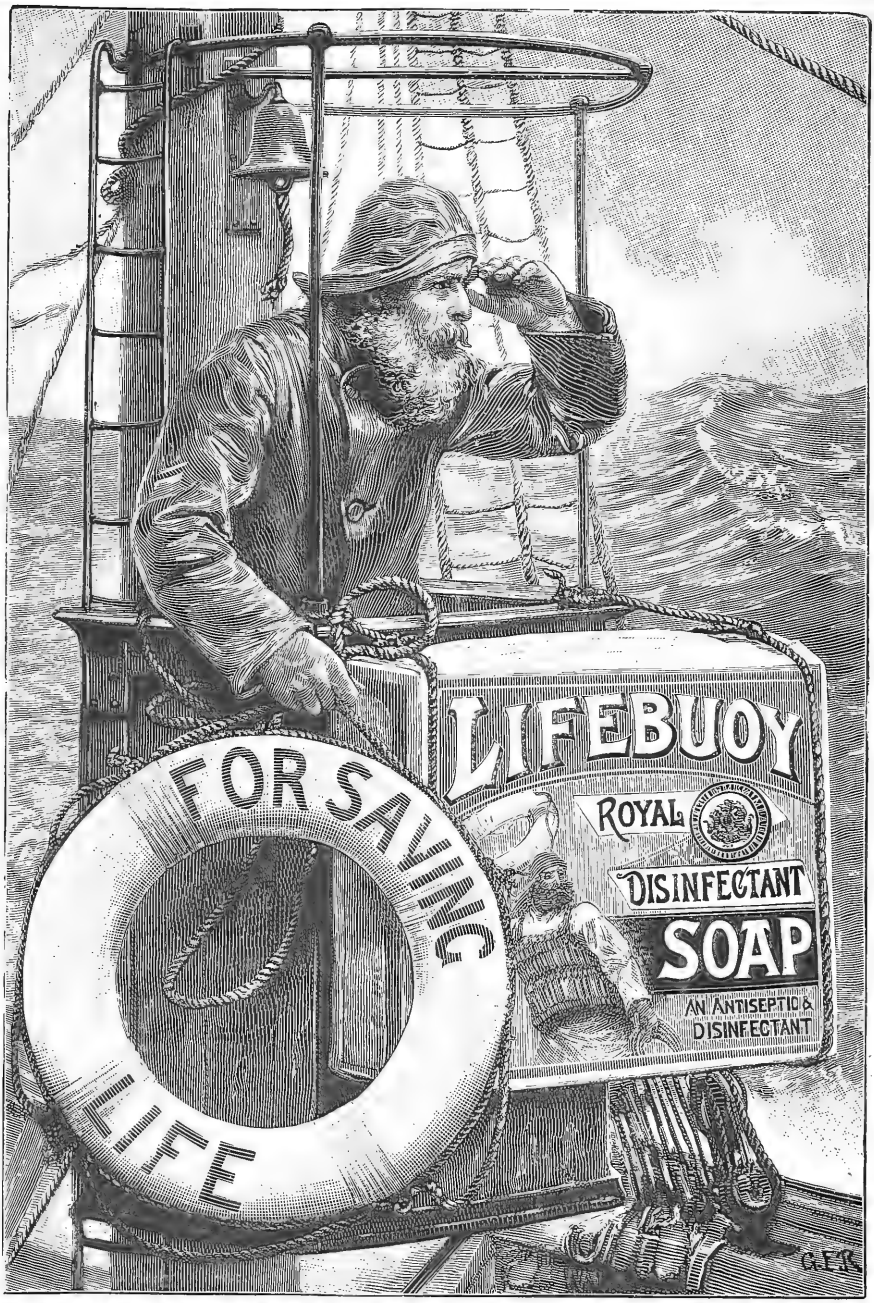

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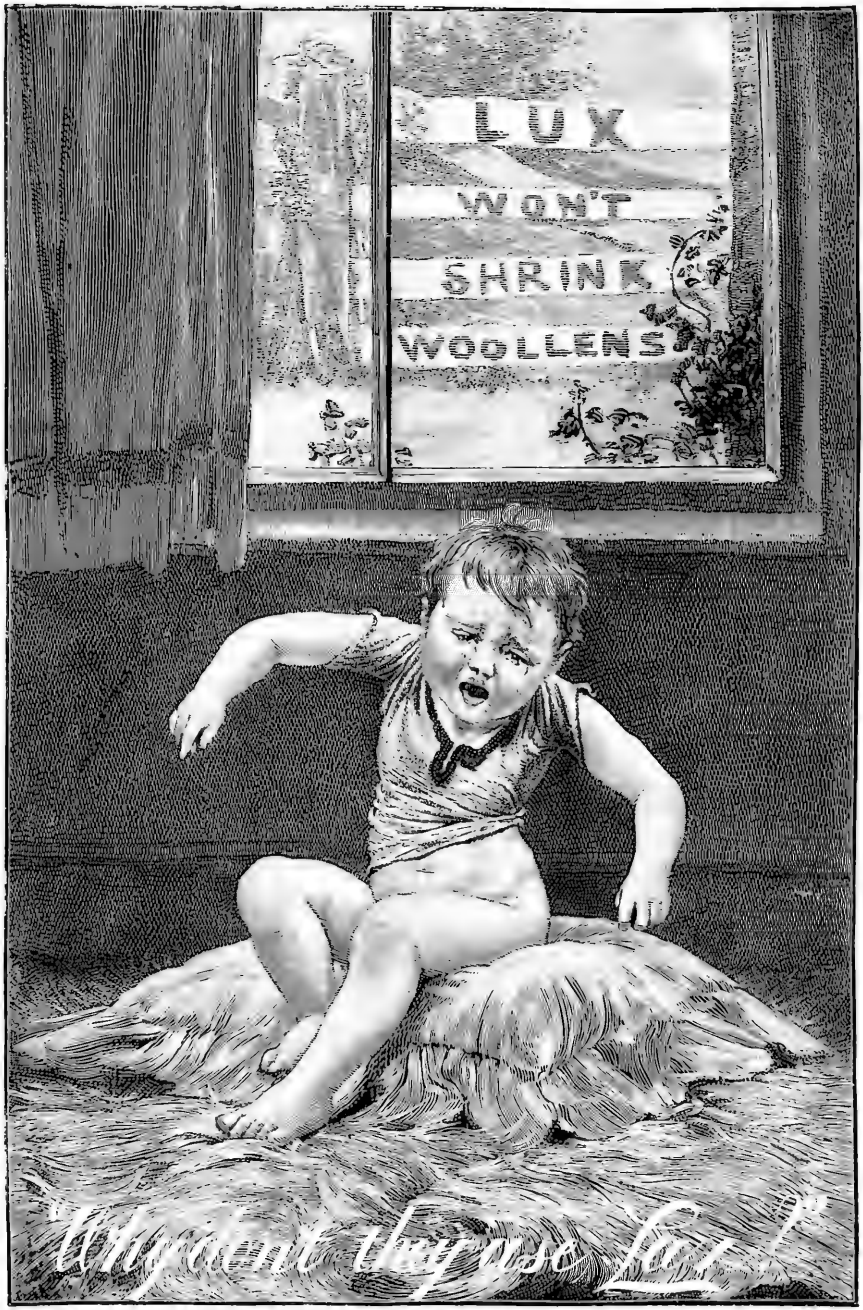

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