

3. Notes on the Mammals of Southern Cameroons and the Benito. By GEORGE L. BATES*.

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It does not seem worth while to repeat here the description of the Cameroons-Gaboon forest given in connection with Dr. Sharpe's paper on the Birds of this Region in 'The Ibis' (1904, pp. 592-595). But it is necessary to bear in mind that the whole face of the country is absolutely covered with forest, consisting of tall trees standing close together, with the spaces between their stems filled with saplings and underbrush, and the whole bound together by vines and creepers, many of them thorny. This mass of vegetation excludes the sunlight, except in rare openings or rifts. Walking through it is difficult, except by following the paths. Clearings have been made for villages and plantations, and these when abandoned do not immediately return to forest, but for several years are possessed by a thicket of grass, bushes, and small trees of quick growth. Thus in the more thickly inhabited parts of the country there are considerable areas covered by this smaller growth instead of forest. But as these are near villages of men, and are avoided by the large animals, they may be almost ignored in considering the nature of the country as a habitation for mammals, though they are the favourite haunts of many birds.

The dense and impenetrable nature of the forest, with but few human dwellings and paths, makes it an admirable hiding-place for animals of all kinds. Furthermore, the fact that everything larger than a mouse or a sparrow, whether beast, bird, or reptile, is constantly hunted for food by the natives, makes the animals afraid of man. Hence it comes that observation of animal life is peculiarly difficult here. The statement is often made with reference to the animals of West Africa, in books of Natural History, that almost nothing is known of their habits in the wild state, because travellers have failed to record their observations. But the truth seems to be that travellers have seen little to record.

The remark has been made by more than one person who has journeyed through this forest region, that animal life in it is scarce; yet it really abounds in wonderful variety. Comparatively few white men, and not all natives, have seen an Elephant in this country; yet their trails through the forest, the broken and uprooted trees where they have been feeding, and even the mud-puddles where they have wallowed, are often seen. Leopards may be said to abound, judging from their ravages among domestic animals, and the frequency with which their tracks or droppings or leavings of their prey are found in the

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forest; yet, except in a few cases where they have been trapped, no white man I know has ever seen one alive. No white man I know ever saw a Buffalo; but their tracks are often seen, and natives sometimes kill them and sometimes are killed by them.

The Red River-Hog does great damage to crops, and many of them are killed by the natives with their guns and in pitfalls; yet I never distinctly saw one running wild, though I have often heard them, and seen places where they had been.

It is doubtless true that one walking along the paths through the forest is never far from a company of monkeys feeding in the tree-tops; but a person who is not thinking of monkeys may sometimes go many days' journey without catching a glimpse of one. No white man I know has ever seen a Gorilla wild, plainly enough to be sure that that was what he saw; yet in certain localities there are, at times, many of them. I once tramped around with a native guide for several days, seeing recent tracks of Gorillas and beds where they had slept, without once meeting one.

The natives of the country hunt the animals for food, and have the inherited keenness of sight and hearing of savages, improved by practice, the immense advantages of dark skins, rendering them inconspicuous in the darkness of the forest, and a noiseless step, by which they can approach game without alarming it; they thus learn far more about the animals of the country than any white man learns. I have no doubt that most of the scanty information hitherto published about animal life in the Guinea forest has been obtained from natives. Even Du Chaillu, who gained more knowledge of this forest than any other man, must have based his accounts on information obtained from natives. It was the opinion of some of the old missionaries, whose guest he was at times while in Africa, that many of the adventures he relates were taken from the hunting-tales of natives, and that, although in representing them as his own personal adventures he may have been untruthful, he probably took conscientious care to tell only what he believed really had happened to some one, and hence was not untruthful where the facts of natural history were concerned.

These remarks about the difficulty of observing animal life here are intended to furnish some excuse for the scantiness of the information in the notes that follow. They are intended also as an apology for recounting things told by natives. Of course not everything told by natives has been accepted as true. A tendency to exaggerate could be detected by comparing different accounts; and sometimes statements in which all accounts agree were found to be the least trustworthy of all, since they were found to be merely taken from tradition and not from actual observation, like many popular beliefs about animals among white races. But such worthless statements should be sifted out, and the statements here given from native testimony are such as seem worthy of belief.

Before coming to notes about particular animals or groups of

animals, one more peculiarity about the nature of the forest may be mentioned here, and that is the way in which the colouring of certain animals is adapted to make them invisible or inconspicuous in it. It is a matter of common observation by all who practice shooting in this forest, that the dark skin of the naked native men is better fitted to make them inconspicuous than any sort of clothing a white man may wear. The dark colouring of many animals doubtless has the same effect. But an acquaintance with the forest shows also the more remarkable fact that animals with spots or patterns of dark and bright colours, like Leopards, Monitor Lizards, Snakes, &c., are perfectly adapted to escape observation so long as they are motionless; for the dark and sombre ground-colour, formed by the dead leaves on the ground and the black stems of trees, is dotted with innumerable bright spots. In rainy weather the light glistens from the wet leaves, both above and below; and in fair weather the sunshine, where it gets through the foliage at all, makes bright flecks on the dark ground and trees. Then there are other bits of brightness: sometimes golden-yellow flowers grow right out of the black tree-trunks, yellow fungi deck the decaying logs, yellow withered leaves may at all seasons be seen among the black and brown ones on the ground. Some trees have sap of an intense yellow colour that flows out and makes yellow streaks or blotches below every cut or insect-puncture in the black bark.

Another thing must often serve to make the red wild hog inconspicuous; that is, the red colour of the soil. I have seen bare places on the ground, as in a path, or where a tree has fallen tearing up the soil with its roots, where the Red River-Hog might lie and not be noticed because it was of the same colour as the ground, and in some of such places hogs had actually recently lain.

THE GORILLA (*Gorilla*).

Gorillas generally keep to the depths of the forest. When they come into the outlying clearings of human settlements, it is because they are attracted by some fruit or succulent plant. The commonest attraction is the fruit of a tall cane-like endogen (? *Amomum* sp.) growing thickly on abandoned garden-land. At one very small isolated village the people told me that they often both saw and heard Gorillas, which actually sometimes came and broke down the plantain-stalks behind the village, to eat the tender heart. At that village there were only two or three men, and they had no guns.

Usually Gorillas are very wary when they approach human dwellings. Once I spent several days, with a native guide, tramping about in old clearings overgrown with "mejom" (the cane-like plant above-mentioned), looking for Gorillas. We saw many tracks, showing the imprint both of the soles of the hind hands or feet and of the backs of the fingers of the front; we saw also many hulls of the fruits of "mejom," and shoots torn

open and the tender inside eaten; and we saw many old beds of "mejom"-stalks broken down and matted together; but we did not get sight of a Gorilla. The tracks and beds on that occasion showed that there was a family of three or four individuals there, some of them small. On another occasion I saw a single bed, that had been used by a solitary Gorilla only the night before. A woman had heard the animal the evening before, breaking down the stalks for his bed. I was told that Gorillas sleep on these beds, which are thick enough to keep them a foot or two up from the ground, in a sitting posture, with the head bent forward on the breast. The people say they sometimes hear them snore. Even when sleeping Gorillas are hard to approach, as they waken easily. An attempt, made at early dawn, to surround the one the woman heard making his bed was unsuccessful.

In most of the cases of which I have heard, of Gorillas being killed by natives, they were met with accidentally in the daytime, on the ground or in low trees in the outlying clearings. Many natives do not venture to molest a male Gorilla, even when they see one, as he is dangerous when wounded. I was told of a boy having been killed by one, and I saw the severe wounds in a man's thigh made by the biting of a wounded Gorilla.

The only case of a white man's killing a Gorilla of which I know is that of the German trader Paschen, in the Yaunde country, to the north of where I have been.

They say the male Gorilla sometimes utters a deep gruff call, but I have not heard it.

THE CHIMPANZEE (*Anthropopithecus*).

Chimpanzees are much more frequently killed by native hunters than Gorillas, and nearly always in the forest, not in clearings. When found in the forest, they are usually in companies of half-a-dozen or so, in the trees or on the ground. They often make a noise in the forest, which sounds very like the hallooing or excited talking of men. Once even my guide was fooled by them, and, on hearing them, inquired who those men hunting porcupines could be.

Once at a certain village, just as people were going to bed, a Chimpanzee was heard in the forest near by, making a most unearthly yelling. It slept in a tree near the village, and early in the morning men went out with bows, and punctured its skin with some poisoned arrows, before it had left its bed. When I went out a little later, I was shown the bed where it slept, made of branches broken and laid together, some 20 feet from the ground. The animal had by then retreated into the top of a very high tree, from which it could not escape except by coming nearer the ground, and this it was afraid to do on account of the people beneath. It was walking backwards and forwards along the branches, screaming and beating them with its palms; this it kept up for an hour or two. It then became stupid and sat still

for a few moments, when it slid off the branch, and first catching it with one hand and hanging a moment, it dropped to the ground, dead. It died about 8 o'clock, and must have been first shot with the poisoned arrows a little before 6.

This animal was wandering alone; it was an old male.

THE DRILL (AND MANDRILL?).

The Bulu name "sek" is applied to the Drill. The name "zômbô" seems to signify a large old male of the same species; though possibly the Mandrill is found here also, and confounded with the Drill.

These baboons are not plentiful, and seem to keep to the depths of the forest, remote from villages. In such places they are often found in large companies, though they are sometimes seen only three or four together. I have seen a place where the dead leaves had been scratched around as if by hogs rooting, and been told that it was where a troop of "sek" had been feeding, hunting among the leaves for nuts or roots. I have seen places also where little shrubby stemless palms had been grubbed or pulled up by the roots, and this, I was told, was the work of "sek" that were seeking the tender terminal bud which, in the case of larger palms, is eaten by men.

Natives have told me that if a company of these animals is surrounded while on the ground, they cannot quickly escape by climbing trees; they are certainly not such agile climbers as the smaller monkeys, but they do climb trees. I have known all but one of a company of them, that were discovered in the tree-tops, to get away by running along the branches and hiding in the foliage, like small monkeys. I have been told that they sleep in the tree-tops, as other monkeys do.

A wounded male I saw looked very ferocious, and the native hunters seemed afraid he would kill a small dog they had. But I never heard them speak of the "sek" or "zômbô" as being dangerous to man.

A female killed in the month of August was accompanied by a sucking young one.

THE CERCOPITHECUS MONKEYS.

The genus *Cercopithecus* comprises all the common species of Monkeys of this country. Shooting these monkeys affords much sport to white men who get out into the forest, and is the principal occupation of native hunters. They are not easily approached, for they have keen sight and hearing and are shy. They go about in small companies of a dozen or less, with one old male for leader. Often an old male is found alone, probably a defeated candidate for the place of leader, who has gone off by himself. The leader may often be heard calling in a loud, gruff, barking tone, to keep the company together. Except for the occasional call of the leader, the company feeds silently, and the

only sound that betrays the presence of monkeys is the rustling of boughs as they pluck fruits or jump from branch to branch. Only when they discover the hunter and become frightened, do they utter a little cackling sort of chatter; then they scurry away, and if they are in thick foliage they hide and remain hidden securely as long as the hunter has patience to wait for them to come out. But if they are in an open tree they may be shot while running, if a man is quick enough. If the leader has passed ahead, sometimes the others will venture out in plain sight, in order to follow him.

These monkeys very rarely come to the ground; I myself have never seen one on or even near the ground, except when wounded. They can pass from the branches of one tree to those of another, not touching it, by jumping; they jump upon and grasp the swaying outmost twigs, which bend far down with the weight, and then spring up. The monkey merely holds on as the branch sways down, but with the rebound he scrambles along to the larger branches. Monkeys can cross any but the largest rivers in this way, on the nearly meeting tree-tops.

These monkeys sleep in the trees, but do not make rude beds of the branches as does the Chimpanzee. I have asked many natives how monkeys manage to keep from falling while asleep, and the answers are various. But there seems probability in the account that they sleep sitting, and holding on to branches or to each other.

The habits of the three commonest kinds of *Cercopithecus* are very similar, and what is said above applies to all of them. The "ôsōk" (*C. cephus*) seems to be the most nimble, and the white-nosed "avemba" (*C. nictitans*) the least so; the latter kind is rather oftener killed than the others. Different kinds are often found together in the same company. The calls of the three kinds, the two mentioned and the "ésuma" (*C. eraxlebeni*), are very much alike, but one can learn to distinguish them.

The habits of the little "ôzem" (*C. talapoin*) differ in some respects from those of the other kinds. It is never found far from a large stream of water, and generally keeps to the trees on the very banks of streams. At villages situated near rivers I have been told that these little monkeys steal corn from the gardens. They are quicker in their movements even than the others. Their call is very different, being a little explosive "k-sss!" that sounds like the splash of a stick thrown into the water.

The only remaining species of *Cercopithecus* that I collected is *C. neglectus*, called "avut" or "fuñ." I obtained it only near the river Ja, as I did also *Cercocebus agilis*, called "nsak." But I heard of them both on the Benito. They seem to be found only near large rivers. Hunters at the Ja told me that they find both these kinds only on the banks of streams. They hunt them on a small tributary of the Ja, near its mouth, by wading in the stream when the water is low.

I obtained a number of specimens of embryos taken from the bodies of monkeys killed by natives. These were mostly brought in May, June, and July, though some came also in October and November.

OTHER MONKEYS.

The monkeys I have collected, not of the genus *Cercopithecus*, are *Colobus satanas* and two species of *Cercocebus*, besides *Cercocebus agilis* mentioned above.

The Colob is of local distribution, and I know nothing to tell about it except some doubtful statements of natives. The same is true of the *Cercocebus* called "kak" (? *C. albigena*).

The "éka'afuñ" (*Cercocebus collaris*) is a little better known. Monkeys of this species are not rare, but are not often killed. They differ from those of the common kinds in that they often descend to the ground to feed. Their call is very different from that of the *Cercopithecus* monkeys. It is rather shrill, and ends in an after-sound like that made while drawing in the breath or gasping.

THE GALAGO LEMURS.

These little creatures have a wonderfully tight grip; their clammy flattened fingers resemble the toes of tree-frogs.

The "émam" (*Galago alleni*) is found in the daytime in hollow trees, three or four huddled together asleep. The little "ôjam" (*G. demidoffi*) is similarly found asleep, three or four huddled together in old nests of the squirrel "ôsen." Some people have told me that the little Lemurs make their own nests, but it seems more likely that these are only old squirrels' nests. The other species, *G. pallida*, called "nsaé," uses neither hollow tree nor old squirrel's nest for a hiding-place in the daytime. They are found sleeping in bunches of as many as half-a-dozen, clinging with their arms around each other's bodies and around the branch of a tree. A shrill squeaking or chirping, often heard at night among the tree-tops of the forest, is referred by the natives to the "nsaé." They say that this noise is heard oftener near morning, and that then the "father" is calling together the rest of the company, to gather them into a huddle for the daytime.

An "ôjam" that I kept alive once for several days made a chirping noise at night, as shrill as that of a cricket. In grasping anything with its hind hand, the clawed finger was always folded in the palm, under and not over the thing grasped.

An "émam" that was brought to me alive showed great powers in jumping. A monkey can jump outwards and downwards and catch a branch, but this *Galago* could jump out and up and catch hold of a branch. It died in the hot sunshine when I was away from camp; it had probably never felt sunshine before.

THE POTTOS.

The two or three species of *Perodicticus* of which the names

have been sent to me I have not learned to distinguish with certainty; in the little I have to say about them I must mention them together.

They are found in the daytime curled up asleep in the trees, tightly clinging to a branch. So tight is their grip of the branch that specimens have sometimes come to me mutilated in the hands, the natives who captured them declaring that it was only by cutting the fingers that they could loosen the animal's hold.

Pottos are sometimes caught in traps placed on a horizontal pole or bridge crossing an open space between two pieces of forest, such as a narrow place in a garden clearing or a stream. The animal crosses on the pole in preference to descending to the ground. One specimen was killed at night on the roof of a house, to which it seemed to have wandered from the overhanging plantain-tops.

A suckling female was caught in January, along with a half-grown young one.

The single specimen of *Arctocebus aureus* that I sent to the museum is the only one of this animal I have ever seen. I found it in a village on the Benito River, where it had just been killed by a native, who did not know what to call it. However, I have sometimes heard from natives of a rare beast like the Potto, which must be the same.

THE FRUIT-EATING BATS.

The commonest species of *Epomophorus* (? *E. franqueti*), called "éndem," probably makes more noise at night than any other creature of this country. Their monotonous croaking racket may be heard in the bush-growth about villages any night—at least if any of the wild trees growing in such places are in fruit. They were especially abundant about my house when an "Udika" tree near by was bearing. Their noise, consisting of a sort of croaking bark repeated many times in a monotone, was generally heard coming from a thicket where the bat seemed to be hanging. But sometimes, at dead of night, the sound was heard passing overhead, from a bat flying. Whenever a bunch of ripe bananas was hanging on my porch, it was visited by the bats at night. When the bananas got very soft, the bats would eat several of them in a night and bite many more. They took their bites on the wing while flying to and fro.

Boys would sometimes find these bats hanging on bushes in the daytime. On the last day of August and the first of September two females were brought to me, each with a half-grown young one, which had been found clinging to the mother.

The big *Hypsignathus monstrosus* was very abundant in the mangroves and palms along the banks of the Benito River, where it made a noise like that of the "bindem," but still louder. In the Bulu country, where there are no large streams, they are not common, but are sometimes found hanging in the forest,

especially in swampy places. One so found was discovered through the little birds twittering around it, as they do around an owl or a snake.

THE HORSESHOE BATS.

The big *Hipposideros commersoni* I have sometimes seen flying about over villages at evening twilight, catching insects in the air. While doing this it makes a little squeaking sound in a very high key, that some people (natives) said they could not hear.

Hipposideros cyclops is very frequently found in hollow trees, along with *Idiurus* and some species of *Muridae*.

One or two species of *Nycteris* have been found also in hollow trees.

THE VESPERTILIONIDÆ.

The little Bats of this family are generally found hanging on bushes in the daytime, or seen flying around villages at evening. Some of them seem to be partial to the plantains and bananas at the back of villages, hiding under the big leaves.

Two adults and a young one (in the month of October) were caught together, entangled in a spider's web.

One very little bat was found in a knot-hole in a small tree that had been cut down and carried some distance to form the post of a house; the little bat had not been disturbed by the cutting or the carrying of the tree, and was found by boys who were peeling the bark.

THE WRINKLED-LIPPED BAT.

The Bat called "éfefaé" is a member of the genus *Nyctinomus*. "Bifefaé" are found in the holes bored in dead tree-trunks by the Barbets called "ôvôl" (*Helioebucco bonapartei*). The bats and the birds seem to live in the holes at the same time. They are so often associated that the white eggs of the Barbets are said by the natives to hatch out Bats.

The large *Taphozous peli* was obtained only on one occasion, near the Benito River, and must be rare or local.

THE POTAMOGALE.

Most of the specimens I have obtained of the "jes" (*Potamogale velox*) were caught in snares set on the banks of streams, at places where the animal's excrement was seen. It seems to have the habit of resorting always to a certain spot to void excrement. The "jes" is also occasionally killed by women when fishing out little pools in the streams. When one is discovered in the pool it is surrounded, and all the women strike at it with their cutlasses as it darts hither and thither in the water, till it is killed. One specimen (a pregnant female) was said to have been dug out of a hole in the bank of a stream.

Two rather small young ones, also said to have been dug out of a hole in a bank, were brought to me in the month of March. They lived three days, drinking a little milk, and one of them eating also bits of boiled egg, which it seized in its mouth with a sudden motion, as if afraid they would get away. When not curled up asleep they were continually squirming and gliding over each other with a motion that made one think of snakes. Their movements were very quick. They occasionally uttered a little squeaking noise.

As to the time of breeding, it may be remarked that two females, each with embryos in the body that would have been born in a short time, were caught in the month of June.

THE LEOPARD (*Felis pardus*).

As already stated, traces of Leopards are often seen, and their ravages are frequent, though they are seldom seen themselves. When the natives do find them in the forest, they are usually hidden in the closest thickets, and their presence is indicated by the alarmed chattering of squirrels and birds about them. Hunters often find partly-eaten carcasses that leopards have left. They say that of monkeys the Drill is most often found thus.

Leopards are said to hunt in pairs, a male and a female together. If three are together, they are a mother and two well-grown cubs. The she-leopard brings forth two cubs, sometimes three, in large hollow logs or hollows under rocks.

I have often seen droppings of leopards in the path. The kind of hair in them shows on what the leopard has been feeding. Sometimes the long roan hair of the tail of certain antelopes is recognised, and sometimes the quills of porcupines. I have seen the marks of leopards' claws on the bark of trees. Once a soft-wood tree on old cleared land was seen with scars of claw-marks in the bark at regular intervals clear up to the first branches, 15 or 20 feet from the ground. There appeared to have been two animals, and the natives with me remarked that the scars were made by a male leopard chasing a female up the tree.

The natives consider the flesh of the Leopard the best of eating.

THE CIVET (*Viverra civetta*).

I have more than once heard in a thicket in the forest a snarling noise like that of dogs fighting, and been told that it was made by two "bezoé." "Zoé" is the Bulu name of the Civet. I once saw a "zoé" trotting along in the forest with its nose to the ground, apparently smelling for worms or other creatures under the dead leaves.

The "zoé" hides also in the big grass (*Panicum maximum*) that comes up on old cleared ground about villages. A boy cutting grass on the outskirts of the Mission premises found an old white-whiskered female curled up asleep, and killed her with his cutlass.

She had milk in two teats; that was in October. In April a man showed me a young "zoé" the size of a two-week's-old kitten—one of three found in a lair not far from a village. About August a man shot a mother that had two or three little ones in a nest in the same big grass mentioned above.

The Civet visits the fields of growing corn (maize) at night, and breaks down the stalks and eats the tender ears. It prowls about chicken-coops at night, and sometimes catches poultry.

THE GENET (*Genetta*).

The "nsiñ," as the Genet is called, is the greatest poultry thief of the country. From its proverbial shyness, it occupies the place in popular talk and tales that the fox does in Europe. It hides in the thick bushes about villages, ready to snap up any fowl that wanders too far away. But it is also an inhabitant of the big forest, for it is often killed far from any human habitation.

A female killed in January was suckling.

POIANA RICHARDSONI.

This rather rare little beast is called "ôyan." It is found only in the forest, sleeping in the daytime on thick tangled vines, and walking only when disturbed. A female brought me in October had milk in two teats. A native hunter told me that the "ôyan" produces two young.

THE NANDINE (*Nandinia binotata*).

The Nandine, or "mvaé," lives on vegetable food, such as the fruits of the "aseñ" tree and the little gourd-like fruits of a vine (*Luffa batesii*), and these are used by natives to bait traps for catching it. It forages at night and sleeps in the daytime, in thick tangles of vines in the tree-tops. It is sometimes seen at dusk, either in the forest or in village clearings, creeping along the branches of a tree. One evening, at my camp in the forest, two were heard in the tree-tops near by, calling to each other in a small, faint voice, like a kitten mewling.

Though it is thus arboreal, it often runs around on the ground at night and also visits villages. It is frequently caught at night in dead-fall traps near villages. Once in a village where I was staying, happening to be up in the early morning before the people had come out of their houses, I saw a "mvaé" trotting along in the street. Another morning soon after that I noticed that something had been gnawing during the night at the bits of flesh left on a skeleton of a chimpanzee I had hanging up in the palaver-house to dry. The skeleton was hung farther away from the post of the house, but still the next night it was gnawed again, though the animal had to go along the under side of the ridgepole to reach it. The third night the bush-rope by which the skeleton was hung was lengthened, so that the animal had also to descend the bushrope; and still the skeleton showed in the

morning further marks of gnawing. The next night, after watching for it till past midnight, I had just gone to bed when the boy, who took my place watching, fired; he missed the animal, but he saw it, and it was undoubtedly a "mvaé."

Though that one was hunting for meat, there is no doubt that the usual food of the Nandine is vegetable. It never catches chickens, as do other *Viverridæ*.

CROSSARCHUS OBSCURUS.

Three young of this little animal, which is called "nyamesô'ô," were once brought to me by a man who said he found them in a hollow tree with the opening near the ground. They were probably two or three weeks old. They lived only a few days, though they drank a little milk and ate bits of meat and egg. First, one that looked puny at the beginning died. Then one of the others was accidentally killed, and the remaining one after that cried continually till it died. When awake and stirring, these little creatures made a little squeaking noise like the twittering of small birds. When running about on the ground they kept close together, one behind the other, generally with the nose of one touching the rump of the one ahead. Once, when a gun was fired not far off, the three instantly crouched down behind a stick at the sound.

Mr. Johnston, when hunting in the forest, once killed two of these little animals at one shot. He said they were making the same squeaking noise my young ones made. Native hunters say these animals always go in companies one behind the other, like my young ones, sometimes a dozen together; and that they root among the dead leaves and vegetable mould of the forest, looking for worms to eat.

THE MONGOOSES.

The larger *Herpestes* (*H. naso*), called "mvak," is one of the small animals most frequently killed by the natives. Yet I have nothing to record about it except that it is found in the forest in swampy places or near streams, and is said to eat crabs.

The small *Herpestes gracilis*, on the contrary, lives not in the forest, but in the thick bushes about villages, and is seldom killed, though it does not seem to be rare. That it is so seldom killed seems to be because of its extreme wariness. It is a great poultry thief.

The *Bdeogale nigripes* seems to be found in the same kind of place as *Herpestes naso*, but more rarely.

THE LARGER HOOFED ANIMALS.

The Hoofed Animals form the most interesting group from the sportsman's point of view. So it is with regret that I have to confess my failure to learn much about them.

The small Buffalo of this part of Africa, and the two species of

Antelope of the genus *Tragelaphus*, of which the larger is called "émvul" and the other "ñkok," all prefer the parts of the country in which there are open grassy places. Hence they are more common near the coast, where, for a mile or two back, there is much grass, than further inland, where there is scarcely a break in the forest; and far inland, where again there are extensive grassy places, they are likewise more frequently met with.

The Buffalo is not absent, however, from the most densely wooded parts of the country. Sometimes a number of them come to feed at night in the grassy sites of deserted villages. In such places some native hunters are bold enough to shoot them, but they do so at considerable risk to their lives. I have heard of more than one case of a man being killed by a Buffalo.

A large Antelope called "ézôna," of which I have seen strips of the skin and the spiral horns, must be the *Boocercus eurycerus*. I have heard of it only in the interior, about the River Ja.

THE DUYKERS (*Cephalophus*).

The six species that I know of the genus *Cephalophus*, though they differ considerably in size and colour, are much alike in their habits. They are all inhabitants of the deep forest, coming around village clearings only when attracted by the growing crops. When the people find that their patches of maize or peanuts are being visited at night by antelope, they build light fences around them. A small gap is left in the fence, and a snare with a strong noose of vine is fixed in the gap. In this way they not only protect their crops, but often secure meat besides.

When anyone finds fresh tracks of one of these antelopes in the forest, he follows it to some thicket; and if he sees tracks entering and none leaving the thicket, he goes to the village and gets help. Then the men go with a long net they make and keep for the purpose, spread it in a suitable place, and try to surround the antelope and drive it into the net. Many are caught in this way. Many are caught also in pitfalls.

The red "sô" (*Cephalophus castaneus*) is reputed to be less wary than the others. It is sometimes found in the forest or the borders of clearings, lying curled up, asleep. "The sleep of the sô" is proverbial among the Bulu for soundness.

Young of different species of Duyker are often found asleep in the forest, where they have been hidden by their mothers. A female "sô" caught on September 25th would have brought forth one young in less than a month.

The commonest of these Duykers is the smallest one, the "ôkweñ" (*Cephalophus melanorrhæus*). The next in abundance is the "mvin" (*C. callipygus*).

THE PIGMY ANTELOPE.

The diminutive "ôjoé" (*Neotragus batesi*), unlike the Duykers,

is found only in the vicinity of village clearings, and never in the depths of the forest. Hence it is most abundant in parts of the country where there are large and old settlements. Sometimes when it is seen and chased by natives in the grass or thick sweet-potato vines about villages, it becomes entangled and is caught. It is especially fond of eating the growing peanut-tops, and is caught in noose-traps set at the edge of peanut-patches.

THE CHEVROTAIN.

The curious little hoofed animal called "vioñ" (*Dorcatherium aquaticum*) is found only along the banks of streams of considerable size. The only use I have learned that it makes of the water is as a refuge when pursued. It is said to be unable to run fast like an antelope, and if found far from the water is easily caught by dogs. It is hunted by a company of men with dogs, as is the porcupine. The dogs start it up and the men run along the bank, and either intercept it, or, if it gets into the water, shoot it as it swims or stands with only its muzzle out.

The "vioñ" is said to make a rather loud noise, something between the little whistling bellow of antelopes and a loud-grunt.

Its meat is very white and very tender.

THE RED RIVER-HOG (*Potamochoerus porcus*).

In July 1902 several little pigs just born were brought alive to the Mission. They had been found and caught in the forest, in one case four in a litter. In 1903 some were brought in August. Out of several that were brought to the Mission, the only one to survive was "Pet." He early took to human ways, and delighted in the company of the little native school-boys. He was fond of sleeping with them, and squealed angrily when shut up in his pen alone at night.

In his third month he had lost all his stripes, and was coloured like his adult kind. The stripes began to disappear low down on his sides when he was only two or three weeks old; the last stripe to go was the black one along the middle of the back.

When "Pet" was three or four months old, a companion was caught for him in the forest. This pig, a female, being about the size of "Pet," must have been born also about July. "Pet" had become so accustomed to human society that he would not own kinship with the new-comer; though in the same pen with her, he took no more notice of her than of an animal of another kind. She, in turn, did not take kindly to her surroundings, and when let out of the pen made for the "bush," and was not caught again.

As "Pet" grew large, he began to grunt or "mem," a peculiar emphatic sound of which the domestic pig's grunt is only a faint imitation. "Pet's" grunt expressed lusty strength and self-satisfaction, with the suggestion of a threat to any one who should molest him. As he grew he also developed carnivorous

propensities, in so far as to catch and eat chickens. When a chicken or well-grown hen approached too near, to share his corn, he whirled suddenly and caught her in his mouth. Then he learned to take fowls from the roost at night, and showed much ingenuity in getting into the chicken-house for the purpose. He became such a nuisance on this account that he was made into pork before he reached his full size.

The wild Red Hog's fondness for cassava-roots causes it to do much damage to the gardens. But what the people lose thus they more than get back in meat by killing the hogs in pitfalls dug where they must pass to get to the cassava. Once, in June, there were caught in two pits near the village where I was staying two adult males, one adult female, and three half- or two-thirds-grown young ones, probably nearly a year old. They belonged to one band, or "sounder," that was found in the daytime in the neighbourhood of a clearing, and was surrounded by men and driven into the pits.

These wild hogs forage both by day and by night. Their incursions into the gardens are generally made at evening. Hunters tell me that they sleep in the latter part of the night and in the heat of the day.

I have seen a nest or bed in the forest where a family of these hogs had slept. It was in a damp place, and was composed of a mass of endogenous plants such as grew there, pulled up by the roots and piled together. Natives say the hogs do not use the same sleeping-place more than one or two nights or days. Even the small pigs follow the sow from place to place, and may be heard squealing as they run after her.

These hogs are fond of dampness and of mud, as are all their kind, and many other animals besides. But they find damp places anywhere in the forest, and are by no means partial to the banks of rivers.

The meat is tender and good, but with little of the characteristic pork flavour.

THE TREE DASSIE (*Dendrohyrax dorsalis*).

This little animal, called "nyôk," utters at intervals during the night a loud, long-drawn, trilling or rattling cry. This is repeated several times in quick succession, with increasing loudness, so that you think the animal nearer when he finishes than when he began. The sound always comes from high up in a large tree. Natives hearing it at night locate it in a certain tree, and go next day and chop the animal out of the hollow high up the tree-trunk, where it lives, and catch it alive. Sometimes two are found together: and they say when the shining of their eyes is seen in the darkness of the hollow tree, one eye only of each animal is seen; if two eyes appear, there must be two animals.

The people all tell me the "nyôk" descends to the ground to feed at night, and that it feeds on the leaves of bushes; a certain

shrub, a species of *Vitex*, has been pointed out as its favourite food. That it eats leaves is certain from what I have seen in the stomachs of specimens. That it goes about on the ground at night is proved by the fact that specimens have been brought to me caught in dead-fall traps on the ground at night. The "nyôk" seems to be silent when on the ground, and utters its cry only when up a tree.

While it is certain that this animal constantly ascends and descends trees, it seems singularly ill-constructed for climbing, and one seeing it would almost as soon expect a pig to have arboreal habits. Its descent is easy, however, if it is true, as the natives tell, that it merely lets go and tumbles down. I have seen, indistinctly, an animal of the size of the "nyôk" tumble from a leaning tree-trunk to the ground and rush off through the undergrowth. Its mode of ascent is difficult to explain: the fact that many trees stand leaning may help to account for it. I have been told more than once that the "nyôk" reaches its high door by means of a ladder of tangled vines such as hang from every large tree, sticking its feet through the loops to climb. The long projecting front teeth look as though they might help it to climb. But a young specimen, the tusks of which did not project at all, was said by the man who brought it to have been shot while climbing a vine. The rubber-like surfaces of its long soles may help it to keep from slipping while climbing.

This animal seems to be a favourite prey of the Leopard and of the Crowned Hawk-Eagle.

THE ELEPHANT (*Elephas africanus*).

In this forest country Elephants are seldom seen. Their paths are in the most remote parts of the forest, but they often come on moonlight nights to outlying gardens or to deserted village sites where a few plantains and bananas are still growing. These they tear open, eating the tender heart. When they are feeding the noise of the breaking of branches can be heard to a considerable distance. The only sight I have obtained of elephants wild was at early dawn, in an abandoned garden, which they were just leaving for the forest. I was then struck by the ease with which one bounded over a large log. Many things go to show that elephants wild are far from clumsy, and are even agile in their movements. Their tracks often lead up or down steep hills. They range far through the forest and travel far in a day.

The natives hang a small log, with a large iron spear-head set in the lower end, over a place where an elephant is likely to pass, in such a way that in passing he throws a trigger connected with the vine by which the log is suspended, and lets it drop on his back. When an elephant has been wounded in this way it is tracked far through the forest, sometimes for several days, and occasionally it is at last found dead. With the inferior guns the natives possess, they wisely refrain from shooting elephants, even

when they come upon them. But some men I found in the region of the Ja bold enough to shoot darts headed with broad and sharp chisel-like blades from their guns, and thus kill elephants. When a native kills an elephant he secures a great prize, for a pair of good-sized tusks are a small fortune to him, and the supply of meat is enough for many villages.

At a village on the Benito River I saw where the people, a few months before, had constructed a strong fence at the outskirts of their clearing, where a herd of elephants had been coming of nights to feed. Into the enclosure thus made they had managed to get the elephants, and had killed six or eight of them, shooting them from behind the stockade or from stations in large trees.

Natives sometimes find elephants dead. These may sometimes be such as have been wounded by spears of the kind described above; but I think that they are those that have died a natural death.

A large elephant-skull that I once saw lying by a path in the forest had no sockets for the tusks, but only rudimentary holes the size of one's finger. The people say elephants are often destitute of tusks.

THE SPECIES OF ANOMALURUS.

The *Anomaluri*, which have in Fang and Bulu the generic name "ñgui," are among the most strictly arboreal animals that exist. I never saw one, or heard of one having been seen, on the ground; and I know that when one falls to the ground wounded, it is helpless, and does not try to run away. They can ascend and descend large smooth tree-trunks or the inside of hollow trees, where an ordinary squirrel could not go. In such places they have a humping mode of progress like that of a Geometer caterpillar, and the sharp-pointed scales on the underside of the tail are pressed against the tree to aid them. They must be much aided also by the wonderful sharpness and strong curve of their claws. The claws of dead specimens were continually catching on things—on other specimens, the side of the vessel, or even my hand when handling them—and holding so that they were not easily shaken off. I have never seen these Flying-Squirrels on the small outer branches of trees; but they must go on the outer branches, for they leap or sail through the air from one tree to another.

I have often asked the natives what these animals eat. The answers showed ignorance: it was commonly said that they eat fruit or nuts; I was also told that the "avemba ñgui" (*A. beecrofti*) eats "the flesh" of trees, that is, the soft cambium-layer under the bark. A greenish pulpy mass I have seen in the stomachs of some specimens seemed to confirm this.

The species just referred to is generally found in the daytime clinging to the inside of large hollow trees, though sometimes, especially towards evening, it is seen crouching against the outside of

the trunks of trees. The "ôwôs ñgui" (*A. beldeni*) is not found in hollow trees—at least, not usually. It is found even in the daytime, crouching flat against the trunks of trees, but is oftenest seen towards evening. The rare *A. fulgens* seems to be like *A. beldeni* in habits. The small *A. batesi*, which seems also to be rather rare, has been found in hollow trees, like *A. beecrofti*.

I have more than once heard a low noise in the forest at night, between a whistle and a hoot, or like the sound of a switch rushing through the air. It was like that made by an owl, though I know of no owl's cry of one syllable as this is. This noise the natives believe to be made by the "avemba ñgui" (*A. beecrofti*).

THE SMALLER ANOMALURIDÆ.

The two species of *Idiurus*, the rare *Zenkerella*, and the Dormouse are all called by the same Bulu name "ôsi'indan." None of these, except the Dormouse, has ever been found, so far as I know, in any other place than hollow trees. As they seem to spend the daytime in hiding, they must feed abroad at night. Whenever a hollow tree is chopped down, some of these little animals, together with bats, especially the "angoñ" (*Hipposideros cyclops*) and certain species of Muridæ, are found in it. Often boys insert burning plantain-leaves into an opening in a hollow tree near the ground, and the smoke ascending suffocates the little creatures above, so that they drop down and are caught.

THE SQUIRRELS.

Several of the species of Squirrel are quite abundant. The commonest of all is the small striped one called "ôsen," or rather the two called "ôsen." This name is applied both to *Sciurus isabella* and *S. lemniscatus*, and as these are very much alike, and I have not usually distinguished them, they must be spoken of together. The "ôsen" is found both in the forest and in the bushes of old clearings. Nests of the "ôsen" are often found, of dry leaves and fibres woven into a complete globe. One I once found, with two young ones in it, had no opening apparent, and the little mother seemed to have closed it after her when she left. These young ones were found in February, and in the same month I was shown other young "ôsen" by boys who had found them.

About nests of the other Squirrels I can say nothing. But I have seen an "ôvaé" (*Sciurus rufobrachiatus*) carrying a spray of green leaves in its mouth as it ran along the branches.

The two large Squirrels (*S. nordhoffi* and *S. wilsoni*) are much alike, though always distinguishable, if seen plainly. The former (called "mvôk") is the commoner; the other (called "nsem") is said to descend to the ground, which the "mvôk" seldom or never does. These two are said by the natives to be able to gnaw through the flinty shell of the "ngali" nut, the hardest vegetable substance I have ever seen; while other Squirrels are said to be unable to do this.

The "édôn" (*S. pyrrhopus*) is often seen running on the ground or on logs. The same native name is applied to the less common *S. auriculatus*. *S. mystax*, which is a third species closely resembling the last two, was common along the banks of the Benito River, in the *Pandanus* bushes growing by the water's edge. It is absent or rare in the Bulu country, where there are no large rivers and no *Pandanus*.

Some of the Squirrels, at least, are able to pass, like monkeys, from one tree to another, by jumping across and catching themselves in the foliage. An "ôvaé" was seen to spring from a limb where it was running, outward and downward, 6 or 8 feet, into the thick foliage of another tree, and catch itself on the leaves and small twigs. An "ôsen" was seen to do the same, but not jumping so far.

I have learned to distinguish the commonest kinds by their chatter. The little "sep" (*S. poensis*) makes a sibilant noise of one syllable, which may be written "pish!" The "ôsen's" chatter is that most often heard, and varies a good deal. The natives represent it by the word "kéngé," which does very well, only that often a syllable is rapidly repeated many times, somewhat as a person who stutters would do in saying "kéngé." The "édôn" separates the syllables more, uttering only one or two together, thus: "ka-paka." The noise the "ôvaé" makes is peculiar and unlike a squirrel, being guttural. The "mvôk" makes a noise with somewhat of the same guttural tone, though less so than the "ôvaé," and with the syllables more separated and the voice stronger and gruffer.

All the commoner kinds of Squirrels have been seen joining in companies with little birds in the forest. It is the habit of many kinds of little birds to feed thus in companies scattered over several neighbouring trees, moving loosely together, and such companies very often have a Squirrel or two in them.

THE MURIDÆ.

The majority of the little animals of the Rat and Mouse family are inhabitants of gardens and the neighbourhood of villages. This is the case with all those belonging to the genus *Mus*; these are all trapped by boys, with various devices, in and around cassava-gardens.

The "mven" (*Mus univittatus*) is reputed to be the most destructive of all to cassava-roots. It is the animal proverbial for greediness, as the pig is among us. It lives and breeds in burrows. It is bolder, and oftener seen running around in the daytime, than the others.

The "ndan" (*Mus tullbergi*) lives in hollow logs and such places. It often comes into houses to find food and to nest, and becomes a house-mouse.

The "abok" (*Enomys hypoxanthus*) lives in the bushes growing on waste ground immediately around villages. It makes nests of

dry grass in bushes, 4 or 5 feet from the ground. When meat is scarce, the village boys often hunt "mebok" for food. They generally hunt them at dusk, when they (the rats) begin to stir abroad, killing them with sticks or with bow and arrow, or surrounding them in the weeds and driving them into a net, or under an old cloth or piece of bark. This hunting "mebok" is a great sport with the village boys. Owls often come around villages at dusk, probably for the same purpose.

The tiny *Dendromus messorius* likewise makes a nest in the weeds and grass around villages; its nests are nearer the ground than those of the "abok."

The pretty little striped *Arvicanthis pulchellus* also lives in the weeds and grass around villages, often coming right into the village street, when that is weedy. It is not found within 60 or 70 miles of the coast, where the village clearings are smaller and more scattered than they are farther inland. The people call it "ze-fô," or leopard-mouse, from its bright colour. There is a proverb to the effect that "you do not need to tell the leopard-mouse where to turn off the path."

The little red *Lophuromys sikapusi* is another inhabitant of the bushes and grass that grow only about villages. It is a curious fact that most of the examples of this species caught have stumpy tails or no tails at all. The notion of the people about it is, that whenever the "ékui" (as they call this mouse) crosses a path it loses its tail.

The "nsomian" (*Deomys ferrugineus*) is trapped, as the others thus far mentioned are, in old cleared land about villages; but it seems to live also in the forest. I have seen one caught by smoking it out of a hollow tree.

The "ndôn" (*Malacomys longipes*) is an inhabitant of the forest, where it is often caught in dead-fall traps set for the large rodent "kôé."

The "kôé" (*Cricetomys gambianus*) lives in burrows in the forest. Trapping it is considered a pursuit worthy of men, while other Muridæ are left for boys. Men go on camping-trips far into the forest for this purpose, finding a place where the "kôé" are abundant, and there setting many traps and staying several days, drying the bodies of their catch over the fire, to take back to the village and store for future use. I have heard, when passing along a forest-path at dusk, a little piping or squeaking noise that my guide said was made by the "kôé."

The Black Rat has been introduced, and has established itself in the villages at and near the coast. It has not yet got more than fifty miles inland.

THE BRUSH-TAILED PORCUPINE (*Atherura africana*).

Porcupines hide in rocky places, under and between the rocks, and in hollow logs. They are found in such places in the daytime, and are said to walk abroad only at night. They are hunted

with dogs, the small native dogs entering their holes and driving them out. Often the dogs themselves catch and kill the Porcupine, seizing it by the throat, where there are no quills. If it escapes the dogs, it is driven by men, with much hallooing, to a place where a net is stretched, into which it runs and is caught. Often several are caught at once in this way.

THE PANGOLINS (*Manis*).

The one or two small species of *Manis* are called "ka," and the large one, which I have heard of but not seen, and suppose to be *Manis gigantea*, is called "avi."

They all burrow in the earth. The "ka" must be mainly nocturnal. One brought to me was said to have been caught walking on the ground in the forest at early morning. Another was found in the daytime on top of one of the ants' nests, like huge hornets' nests, that are found adhering to the trunks of trees. Those I have received as specimens have generally been brought alive and curled up tightly. It takes much strength to unroll them, and they are hard to kill. When forcibly unrolled they eject in small quantities a very pungent yellow liquid; some of this that fell on a porch at the Benito mission-station permanently discoloured the paint.

4. A Contribution to the Study of the Function of the Antennæ in Insects. By MACLEOD YEARSLEY, F.R.C.S., F.Z.S.

[Received January 20, 1905.]

The true function of the antennæ of insects has for many years been a disputed point. As early as 1838 Lefebvre (1) disagreed with Oken, who regarded them as auditory organs, and attributed to them the olfactory sense. In 1847 Erichson (2), by reason of his anatomical studies of the antennæ, adhered to this view. The subject was also investigated by Leydig (3) in 1855, who traced the antennal nerve to the organs discovered by Erichson. He also (4) described what he considered to be auditory end-organs. Lowne (5) pointed out that one anatomical fact (first noted by Diette (6) in 1876), viz., the similarity of structure between the antennal ganglion and the olfactory bulb of vertebrates was in itself a guide to the function of the antennæ; and Perris (7) made systematic investigations by experiments on living insects and established their olfactory function. It would, however, be fruitless to attempt to mention all who have expressed opinions—supported by more or less evidence—upon the subject. Indeed, Kraepelin gives references to more than 100 papers dealing with the question between 1730 and 1883. Certain observations have been made by Kirby (8), Meyer, Lehmann (9), Leydig, Gruber, Hurst (10), Hammond, and others

in favour of an auditory function; but a perusal of their investigations does not convince. A more favourable verdict can be accorded to the conclusions of Perris (11), Hausa (12), Forel (13), and Plateau (14) in support of an olfactory function.

Lowne (15), in discussing the whole matter, thought it improbable that the antennæ contain organs of audition in insects, and remarks: "I think it more probably a balancing organ than an auditory organ in the strict sense of the word."

Lord Avebury (16) describes an individual ant (*Myrmica ruginodis*) which had lost the terminal portion of both her antennæ: "She seemed to have lost her wits. I put her into a nest, but the others took no notice of her; after wandering about a little, she retired into a solitary place, where she remained from 3 P.M. to 8 P.M. without moving. The following morning I looked for her at 5.30, and found her still at the same spot. She remained there till 9, when she came out. She remained out all day; and the following morning I found her dead."

Latreille (17), quoted by Lord Avebury, says: "Le sens de l'odorat se manifestant d'une manière aussi sensible, je voulois profiter de cette remarque pour eu découvrir le siège. On a soupçonné depuis longtemps qu'il résidoit dans les antennes. Je les arrachai à plusieurs fourmis fauves ouvrières, auprès du nid desquelles je me trouvois. Je vis aussitôt ces petits animaux que j'avois ainsi mutilés tomber dans un état d'ivresse ou une espèce de folie. Ils erroient çà et là, et ne reconnoissoient plus leur chemin. Ils m'occupaient; mais je n'étais pas le seul. Quelques autres fourmis s'approchèrent de ces pauvres affligées, portèrent leur langue sur les blessures, et y laissèrent tomber une goutte de liqueur. Cet acte de sensibilité se renouvela plusieurs fois; je l'observai avec une loupe."

The "condition of intoxication or species of madness" exhibited by Latreille's ants, bereft of their antennæ, is at least suggestive of support to Lowne's surmise; moreover, the results of experiments carried out by Yves Delage (18) upon Cephalopoda and Crustacea and by Clemens (19) upon *Samia cecropia* support it yet more strongly.

With a view of obtaining further evidence upon the matter, I recently (1904) made a series of experiments upon Wasps. I captured at different times a number of specimens (30 in all) of *Vespa vulgaris*, and subjected them to removal of their antennæ. My method was to confine each wasp under a small inverted wineglass, beneath which was placed a little powdered sugar. By cautiously introducing a pair of fine angular scissors under the tilted edge of the glass, I was able to snip off each antenna at its base. The insect thus mutilated was then carried into the garden and its movements carefully watched.

Experiments thus made on 30 wasps gave uniform results. On first losing its antennæ, each wasp kept passing its front legs between its jaws and then rapidly drawing them over the tiny wounds left by the scissors. Each wasp continued this manœuvre

for from 5 to 10 minutes, after which it ceased to pay attention to its injury and tried to fly. Attempts at flight generally occupied another 5 minutes, and were invariably attended with the same result. Each time the wings were opened, the insect was raised for about an inch from the ground and then turned a somersault headforemost, like an acrobat. These somersaults were always headforemost, the animal alighting on its back and struggling to its feet again.

Each wasp made some score or more attempts at flight, always with the same result. They then desisted and wandered slowly about as if uncertain of their bearings, blundering up against obstacles. Several were placed upon a window-sill, and each one so placed, if it reached the edge in the course of its wanderings, immediately fell off.

Summarised, the results of the removal of the antennæ in the 30 wasps were:—

1. Loss of the power of flight.
2. Loss of the sense of direction.
3. Very noticeable slowness in all movements.

It has been suggested to me that the loss of flight and the somersaults made headforemost every time that flight was attempted might have been due to the loss of a balancing weight occasioned by the removal of the antennæ, and that the experiment should be made of fixing on false antennæ in order to ascertain whether the insect would thus regain its power of flight. Whilst admitting that this explanation is possible, I would point out that, if the want of balance were due to the absence of the anterior weight of the antennæ, the insect would be more likely to turn over backwards, on account of the over-balancing weight of the abdomen, whereas the wasps experimented upon invariably turned over headforemost.

The conclusion to be drawn from these experiments is that, in wasps, the antennæ are equilibrating in function, and in this respect they agree with Lowne's surmise, quoted above, and with the experiments of Clemens on *Samia cecropia*, already cited.

REFERENCES.

1. "Note sur le sentiment olfactif des Antennes." Ann. Soc. Entom. France, tom. vii., 1838.
2. Die Fabrica et usu Antennarum in Insectis. 4to. Berolinii, 1847.
3. "Zum feineren Bau der Arthropoden." Müll. Archiv, 1855.
4. "Ueber Geruchs- und Gehörorgane der Krebse und Insecten." Müll. Archiv, 1860.
5. 'The Anatomy of the Blowfly,' vol. ii. p. 590.
6. "Die Organisation des Arthropodengehirns." Zeitsch. f. w. Zool., Bd. xxvii. 1876.
7. "Mémoire sur le Siège de l'odorat dans les Articulés." Ann. Sc. Nat. sér. iii. Zool. tom. xiv. 1850.

8. 'Introduction to Entomology.'
9. 'De antennis insectorum dissertatio posterior, usum antenarum recensens.' 12mo. Hamburgi, 1800.
10. "On the Life-history and Development of a Gnat (*Culex*)." Trans. Manchester Microscop. Soc. 1900.
11. Loc. cit.
12. "Physiologische und histologische Untersuchungen über das Geruchsorgan der Insecten." Zeitsch. f. w. Zool., Bd. xxxiv. 1880.
13. "Beitrag zur Kenntniss der Sinnesempfindungen der Insecten." Mitt. d. Münchener entom. Vereins, Bd. ii. 1878.
14. Ann. Soc. Entom. Belg. xxx. 1886, p. cxx.
15. Loc. cit. p. 592.
16. 'Ants, Bees, and Wasps,' p. 96.
17. 'Hist. Nat. des Fourmis,' p. 41.
18. Arch. de Zool. 2^e séries, tom. v. 1887.
19. Journal of the Acad. of Nat. Sciences, Philadelphia, vol. iv. pp. 158-160.

5. Notes on a small Collection of Heterocera from the Fiji Islands, with Descriptions of some New Species. By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

[Received November 29, 1904.]

(Plates VIII. & IX.*)

In the early part of last year I received, through the kindness of my friend Mr. Waterhouse of Sydney, a small collection of Heterocera from the island of Viti Levu (the largest of the Fiji group), among which are several interesting new species and some new records. The measurements of the specimens are taken by measuring the length of the wing from the centre of the thorax to the apex of the primary and doubling it. All the insects were taken at Nausori on the Rewa River.

SPHINGIDÆ.

PSILOGRAMMA JORDANA, sp. nov. (Plate VIII. fig. 1.)

♂. Head and thorax pale grey; patagia edged laterally with black, below which is a whitish stripe, the black stripe is continued through the metathorax and meets in the centre. Abdomen grey with a dark central dorsal stripe, a broad lateral rust-red patch on each side which merges into the dark lateral wedge-shaped spots of the posterior segments. Palpi grey, with a broad lateral dark rust-coloured stripe below the tip. Primaries whitish, basal

* For explanation of the Plates, see p. 95.



Bates, George L. 1905. "3. Notes on the Mammals of Southern Cameroons and the Benito." *Proceedings of the Zoological Society of London* 1905, 65–88.
<https://doi.org/10.1111/j.1469-7998.1905.tb08364.x>.

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