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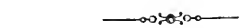
PREFACE.



This will be the last number of the Journal of the S.A.O.U., and in saying farewell the Editor wishes to thank those contributors who have made it possible for him to issue a Journal, even though it may only have been one or two numbers a year. In future the 'Journal' will be incorporated with that of the S.A. Biological Society, the scope of which, although much wider, will still embody all that our Journal has done hitherto. The reasons for this change are given in the body of this volume. Naturally I much regret to see the name of the Society I was mainly instrumental in founding disappear and give place to another, but hope that the change will be for the better, in so far that it will be possible in future to publish a regular Quarterly Journal. I trust the new venture will receive the whole-hearted support of our old contributors.

Wishing all our members a prosperous and happy 1917.

THE EDITOR.

National Zoological Gardens,
Pretoria, September 19th, 1916.

LIST OF PAPERS, &c.,

IN THIS VOLUME.

Vol. XI., No. 2, *December* 1916.

SUBJECT-MATTER INDEX,

INCLUDING NAMES OF CONTRIBUTORS.

PLATE: Curious Site for Heron's Nest.

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SOUTH AFRICAN ORNITHOLOGISTS' UNION.

Vol. XI. **DECEMBER 1915.** **No. 1.**

I.—*The Birds of Philipstown, Cape Province, with Notes on their Habits.* By H. LEIGHTON HARE.

LOOKING back on a stay of close upon two years at Philipstown, C.P., I cannot help recalling the remark of a friend who had travelled through that part of the country, in regard to the possibilities of the district from an ornithologist's point of view. His opinion was summed up in the remark, "Well, it looks as if it might support an odd koester (lark) or two!"

That my friend was unduly pessimistic, and that the district offers quite a fair scope to the collector, I shall endeavour to show in the following promiscuous notes on the birds observed there. In compiling these notes I have not attempted to follow any fixed order of classification, but I am hopeful that they will, nevertheless, prove to be of some small interest.

Commencing with the Eagles—only three species were identified with certainty, namely, the Martial Hawk-Eagle (*Eutolmatus bellicosus*), the Black-breasted Harrier-Eagle (*Circaetus pectoralis*), and the Tawny Eagle (*Aquila rapax*). The first-named is fairly frequently seen. It is destructive to young springbucks, but does not despise such small game as ground-squirrel ("Waaierstert meerkat"). The Tawny Eagle, I believe, breeds in the district. One of a pair of

these birds frequenting a certain locality was shot, and shortly afterwards I found, in a tree in the neighbourhood, a large nest under construction, the materials of which were quite fresh. Although the mate remained in the vicinity for a week or two longer, nothing further was added to the nest. I feel sure that but for the untimely death of the one bird the pair would have bred there.

The Jackal-Buzzard (*Buteo jakal*), a common bird, is a permanent resident. Several good specimens were secured by means of a trap set on the top of a long pole, which was then erected in a conspicuous place. A clutch of two eggs was taken from a nest in a large "Karree" tree; one was dirty-white in colour, the other covered with dark blotches on a dirty-white background. They differed so much in appearance that it was difficult to believe that they had been taken from the same nest. The Jackal-Buzzard is quite a useful bird. It appears to subsist mainly on small birds and rats, although it doubtless levies toll on game-birds and hares when opportunity offers. It will occasionally kill snakes.

The Steppe Buzzard (*Buteo desertorum*) is a summer visitant. The stomachs of specimens secured contained rats, birds, and frogs. One had also swallowed a piece of stick about the thickness of a lead pencil and two inches in length, but this was probably accidental.

Black-shouldered Kite (*Elanus cæruleus*).—This useful little Hawk is rare; it was only recorded once. The Yellow-billed Kite (*Milvus ægyptius*) is a summer migrant. Parties of from 10 to 20 are occasionally seen, though usually they wander about singly or in pairs. Sometimes they are found feeding on carrion. They are venturesome birds, as I had opportunities of seeing when on active service in the district of Gordonia a few months ago. On one occasion we were much entertained by the efforts of a Kite to pick up a scrap of meat lying a few paces from the door of one of the tents in our camp. Time after time he would swoop, but invariably his heart failed him just at the critical moment, and in the end he gave it up. Sometimes when on the march

three or four of these birds would accompany us for miles skimming over the bushes just in front of the leading horsemen and taking on the wing any locusts that had been disturbed. At one spot in the district I saw a flock of fully 100 of these birds.

Chanting Goshawk (*Melierax canorus*).—These handsome birds are fairly plentiful. Their nests, usually placed in a tree from 8 to 12 feet from the ground, and scantily lined with scraps of wool or horse-dung, are easily found. The eggs, two in number, are white. Judging by the litter of skulls and feet round the nest, they evidently do good execution amongst the "genus *Lepus*." But in a district where hares are regarded as vermin, this, I think, should be "counted unto them for righteousness." When on the wing this bird sometimes utters a wild weird cry; generally, however, its pleasant trilling whistle is to be heard in the early morning and towards evening.

Harriers make their appearance in the spring and leave again towards the end of summer. Montagu's Harrier (*Circus cinereaceus*) and the Pale Harrier (*Circus macrurus*) are fairly numerous. The Black Harrier (*Circus maurus*) was recorded only once.

Of the three Kestrels, the Greater (*Tinnunculus rupicoloides*), the South African (*T. rupicolus*), and the Lesser (*T. naumanni*), only the South African variety is, so far as I am aware, a permanent resident. This bird appears to have been endowed with an undue allowance of impudence. It never seems to be happier than when it is annoying some bird larger than itself, and the appearance of a Jackal-Buzzard is always an excuse for the Kestrel to be up and doing. But it does not confine its unwelcome attention to birds only; on one occasion I was puzzled by the behaviour of one of these birds, which swooped repeatedly over a spot on a hill-side. Investigation disclosed the presence of a fine lynx whose criminal career was then and there cut short. A reliable farmer in the district informed me that he had seen this bird, with the assistance of a dog, worry a White-quilled Knorhaan (*Otis afroides*) to death. Each time the

Knorhaan sought refuge on the ground the dog would flush it. The Hawk would then attack it in the air, driving it to cover again. The performance would be repeated, and so the game went on until the unfortunate Knorhaan, losing its balance in the air, was dashed to the ground and killed. I have also known a Kestrel to strike down a wounded Partridge.

The Greater Kestrel is not uncommon in the district.

The lesser variety at times appears in large numbers, their visits generally coinciding with the presence of swarms of locusts, on which they feed. The stomach of one specimen secured contained the mandibles of a number of hunting spiders ("Jacht spinnikop").

In addition to the Hawks above mentioned, must be recorded either the S.A. Peregrine (*Falco minor*) or the S.A. Lanner (*F. biarmicus*), or possibly both. In dealing with a class of birds so wary and so liable to changes of plumage when passing from the juvenile to the adult stage, it is often impossible to identify them with certainty unless one has the specimen in one's hands, and I cannot help feeling that several migratory species must have escaped notice.

The only Owls observed were the Spotted Eagle-Owl (*Bubo maculosus*) and the Barn-Owl (*Strix flammea*). The former were very plentiful near the village during the early part of the year 1912. Why they should have become scarcer since that time I cannot say, unless the senseless persecution to which these unfortunate birds are invariably subjected at the hands of ignorant and superstitious country-folk can account for it. There is no bird in the country more deserving of protection and, in my opinion, no opportunity of impressing the fact upon farmers should be lost. The Eagle-Owl may sometimes be seen catching field-mice during the late afternoon. It was somewhat of a surprise to me to learn that this bird will feed on carrion. I saw a pair which had died through feeding on a spring-hare which had been poisoned and dropped in the "veld" as bait for jackals.

The Barn-Owl is more often heard than seen. Several

used to inhabit some holes in the side of a well on the outskirts of the village and raised breeds there.

The Secretary-Bird (*Serpentarius secretarius*) is not uncommon. A pair will generally be found to keep more or less to the same locality. If one is shot the survivor will soon pick up another mate, and if both are destroyed it will not be long before another pair has taken their place. I saw this happen at a certain farm in the district where a pair of Secretary-Birds, after having lived in peace and security for several years, came to an untimely end through feeding on the carcases of lambs which had been poisoned and laid on the "veld" for jackals. Opinions seem to be very much divided as to whether the Secretary-Bird should be protected or not, the views of both sides generally running to extremes. The question is a difficult one to decide. In spite of all that may be said in its favour as an exterminator of snakes, the fact remains that it is very partial to leverets and young partridges. But in so far as the Philipstown district is concerned, I think it may be given the benefit of the doubt, for partridges are practically non-existent on the flats, and hares are regarded as vermin. In country where game is plentiful and snakes scarce, I certainly think there are some grounds for the views held by those who maintain that the Secretary-Bird does more harm than good, but I hope that many years will elapse before its quaint figure ceases to ornament the dry stretches of the Karoo. This bird breeds in the district. It does not seem to be fond of taking long flights, but it can undoubtedly soar well if so minded. I recall once, on a bright clear day, seeing one mount in spirals until completely lost to sight.

The Order Anseres, as may be expected, is not too well represented. The Egyptian Goose (*Alopochen ægyptiacus*), South African Shelduck (*Casarca cana*), and Black Buck (*Anas sparsa*) are all permanent residents. All three species are usually found in pairs; this, however, is not always the case. Occasionally flights of Shelduck numbering 12 or 14 individuals may be seen. These probably comprise the parent birds and a brood of young which have had the good

fortune to reach the flying stage, in spite of the many dangers to which they, as ducklings, must have been exposed on some open sheet of water. At long intervals, too, the rare sight (for this district, at any rate) may be witnessed of flocks of 100 or more of these birds on a large "pan," which is filled after abnormally heavy rains. This event, however, only takes place about once in ten years. When this "pan" does contain water, it is surprising to see what numbers of water-fowl will assemble in a few days' time. Large flights of Egyptian Geese, Red-billed Duck (*Pœcilonetta erythrorhyncha*), and Red-knobbed Coot (*Fulica cristata*) congregate rapidly. The favourite nesting-site of the Egyptian Goose appears to be the disused nest of some Hammerkop (*Scopus umbretta*) perched on an overhanging ledge of rock. The bird sits very close, and no amount of moving about on the roof of the nest will induce it to stir off the eggs. Only when the nest has been broken open from above will it take to flight. I have not had an opportunity of seeing how the young, after they are hatched, are removed, but I believe they are carried one by one by the neck in the parent bird's bill. The young will often be reared on a comparatively small pond, and when danger threatens the old birds fly off while the young scuttle ashore and hide. Given a little cover, they contrive to conceal themselves in a truly marvellous manner, and unless the spot be carefully marked search will, nine times out of ten, be fruitless. When the banks afford next to no shelter, the sight of these helpless little creatures on the bare ground, trying to pass themselves off as stones or what-not, is really pathetic. They are evidently trained by their parents how to behave in such emergencies, and the primary rule, I imagine, must be "once hidden, do not stir until you hear the signal that danger is past." A friend and I once spent a long time searching for a half-grown gosling, which we knew must be hidden very close by. The ground was only sparsely covered with small bushes, but the search was in vain, although, as subsequently transpired, we must have almost trodden on the bird several times. Tiring of the game at last we gave it up, but re-

mained in the vicinity for about half an hour longer, when I announced my intention of having "just one more look." Almost immediately I imagined I caught sight of the gosling lying in a ragged bush right at my feet, stooped down and examined it casually, and then called to my friend to come and see "how wonderfully like a gosling this *stone* looked." As he came up I bent down more closely still to examine the supposed stone, and then to my blank amazement discovered that it was the gosling after all. The vermiculated colouring of its back harmonised, quite accidentally I suppose, with stones which were lying about the place. I need hardly say that after it had been examined it was returned to the water. Though I have not found the Black Duck (*A. sparsa*) breeding in the district, I have taken the eggs on the Vaal River at Barkly West. The nest consisted of a layer of rushes, while the eggs, nine in number and of a light brown shade, were surrounded and partly covered in a most skilful manner by a ring of down evidently plucked from the parent bird's breast. The Coot (*F. cristata*) was found breeding at Philipstown in the middle of winter (July).

The Cape Dabchick (*Podicipes capensis*) was recorded only once, though doubtless it would be found on the Orange River, which forms the north-eastern boundary of the district. If this one had found its way from the river, it must have crossed longer stretches of country than one would suppose a bird of such seemingly feeble flight capable of.

The Grey Heron (*Ardea cinerea*) is common everywhere. A number breed each year on a farm not many miles from the village. The nests are built in a couple of large willow-trees, but are inaccessible to anyone but an expert climber. These birds may often be seen during the day standing about on the "veld" miles away from water, or stalking along through lucerne-fields. A change of diet from frogs, &c., to beetles, caterpillars, and possibly field-mice, evidently does not come amiss.

It is hardly necessary to mention that the Hammerkop (*Scopus umbretta*) is also found here—where, indeed, in South Africa is it not to be seen? I had several good opportunities

of watching a quaint performance, in which a pair of these birds will sometimes take part. The two face each other, bow gravely several times, and then one leaps lightly on to the other's shoulders and remains there, standing erect and flapping its wings for a space of half a minute or so, both meanwhile keeping up a loud cheerful piping. Then the "rider" jumps down, the other promptly mounts, and the same performance is gone through. This is repeated, turn and turn about, perhaps half a dozen times.

Curlew (*Numenius arquatus*) were observed only once during my stay at Philipstown. They were at the "pan" already mentioned.

The Avocet (*Recurvirostra avocetta*) was occasionally seen in small parties, but more commonly in pairs. A small boy attending the public school once brought his teacher the head of an Avocet. He explained that, according to his father, it was a most destructive bird, as it flew over the corn-fields slicing off the ears of corn with its curved bill. In future let it not be said that our country-folk do not take an intelligent interest in the fauna of the country.

The Greenshank (*Totanus glottis*), Marsh-Sandpiper (*Totanus stagnatilis*), Wood-Sandpiper (*Totanus glareola*), and Little Stint (*Tringa minuta*) make their appearance in spring. The two last-mentioned species are particularly plentiful.

Two species of Stork are irregular visitors to the district, namely, the White Stork (*Ciconia alba*) and the Black Stork (*C. nigra*). The latter are generally seen singly or in pairs during the winter months—they are by no means common.

Blue Crane (*Tetrapteryx paradisea*).—This bird is a familiar sight on the "veld." At times huge flocks assemble, and although they are inclined to be troublesome in grain-lands they unquestionably do much towards keeping down insect-pests. No one who has seen a flock at work over an area where locusts have deposited their eggs will doubt this. The Blue Crane lays its eggs on the bare ground, a few pebbles being scraped together to form an apology for a nest. I ascertained once that a pair were breeding on a farm close

to the village. The spot selected was a gentle rise in the middle of a big flat. This gave the birds a clear view in all directions, and enabled them to slip away from the nest as soon as anyone hove in sight. Several unsuccessful attempts were made to locate the nest; each time the bird would be seen sneaking off, but it was impossible to say exactly where it had risen from the ground. There were several good-sized open gravelly spaces in the neighbourhood, on any one of which the eggs might be lying. Recourse was eventually had to strategy. Accompanied by a friend armed with a pair of field-glasses a careful stalk was made to the nearest point where cover could be found, a distance of 700 or 800 yards from the ridge. The friend then focussed the glasses on the ridge while I advanced into the open, making no attempt to conceal myself, and almost immediately he shouted that he had seen the bird rise from the middle of one of the bare patches. The rest was easy. Looking at the two eggs lying on the bare ground, it seemed ridiculous that there should have been any difficulty in finding them, and yet had one not been specially searching one might have passed within a foot or two without noticing them. The clutch consists of two eggs. The young may often be seen following their parents about the "veld." They are unable to fly until almost full grown. If chased on horseback the parents will endeavour, in every possible way, to draw the pursuer away from the young, resorting to the time-worn dodges of throwing themselves down on the ground, shamming lame, &c. When finally overtaken, the young birds show plenty of fight. These birds generally repair to some dam during the evening and pass the night standing in the water, probably as a safeguard against surprise attacks by wild cats or other carnivora. This habit is carried to ridiculous lengths in the case of the young. Some friends of mine who had a pair informed me that one used invariably to sleep at night standing in a small dish which contained their supply of drinking-water. If caught young the Blue Crane is easily tamed and makes an interesting pet.

"Paauw" are very numerous during the summer months,

parties of 10 or 12 being seen together. They breed in the district, and may sometimes be heard making a drumming noise, which carries a long distance. Only the Veld Paauw (*Otis cafra*) was identified with certainty.

Three species of Knorhaan, namely, the Blue (*Otis cœrulescens*), the Vaal (*O. vigorsi*), and the White-quilled (*O. afroides*), are found in the district. I should like to see all of them placed under absolute protection, on the same footing with the large and small locust-birds. They feed largely on locusts in the "voetganger" stage, and also on a certain caterpillar which has increased so rapidly during the last few years as to constitute a serious pest. Not many of the Blue variety are left in the district. The Vaal Knorhaan is fairly evenly distributed throughout, generally being seen in twos or threes. The White-quilled Knorhaan is scarce in some parts and plentiful in others. Their numbers fluctuate, however, and although plentiful in a locality one year there may be very few the following year, even though there has been no shooting This, I think, must be due to disease—certainly many are troubled with worms in the intestines.

I cannot pass these birds by without quoting a couple of instances to show how soon one whose mate has been killed will find another. I had been asked specially to obtain a few specimens of Knorhaan for the South African Museum, and got permission from a farmer to shoot three on his farm. These, he informed me, were the only ones on his place. I arrived there in the afternoon. The farmer was away from home, but a native who knew where the birds were to be found was placed at my disposal. On the way I enquired whether there were any other Knorhaan on the farm. "No," he was quite emphatic, there were only three and they were always to be found in a small patch of lucerne not far from the homestead. In due course we ran across the birds, two of which were bagged. The third became very wary, and after a lot of manœuvring I abandoned the chase late in the afternoon. Next morning at breakfast time I was astonished to see the old bird back in the lucerne-patch with a new

mate. It may, of course, be suggested that the evidence is not conclusive and that this was an entirely new pair, but I hardly think this likely and, in my own mind, I am convinced that such was not the case. Here is another instance. There were a few pairs of Vaal Knorhaan on another farm. One pair could always be found in the neighbourhood of a low stony ridge. I shot one of this pair—the other escaped —and a few days later heard from the farmer that the survivor had picked up another mate. I subsequently shot both these, male and female, and within a fortnight another pair had taken their place. I am glad to say that, having secured all the specimens that were required, these were left in peace.

Dikkop (*Œdicnemus capensis*).—This is a common bird and can always be heard calling on bright moonlight nights. During the day they lie hidden amongst bushes, and sometimes as many as 20 can be flushed from one spot.

The Crowned Lapwing (*Stephanibyx coronatus*) is fairly common, while Burchell's Courser (*Cursorius rufus*) and the Two-banded Courser (*Rhinoptilus africanus*) are plentiful.

The Caspian Plover (*Ægialitis asiaticus*) was recorded and Kittlitz's Sand-Plover (*A. pecuaria*) several times. The Three-banded Plover (*A. tricollaris*) is, of course, a permanent resident. Its nest, consisting of a few pebbles scraped together, is generally situated on more or less bare ground not far from water. It is easily found.

Crowned Guinea-fowl (*Numida coronata*) exist in fair numbers in the neighbourhood of the Orange River.

Small coveys of Greywing Partridge (*Francolinus africanus*) are evenly distributed and Redwing (*F. levaillanti*) sparingly. The former are generally to be found on rocky ground, while the latter, which are scarcer, keep to the flats. The stomach of a Greywing was found to contain, besides insects of several kinds and vegetable matter, 30 young toads.

Quail (*Coturnix africana*) are occasionally put up either singly or in pairs. I do not think they ever appear in anything like large numbers.

Namaqua Sand-Grouse (*Pteroclurus namaqua*) are very plentiful at certain times of the year, though from all accounts they are never seen in such large numbers as in former years. They breed in the district, and their eggs were frequently taken. The clutch consists of three eggs.

The Speckled Pigeon (*Columba phæonota*), Cape Turtle-Dove (*Turtur capicola*), Laughing Dove (*T. senegalensis*), and Namaqua Dove (*Œna capensis*) are all very common.

The Bacbakiri Shrike (*Laniarius gutturalis*), Fiscal Shrike (*Lanius collaris*), and Coronetted Shrike (*Lanius subcoronatus*) are all resident species. The Red-backed Shrike (*Lanius collurio*) is a rather rare summer visitor. I once saw the nest of a Bacbakiri constructed entirely (with the exception, perhaps, of the inner lining) of green twigs plucked from a thyme-bush. It certainly was a sweet-smelling abode; incidentally the thyme-bush was just about ruined when the birds had finished with it. I fancy they must have found the scent to their liking, because there was no lack of other good nesting-material in the neighbourhood. It is sometimes rather difficult to draw the line between the Fiscal and the Coronetted Shrike. Where the white band across the forehead and the white eyebrows are plainly in evidence, there is, of course, no question about the identity, but some birds are found with just the very faintest trace of a white eyebrow. The breast of the Fiscal of these parts is pure white, and shows no traces of the smoky colour to be seen in specimens from the neighbourhood of the Cape. This bird destroys many insects, and is a good friend to the farmer. Apart from his cruel habit of impaling living locusts, beetles, &c., on thorns or barbed wire, for which I suppose he cannot be held to blame, the only bad trait in his character is his fondness for pulling off the head of a caged canary whenever he gets the opportunity to do so. He is a pugnacious bird. Quite recently I came upon two indulging in a regular "rough and tumble" on the ground. They rolled over and over in the dust using beak and claws vigorously, surrounded by a circle of Chats, Sparrows, Seedeaters, and Buntings, who appeared to be enjoying the fun immensely. I do not

know how long the fight had been going on before I arrived, but I watched for fully five minutes before one of the combatants "threw up the sponge," and in a very ruffled state made off, hotly pursued by the victor. These birds are tolerably good mimics and are particularly fond of imitating the call of the Greywing Partridge.

The only Thrush found in these parts is Cabanis' Thrush (*Turdus cabanisi*)—it is not uncommon.

The Black-fronted Bulbul (*Pycnonotus nigricans*) is a very common bird.

The Ground-Woodpecker (*Geocolaptes olivaceus*) is seen now and then. It is not very plentiful.

Pied Barbet (*Tricholæma leucomelas*).—These birds are very plentiful everywhere, and are rather troublesome in orchards. Shelley's Barbet (*T. affinis*) (see Stark and Sclater, vol. iii. p. 162) is merely the young of the Pied Barbet. The absence of the tooth to the upper mandible does not signify, as the young of the Black-collared Barbet (*Lybius torquatus*) will also be found to be lacking in this respect. Apparently the patch of red on the forehead only appears when the bird reaches the adult stage.

Two species of Mouse-bird, the White-backed (*Colius capensis*) and the Red-faced (*C. erythromelon*), are very common. I have sought in vain for a redeeming feature in their characters. They are unmitigated rascals, and easily take first place in the ranks of the orchard-plunderers.

The White-necked Raven (*Corvultur albicollis*), Black Crow (*Corvus capensis*), and Pied Crow (*C. scapulatus*) are all residents, but are not often seen. Flocks of the last-named were causing the postal authorities at De Aar and Britstown much annoyance recently. They used to roost on the telegraph-wires in such numbers as to interfere with the current. The trouble was caused by the upper wires sagging under the weight of the birds until brought into contact with the lower wires. I have heard of the same trouble being experienced in the district of Glen Grey, but in this case Black Crows were the offenders.

Of the three species of Starling, namely, the Pale-winged

(*Amydrus caffer*), the Wattled (*Dilophus carunculatus*), and the Pied or Common Spreeuw (*Spreo bicolor*), only the last-mentioned is really common. The Pale-winged Starlings generally go in pairs. Wattled Starlings are seldom seen by themselves, being generally in the company of Pied Starlings. The Common Spreeuw, if one can overlook his depredations in the orchard, is essentially a useful bird. They do much towards keeping down caterpillars and grubs in lucerne-fields. During severe droughts, when food had become scarce, I have seen them wading about in shallow pools feeding on tadpoles, on which they seemed to thrive.

The Chat family is fairly well represented. The Capped Wheatear (*Saxicola pileata*), Mountain-Chat (*S. monticola*), Familiar Chat (*S. familiaris*), Layard's Chat (*S. layardi*), Sickle-winged Chat (*Emarginata sinuata*), and Ant-eating Chat (*Myrmecocichla formicivora*) are all common. The S.A. Stone-Chat (*Pratincola torquata*) is somewhat rare. The different phases of plumage adopted by the Mountain-Chat are very striking. Although it is generally thought that the plumage of the female—brownish black with white on the rump, upper tail-coverts, and tail (see Stark and Sclater, vol. ii. p. 194), remains constant throughout life, this is not an invariable rule. Specimens of the female in grey plumage were collected and submitted to the S.A. Museum, and the fact verified. In these cases, to remove all doubt, the bodies preserved in spirits were also sent for examination.

The Larks to be found here are the Thick-billed (*Calendula crassirostris*), the Grey-collared (*Alæmon semitorquata*), the Red-capped (*Tephrocorys cinerea*), Rufous Long-billed (*Certhilauda rufula*), the Grey-backed (*Pyrrhulauda verticalis*), and the Dark-naped (*P. australis*). The Thick-billed and Grey-collared varieties are somewhat troublesome in grain-lands, as they are given to scratching up the germinating seeds. Grey-backed Larks may often be seen feeding in the streets along with the Red-capped. Enormous flocks of Dark-naped Larks congregate together, but they keep rather further afield. A new subspecies of Lark was collected by me in this district and given the name of *Calan-*

drella sclateri capensis by Ogilvie-Grant. The original series was sent to the S. African Museum, Cape Town, and four more specimens, collected more recently, have been acquired by the Transvaal Museum. Two or three other species of Lark were seen, but not identified.

Three species of Pipit were recorded, namely, Tawny Pipit (*Anthus rufulus vaalteni*), Davies' Pipit (*A. daviesi*), and Large Yellow-tufted Pipit (*A. crenatus*). The first is common, the second rare, and the third is not uncommon on the hills.

Wagtails.—The Pied Wagtail (*Motacilla vidua*) is found along the Orange River, and the Common Wagtail (*M. capensis*) is abundant everywhere.

The Giant Kingfisher (*Ceryle maxima*) was seen only once, though doubtless this bird, as well as the Pied (*C. rudis*) and the Malachite Kingfishers (*Corythornis cyanostigma*), would be found along the river. The Giant Kingfisher can swallow fish of an astonishing size. At Barkly West I saw a yellow fish, 7 inches in length, taken from the stomach of one of these birds. The head of the fish had been battered to pieces, but the body was intact.

The Swallow-tailed Bee-eater (*Dicrocercus hirundineus*) is a very rare bird in these parts. It was recorded only once from a farm on the boundary between Philipstown and Hanover districts. The European Bee-eater (*Merops apiaster*) is very abundant all through the summer months. It breeds in the district, and is an unwelcome visitor to farmers who keep bees. Specimens collected at Barkly West were found to have fed exclusively on dragon-flies.

Rufous-cheeked Nightjar (*Caprimulgus rufigena*).—This bird is a summer visitor and is fairly common. I believe it drinks while on the wing—at any rate, I have occasionally seen one, while skimming over a sheet of water in the evening, drop down for an instant on to the surface.

The S.A. Hoopoe (*Upupa africana*) is rather a rare bird in these parts.

The Didric Cuckoo (*Chrysococcyx cupreus*) is a migratory species, arriving generally in October and leaving again

towards the end of summer. I believe it is the general opinion that this bird, after depositing its egg in some other bird's nest, takes no further interest in its offspring. This is not always the case. I have it from a very reliable gentleman in Barkly West that a young Didric was once hatched in a Sparrow's nest under his verandah, and that after leaving the nest it remained in the vicinity and was fed daily for a week or more by a pair of adult Cuckoos as well as by its foster-parents.

It is perhaps hardly necessary to mention that the Cape Sparrow (*Passer arcuatus*) is a permanent resident here and is plentiful. The Grey-headed Sparrow (*P. diffusus*) is found in the neighbourhood of the Orange River, where it forms a boundary of the district. Recently, in Gordonia district, I frequently saw these two species mixing together freely. When feeding on the ground one peculiarity was very noticeable, namely, that, while the Cape Sparrow invariably hopped, the Grey-headed Sparrow almost always ran, after the manner of a Lark. I found this bird breeding at Kakamas during December of last year. The nest was situated in a hole in the trunk of a tree about 8 feet from the ground, but I was unable to examine it closely as there were several large wasp-nests near the entrance.

The S.A. White-bellied Swift (*Cypselus africanus*) and the Black Swift (*C. barbatus*) are only seen occasionally. I once shot one of the latter on the slopes of Table Mountain, Cape Town, and found in its throat a ball, about the size of an ordinary marble, of small spiders and flying beetles, many of which were still alive. The spiders had doubtless been taken from their webs slung between bushes and trees on the hill-side. The Indian Swift (*C. affinis*) and the African White-rumped Swift (*C. caffer*) are both very common, and breed in the district. Some nests of the former, easily distinguishable by the external covering of feathers, may be seen sandwiched in between a number of those of the S.A. Cliff-Swallow (*Petrochelidon spilodera*) under the eaves of the Reformed Church at Philipstown. The White-rumped species is found breeding in old Swallow-nests or deserted

Sparrow-nests in holes in walls. Neither of these Swifts remains at Philipstown during the whole of the winter. The White-rumped species disappears altogether at the first approach of cold weather; the other remains somewhat longer, but eventually disappears too. It is, however, only a partial migrant, as I have known it to stay all through the winter at Barkly West, and I also came across this bird at Britstown, C.P., in the middle of winter (July).

The Larger Stripe-breasted Swallow (*Hirundo cucullata*), White-throated Swallow (*H. albigularis*), European Swallow (*H. rustica*), and S.A. Cliff-Swallow (*Petrochelidon spilodera*) are all migratory species and very common during the summer months. As mentioned above, a colony of the last-named has established itself at the Reformed Church, where some hundreds of nests, clustered together in places four and five deep, may be seen. The nests have been constructed on two sides of the building only, the sides not used being those facing the quarters from which heavy rains always come. I believe each pair of birds raises at least two broods during their stay here. The colony presents a scene of feverish activity when breeding is in full swing. They do not migrate all together, but early in April begin drifting away in small parties as soon as the broods of young are able to fly. By the end of April all have disappeared. The entrance to the nest of the Cliff-Swallow is very narrow—in fact, the bird has often to regularly force its way into and out of the nest. I once saw the dead bodies of two Swallows hanging from a nest; they had obviously attempted to enter the same nest at one and the same time, with the result that both their heads had been firmly caught in the narrow opening.

Two species of Martin are permanent residents, namely, the S.A. Rock-Martin (*Ptyonoprogne fuligula*) and the S. A. Sand-Martin (*Cotile paludicola*).

Fly-catchers.—The Brown Fly-catcher (*Bradyornis infuscatus*) is very beautiful. A clutch of eggs, four in number, was taken from a nest placed in a bush about three feet from the ground in October. I also found the nest with eggs in Gordonia District during December of last year.

The Spotted Flycatcher (*Musicapa grisola*) was recorded only once, and the Pririt Flycatcher (*Pachyprora pririt*) twice or three times.

The following list completes the record of birds seen in the District. There is nothing of particular interest to add concerning them:—

Masked Weaver (*Hyphantornis velatus*), Red Bishop-bird (*Pyromelana oryx*), Red-headed Weaver-Finch (*Amadina erythrocephala*), Pin-tailed Widow-bird (*Vidua principalis*), all common; Scaly-feathered Weaver-bird (*Sporopipes squamifrons*), rather rare; Common Bunting (*Fringillaria capensis*) and Lark-Bunting (*F. impetuani*), common; White-throated Seed-eater (*Serinus albigularis*), Lesser Seed-eater (*S. marshalli*), and Mountain Canary (*Alario alario*), common. (In regard to the last-named bird I notice that the latest check-list issued by the South African Museum contains a new subspecies of Mountain Canary called *Alario alario leucolæma*. This is evidently an error. The male Mountain Canary, when it becomes old, assumes white eyebrows and patches of white on the cheeks and throat, and an aged bird has doubtless incorrectly been assumed to belong to a distinct subspecies.) Common Waxbill (*Estrilda astrild*), rather rare; Malachite Sun-bird (*Nectarinia famosa*), rare; White-vented Sun-bird (*Cinnyris fuscus*), common; Cape Robin (*Cossypha caffra*) and Cape Ground-Robin (*Erythropygia coryphæus*), common. (The latter is a watchful inquisitive bird, and is generally the first to detect the presence of a snake, a polecat, or other vermin.) Black-breasted Tit (*Parus afer*), Cape Penduline Tit (*Ægithalus capensis*), Red-vented Tit-Babbler (*Parisoma subcæruleum*), Layard's Tit-Babbler (*P. layardi*), Pale White-eye (*Zosterops pallida*), Crombec (*Sylviella rufescens*), Rufous-eared Wren-Warbler (*Spiloptila ocularia*), Cape Wren-Warbler (*Prinia maculosa*), Yellow-bellied Bush-Warbler (*Eremomela flaviventris*), and Fairy Warbler (*Apalis scita*), all common. The Green-backed Bush-Warbler (*Chlorodyta icteropygialis*) is somewhat rare; it is generally seen in small parties. Its call, to my mind, closely resembles that of the Cardinal Woodpecker (*Dendropicus cardinalis*).

II.—*Ornithological Notes from Natal.*

By E. C. Chubb, Curator, Durban Museum.

Ringed Bird found at Port Shepstone.

The Durban Museum recently received from the Magistrate at Port Shepstone a Tern, which was found dead on the beach there on the 8th July last, bearing a ring of the Bird Protection Station at Rositten in Germany, inscribed as follows :—" Vogelwarte Rossitten, F 22020."

It appears to be an immature example of the Common Tern (*Sterna fluviatilis*, Naum.), in winter plumage.

Bar-Tailed Godwit (*Limosa lapponica*, Linn.) in Natal.

In a previous number of the 'Journal' (vol. vii. p. 80) I recorded the occurrence of the Black-tailed Godwit (*Limosa limosa*, Linn.) for the first time in South Africa, an example having been obtained at Durban by Mr. H. M. Millar in February 1911.

I now take the opportunity of recording a visit to South Africa on the part of the Bar-tailed Godwit (*Limosa lapponica*, Linn.), a specimen of which was shot for the Durban Museum by Mr. H. M. Millar at the head of Durban Bay in March 1912. It seems to be an adult bird in winter plumage.

Black-Tailed Tropic-Bird (*Phaëton lepturus*, Daud.) in Natal.

The Durban Museum possesses an example of the Black-tailed Tropic-Bird (*Phaëton lepturus*, Daud.), which was shot by the donor, Mr. J. Alder, at the Umgeni River bridge, 4 miles N.E. of Durban, on 5th February, 1912.

As far as I am aware, this bird has not been hitherto recorded on the mainland of Africa, and the only species up to the present included in the South African list is the Red-tailed Tropic-Bird (*Phaëton rubricauda*, Bodd.) on the evidence of a tail-feather picked up on the beach at Port Elizabeth some years ago.

Variation of the Black Sun-bird (*Cinnyris amethystina*, Shaw).

In the 'Bulletin of the British Ornithologists' Club,' (vol. xxix. p. 65, 1912), Mr. W. L. Sclater directs attention to a "variation" or "mutation" of the Black Sunbird (*Cinnyris amethystina*, Shaw), in which yellow pectoral tufts, normally absent in this species, are present.

It may be of interest to mention that the Durban Museum has since received a second example, which agrees in every respect with the first. It was shot by Mr. George Bailey at Avoca in 1913.

III.—*The Curlew in South Africa.* By John Wood.

This is a shifty bird—we mean shifty in the sense that in wariness and in readiness for instant flight, the Curlew (*Numenius arquatus*) is usually a match for the expert stalker, whether he be after taking its life or its photograph; and here we might remark that anyone who has read bird-books of recent years knows sport with the camera brings problems in tactics and technique and knowledge of habits demanding higher qualifications than necessarily go with the "murder-aiming eye." These birds can only be approached by strategem, or circumvented by imitation of their whistle, as a few of the old poachers could do; and we are inclined to the opinion that they post sentries that rise first and give their cry, "pipe all hands aloft."

The Curlew is with us in numerous small flocks between October and February, as a migrant from Europe. Ten is perhaps an average number, and every person who has gone fishing upon the estuarine rivers of our south-east coast—but one sector of their distribution—knows the bird; its call has a haunting flavour, and he does not forget that it was an incident of the day. The muddy margins of those rivers are favourite feeding-grounds, and there it may be seen most days in summer walking or running about—at a safe distance,

as a rule,—or wading, and even swimming, amongst the sea-grass (*Zostera*) which in smoothly combed out tresses often fringes the water's edge; or it may also be observed doing a little vol-planing preparatory to settling upon some part of the beach, where they live as tide-waiters. Indeed, whilst in South Africa, their meal-hours are a sort of "moving-feast," and with the accuracy of an almanack return is timed to the ebbing surf from excursions up the rivers or out upon the veld, where flies and other insects, not savouring of salt, are snapped up for a change.

We have seen them in flocks, a mile or more away from the shore, at spots where the soil is loose, and worm-casts just after rain are as crowded as scale-insects sometimes are on an orange; but the marine crustacea, worms, and jetsam of the waves were their principal food whilst here, and impart that fishy flavour which may account for the repugnance to its table-qualities many persons brought up in this Colony are supposed to entertain. We daresay there is, too, in this the germ of a rooted superstition, as the bird is now and then alluded to amongst the coastal population as one of the uncanny kinds, darkly capable of spell-casting "Umtagati." It is a fact that in the West of Scotland the Curlew used to be forbidden meat, the breaker of this convention being uneasily regarded in his district as "the man who ate the Curlew"; and its Scotch name of "Whaup" seems derived from a vulture-beaked goblin that dragged its victims through the eaves of their houses. Significant, too, was the prayer of some generations ago to be "delivered from ghaists and lang-nebbit things"—that is, from creatures with long noses capable of poking deeply in other people's affairs. But the man who eats Curlew in Europe tastes something worth risking a little for, because that bird in the north, being chiefly a vegetarian and fresh-water feeder, can be relished as much as any fat Woodcock. Sportsmen are well pleased to have a few included in their bag, and the only disappointment is upon finding the Curlew's bulk is not so much as might be expected.

It is a drab-coloured bird with dark brown streaks on

most of its feathers, and with black and white markings, the *tout ensemble* of which one always admires when a specimen is in hand. As a member of the family of waders that specialise in bills and legs,—the Avocet, for instance, in the former and the Stilt in the other,—the Curlew for more than half the year hardly knows what it is to go dry-shod. Of its length of about 2¼ feet, six to seven inches are required for that down-curved crescent-shaped bill commemorated in the generic name of *Numenius*, meaning new moon. That organ is, indeed, a conspicuous feature, stamping the bird with a likeness in outline to the migrant Sacred Ibis, so much figured in ancient Egyptian art as the venerated harbinger of Spring and the precursor of the Nile's beneficent floods. The Ornithologist, however, claims to have an intelligent appreciation of the bill as a kindly device by Mother Nature, bringing its owner within reach of the very retiring small fry that might otherwise escape contributing towards the bill-of-fare. Those are typified by the mud-prawn and razor-bait eager anglers laboriously dig out of the slobbering silt by the river-side, but which the Curlew's bill expertly feels its way to. Not only is that of the right length, but at the tip sensitive nerves converge to guide the bird, in its probing for food, to seize what it cannot see. It thus can track a tiny crab in the ooze and overcome more complicated conditions than those met in the deep thrust of a sun-bird, or sphinx-moth, towards the unchanging position of the nectar in some tubular flower.

Etymologists differ as to the derivation of the name, but, since there is in the French form of "Courlieu" and the old English one of "Corylewe" quite a good echo of the bird's call, we may assume imitation was the origin. There does not seem to be an Afrikander name, and doubtless this is due to the Curlew being seldom seen up country. Our Ornithologists, however, report its having looked in, in passing, at Potchefstrom, Newcastle, Aliwal North, near Johannesburg, and a few other places well inland; and Sir Robert Maxwell mentions in his delightful "Memories of the Months" having startled a "Whaup" (its Scotch name) from some rietpan

near Kimberley, and was touched on the tender chords of sentiment to hear its note so distant from the accustomed moors in the neighbourhood of the Solway. He might have met some of his countrymen at Kimberley who would confess a preference any day for "the wheeple of a Whaup to the giggle of a Nightingale"; though certainly at that stage of its wanderings the Curlew could only give a feeble wintry reduction of that full, eerie, whinnying performance so effectively imitated by Silver Sand, the Gipsy, in Crockett's stirring novel 'The Raiders.'

We wonder if our poets have not been consciously playing full-dress to the gallery in showing themselves so impressionable towards the "unpremeditated lays" of the Nightingale, Lark, and Thrush, that more or less make music their trade, and whether their responses are not really in need of quickening for that "Call of the Wild" there come from the forlorn Curlew, or from a pair of Sea-Eagles screeching loudly as they waltz in a moderate breeze high above our shore headlands. These sounds in Nature seem to embody the very spirit of the out-of-the-way scenes in which they are heard.

The Curlew is a great traveller—cosmopolitan, indeed, as regards the Old World. It nests upon the heaths and moors of North-western Europe, including Britain, and also far away in that unfamiliar part of the world called the Tundra marshes of Siberia, amid dreary wastes of moss and lichen, a million square miles of moss-hags frozen hard two-thirds of the year, where the map shows here and there a hair, like a streak of a river, drawn across regions of emptiness. The rest of its life is passed south of the Line down to the Cape here, on the one side, and *viâ* India right to New Zealand, on the other. In those parts of South Africa where it mostly congregates it is a shore-bird, and we know it best on the Kaffrarian coast, where it occurs in fours and fives up to small parties of nearly a score as the season advances. A few remain all the year round, and why these also do not go away in seasonal migration we cannot exactly tell, any more than it is known yet why the odd ones remain in the

north and brave out the European winter ; possibly they are young birds in a backward state of development in respect of family instincts.

The Curlew has no domestic duties in South Africa, and we can say their numbers markedly increase during November, while early in February they begin giving us their farewell cries. It is then they set out to those distant lands above mentioned—any how, at that time of the year, one may know they have started night-flights by hearing their short plaintive calls long after sunset. We are under the impression they travel south-westwards along the coast, but do not positively assert they do, because it is quite possible the distant signal-whistles ascribed to the retiring flocks really proceeded from individuals approaching the listener, but generally the faint call from the west seems answered nearest overhead. Gilbert White, who was usually very apt in his descriptions, somehow saw nothing inappropriate in writing of the "Curlew's clamourings," but that is a word which may have passed through a shade or two of meaning since his day.

The Curlew seems to reach Britain in March and breed in the counties of the moors. We have read somewhere that along with the Lapwing they were directed by an ancient Scotch Act of Parliament to be destroyed as "ungrateful birds that came to Scotland to breed and then return to England with their young to feed the enemy." But the great majority on migration only make of England a half-way house of refreshment, as it has been called, where they recuperate for a still further flight, at the same time discovering their affinity in a mate, and thereafter streaming off to nesting-homes in northern latitudes. They are said to leave the south of England when the ice breaks in the Tundra 2000 miles away, achieving this in one night at an average of 250 miles per hour and arriving at their destination fresh as a daisy ! This looks more like the behaviour of a projectile, and not the possible exploit of any avian aviator; yet there are ornithologists who say they can prove this. But this is not all ! When the first broods are two months old they are despatched south-west to where their parents

had such pleasant times in Spring. It would seem that all the parents' knowledge and accumulated experience is transmitted to the offspring, even including that sort of psychic faculty which tells them exactly to the day when King Frost has lost his grip and growth has regained the mastery in their Siberian haunts. This mysterious sixth sense, we are told, is located in a perilymph just behind the ear, and without that perilymph it is as impossible of exercise as sight is without an eye. In proof of this, it is stated that a young Curlew which had lost its friends, and strayed to where it had no business to be, was examined by a knowing ornithologist, who succeeded in demonstrating that the usual duct behind the ear was so undeveloped that the bird could hardly do otherwise than wander from its fellows.

These may appear to some readers astonishing claims, and we must therefore explain that this brief statement of them is from a serious article in a serious magazine, "The Watcher and his Feathered Friends" in the 'Nineteenth Century' for May, where a good few other wonderful incidents illustrative of bird-sense are detailed.

East London,
July, 1915.

IV.—*Remarks upon some widely distributed Groups of Birds containing distinctive Family Traits.* By Ambrose A. Lane.

There has, I believe, been some opposition of late to the multiplication of new species and subspecies, the latter being often based upon some very trifling variation from a normal type. This, combined with alterations in the nomenclature adopted by the older naturalists, and hitherto generally accepted, tends to lead the study of ornithology into a path very intricate to follow, even by those who possess the leisure and facilities to give the matter thorough attention. For the amateur, and sportsman, who enjoys it as a spare-time hobby, it threatens to cause such bewilderment as may eliminate much of the interest and popularity which such a branch of scientific research may well attract. A certain amount of

co-operation in this, as in most other matters, should lead to the best organization for all parties interested to work upon; so that the anatomical expert in the museum laboratory can keep in touch with the field-naturalist and sportman, who studies the same species alive amidst their natural surroundings. Whereas the former may find deviations in structure or marking that may suggest a new species, the field-observer may encounter large numbers of closely allied forms possessing such characteristic traits that he would never think of classifying them as other than mere local variations of the same species—interesting enough in themselves, but not to be dissociated from the type represented by the genus to which they belong. In no way is this more striking to the traveller than the often surprisingly similar movements or utterances which confirm the individuality between species of the same family or genus, although separated by the widest geographical distribution, whilst now and again a strong connecting link will be found between species of widely differing families. Thus the Bush-Wrens (Pteroptochidæ), a very distinctive S. American family, show some striking similarities to the Gallinæ—most species of Bush-Wren, being chiefly terrestrial in habit, having immensely developed running powers, wings shaped like a Guinea-fowl, and possessing the same reluctance to take to flight, if they can escape by running. In addition, the very peculiar note of some species of Bush-Wren resembled the crowing of a Gallinaceous bird.

But these may be chance resemblances, or contracted by similarity of habit, as the Pteroptochidæ take the place in wooded slopes and glades on the S. Pacific coast which is economically occupied by the Pheasant-group elsewhere. Apart from these resemblances, which may be merely fortuitous, are the very decided characteristics of widely separated species of the same genus. Take, for instance, the genus *Turdus*. I have only seen to my knowledge two kinds in S. Africa, neither of which I had the opportunity of identifying as to the exact species, but even the most casual observation was sufficient to place them without hesitation in

the group of true Thrushes to which they belonged. The movements and utterances observed were as characteristic of the Thrush as those of *T. musicus* in England, or *T. falklandicus* in the Chiloe Archipelago, and probably as closely resembled by other Turdidæ equally far removed in other parts of the globe. In the same way, an equally close connection may be found in widely distributed forms of the common Meadow-Pipit—in fact, *Anthus correndera* of the Andean cordilleras, *A. pratensis* of the British Isles, and *A. leucophrys* of the Transvaal are almost indistinguishable to the casual observer in appearance, habits, and note. The genera *Parus* (Tits) and *Motacilla* (Wagtails) of the Old World though varying in colour and markings, are usually as identical in habits, both in the Northern and Southern Hemispheres, though represented in each by distinct species widely separated from each other. The same may be said of many other genera, such as *Lanius* (Shrikes), *Turtur* (Doves), *Saxicola* (Stonechats), *Caprimulgus* (Nightjars), and many more, showing striking family traits in appearance, habits, etc. The genus *Hirundo* (Swallows) has a fairly universal distribution, yet most of its species seem so characteristic as to be unmistakable whenever met with; and the same may be said of *Columba* (Pigeons), *Tinnunculus* (Kestrels), *Buteo* (Buzzards), *Ardea* (Herons), *Fulica* (Coots), *Gallinula* (Waterhens), *Gallinago* (Snipes), *Anas* (Ducks), *Charadrius* (Ring-Plover), and many others which occur both in the Old World and the New. Whether a Coot be *F. gigantea* on an Andean lagoon, *F. atra* on an English lake, or *F. cristata* on a S. African dam or vlei, there is no mistaking the bird for a *Fulica*. There is somewhat more variety in appearance and colour between *C. araucania*, *C. palumbus*, *C. livia*, *C. phæonota*, and others from localities scattered all over the globe; but each *Columba* is so true to the Pigeon-type that we cannot fail to identify it as a close connection. Sea and shore birds do not show so much variety of species, as the latter have usually such an extensive range and the conditions of existence being more uniform than in the case of land-birds that local varieties are apparently less

developed, except in the case of the Penguins, Cormorants, and a few others whose powers of locomotion are limited.

A much greater variety in appearance and form is to be found amongst those species of the Plover-family of the Lapwing-type. The English "Peewit" (*Vanellus vulgaris*), the S. American "Fraile" (*V. cayennensis*), and the two S. African genera *Stephanibyx* and *Hoplopterus* ("Kievietje"), and probably many others, all possess the same family traits, although the Peewit has a more graceful mode of flight and does not make such a clamour as the other species mentioned; still they are each most characteristic of their type, and none of them could well be mistaken for any other. Those birds which attach themselves to human habitations usually acquire a wide range, but seem subject to diverge into local types, though still bearing close resemblance to the original stock. Such is the case with the Sparrow (*Passer*) in the Old World; it did not originally exist in the New, so far as I know, but its place is taken all over temperate S. America by the Diuca Finch (*D. grisea*), whose white throat and light slate colouring give it a vastly different appearance—but in its attachment to human habitations, its nest, and eggs, it is as much of a Sparrow as the S. African "mossie." On the other hand, the S. American Song-Sparrow (*Zonotrichia pileata*) resembles the genus *Passer* more or less in plumage, but its song and habits are more like those of the Chaffinch.

In conclusion, I would suggest that in any scheme of classification one should hesitate before subdividing any existing species, unless very conclusive reasons exist for doing so.

It also appears to me that we have already too many genera. Certain species very closely connected in habits and presenting marked characteristics of one particular family may vary slightly in structure, but this should not entitle them to a separate genus—in fact, to the field-naturalist and sportsman, who wishes to identify such species in their natural haunts, it often causes some confusion. We want our local lists to be of practical use, and a classification that can be readily comprehended and practically applied.

V.—*Birds of the Kaffrarian Frontier.*

By Frank A. O. Pym, Curator, King Williams Town Museum.

To the list of 290 Birds of the Kaffrarian Frontier, which appeared in the Journal of the S.A.O.U. in October 1909, the following species, which have since been observed, should be added :—

Estrilda subflava. (Orange-breasted Waxbill.)—Rare. Specimens collected K. W. Town, December 1912 ; Amabele, June 1913.

Spermestes scutatus. (Hooded Weaver-Finch.)—Apparently a migrant.

Pyromelana taha. (Taha Bishop-Bird)—Uncommon. Examples observed at Pirie Halt, February to April 1911.

Vidua paradisea. (Paradise Widow-Bird.)—Very rare. Specimen taken at Breidback, January 1909.

Certhilauda rufula. (Rufous Long-billed Lark.)—Bolotwa, June 1912.

Anthus nicholsoni. (Nicholson's Pipit.)—Pirie, July 1910.

Anthus pyrrhonotus. (Cinnamon-backed Pipit.)—K. W. Town and Pirie.

Anthobaphes violacea. (Orange-breasted Sun-bird.)—Very rare. Specimen taken, Pirie Forest in October.

Laniarius maraisi. (Marais's Bush-Shrike.)—Rare. Pirie Forest, May 1909.

Parisoma layardi. (Layard's Tit-Babbler.)—Pirie Forest.

Phylloscopus trochilus. (Willow-Wren.)—Migrant. K. W. Town, November to March.

Cryptolopha ruficapilla. (Yellow-throated Flycatcher-Warbler.)—Scarce.

Chlorodyta florisuga. (Eastern Black-breasted Bush-Warbler.)—Pirie Forest.

Cisticola tinniens. (Levaillant's Grass-Warbler.)—Pirie Forest.

Acrocephalus bæticatus. (African Reed-Warbler.)—Observed in Pirie Forest.

Eremomela flaviventris. (Yellow-bellied Bush-Warbler.)—Bolotwa.

Cisticola natalensis. (Natal Grass-Warbler.)—Pirie, Dec. 1911.

Emarginata sinuata. (Sickle-winged Chat.)—Kei Road.

Saxicola familiaris. (Familiar Chat.)—Pirie Forest.

Hemipteryx minuta. (Little Pine-pine Warbler.)—Not uncommon. Very similar in appearance to *Cisticola terrestris* (Wren Grass-Warbler).

Muscicapa grisola. (Spotted Flycatcher.)—Rare. One specimen taken near K. W. Town, 24th March, 1909.

Campophaga hartlaubi. (Hartlaub's Cuckoo-Shrike.)—Rare. St. Matthews, October 1914.

Psalidoprocne holomelæna. (Black Rough-winged Swallow.)—Not common.

Cypselus barbatus. (Black Swift.)—Abundant at Pirie at certain seasons.

Thripias namaquus. (Bearded Woodpecker.)—Rare. Specimen obtained from Great Kei Drift, August 1910.

Coccystes hypopinarius. (Black-and-Grey Cuckoo.)—Uncommon. Erroneously recorded in my previous list as *C. jacobinus*.

Centropus pymi, spec. nov. (Pym's Coucal.)—Uncommon. This bird was recorded in my previous list as *C. superciliosus*, which apparently does not occur here.

Bubo lacteus. (Verreaux's Eagle-Owl.)—Rare.

Tinnunculus naumanni. (Lesser Kestrel.)—Seen here in large flocks from October to end of March.

Tinnunculus amurensis. (Eastern Red-legged Kestrel.)—Rare.

Milvus ægyptius. (Yellow-billed Kite.)—Recorded at Pirie by Rev. R. Godfrey.

Melierax niger. (Black Gabar.)—Very rare. Specimen received from Toise River, March 1910.

Circus cinereaceus. (Montagu's Harrier.)—Rare. Specimens shot in open country near K. W. Town, March 1909.

Leptoptilus crumeniferus. (Marobou.)—Very rare. A specimen was killed near K. W. Town, February 1910.

Pseudotantalus ibis. (Wood-Ibis.)—Rare. I observed four specimens at the Keiskama Mouth in March 1910.

Platalea alba. (African Spoonbill.)—Very rare. Specimen shot at Keiskama Hoek, January 1913.

Phœnicopterus roseus. (Greater Flamingo.)—Uncommon. Keiskama Mouth, December 1912.

Turnix nana. (Natal Hemipode.)—Uncommon.

Porphyrio madagascariensis. (King Reed-Hen.)—Rare. Specimen from Ndabakazi, April 1914.

Ægialitis marginata. (White-fronted Sand-Plover.)—Common at East London.

Totanus hypoleucus. (Common Sandpiper.)—Have not seen it inland; but it occurs at certain seasons along our coast.

Totanus glareola. (Wood-Sandpiper.)—Not uncommon at East London and Keiskama Mouth.

Sterna cantiaca. (Sandwich-Tern.)—Common at Keiskama Mouth, Nahoon, and East London.

Majaqueus æquinoctialis. (Cape Hen.)—Specimens observed at East London and Keiskama Mouth.

Diomedea melanophrys. (Mollymawk.)—East London.

VI.—*Birds in Relation to their Prey: Experiments on Wood-Hoopoes, Small Hornbills, and a Babbler.* By C. F. M. Swynnerton, F.L.S., F.E.S., C.M.B.O.U.

The habits of birds in relation to their insect-prey are of much interest from an entomological point of view, owing to their bearing on the subjects of insect-coloration and economic entomology; and it was in this connection that I myself originally undertook the series of experiments of which those recorded in the present paper are a small part.

It was inevitable, however, that the experiments should prove highly interesting from an ornithological view-point too; and I am selecting for this paper three short series in particular that seem to me between them to illustrate a number of points of ornithological interest, without being to any too wearisome extent mere lists of insects' names.

The Prey.—Butterflies were used mainly, but by no means entirely. This was partly for convenience, partly because it is this suborder of insects that has been and can be best studied from the point of view of coloration. That it was correct to offer butterflies to *Telephonus* and *Lophoceros*, I know from having seen wild individuals of these genera attacking them. I have no such definite records for *Crateropus* and *Irrisor*, yet I cannot help thinking that the former

genus, in particular, will be found readily to attack butterflies under favourable circumstances, and I will discuss the point for *Irrisor* under its own heading *.

A brief and rough account of some of the chief insects to be mentioned may be of use to those of my readers who, not being entomologists, do not know them by name, yet are well acquainted with their appearance in the field :—

The Danainæ (represented in these experiments by the genera *Danaida* and *Amauris*) and the Acræinæ (by *Acræa*), each a subfamily of the Nymphalidæ, are the two groups *par excellence* of African butterflies, the members of which are frequently objectionable to their enemies. All, too, are more or less sluggish and fearless. Indigestibility is the real defence, accompanied in *Amauris* by a pungent gas-like smell, in *Acræa* by an abundant and readily exuding poppy-flavoured fluid, in *Danaida* appreciably by neither.

Danaida chrysippus is our commonest large South African butterfly. It is chestnut, with a black fore-wing tip that is crossed diagonally by a very conspicuous white bar. It has excellent mimics.

Amauris (also a genus of large butterflies) is roughly of two types—with a large *white* hind-wing patch (*A. ochlea* and *A. dominicanus*) or a large *buff* hind-wing patch (*A. echeria*, *lobengula*, and *albimaculata*). Fore wing black with white markings.

Acræa has very numerous species, large and small, mostly red or reddish brown with black spotting. Abundant everywhere. Of the species most used in these experiments, *A. caldarena* is common and has a large black tip to the fore wing, *A. terpsichore* (also called *buxtoni* and *serena*) is

* The food-hunting habits of *Crateropus* are not so very different from those of *Phyllastrephus*, and I have seen members of the latter genus attacking butterflies. The food of *Crateropus*, again, is very varied. I have myself taken ants, termites, and various beetles, grasshoppers, and larvæ, as well as Hymenopterous, Dipterous, and Lepidopterous remains from its stomachs; and four stomachs that I have just examined with some care *all* contained débris of the last-mentioned kind—I cannot say whether of butterflies or moths.

smaller and of a very bright orange-chestnut above ; *A. acara* (mimicked by dry-season *Precis natalensis*), *A. areca*, *A. anemosa*, and *A. natalica* are three very large species, the former especially, with a very brilliant red male, and all with bold black markings. *A. aglaonica* is only as large as *A. caldarena*, but a brilliant species.

The Nymphalinæ and Satyrinæ never (in my experience) descend to the depths of unpleasantness displayed by the other two Nymphalid subfamilies, though some are moderately objectionable, and the Nymphalinæ in particular comprise many of our most active, edible, and protectively-coloured butterflies. Of the species mentioned in the following experiments, *cebrene*, *chelia*, and *böopis* are three smallish species of *Precis*, with highly protective undersides and with more or less dark blue on the hind-wing's upper surface (and in *cebrene* much ochreous yellow), that keep flying on and settling in the path ahead of a walker. *Precis natalensis*, wet-season form, is a bright salmon-red, rough mimic of an *Acræa*, its dry-season (*sesamus*) form a large black butterfly with much blue on the upper surface. *Precis archesia* and *artaxia* are two browner forms, the latter with a "peacock" eye on each hind wing and a leaf-like underside. All are ground-settlers and all are wary. *Atella phalantha* (foliage-frequenting), *Byblia* and *Catacroptera cloantha* (grass) are bright fulvous-orange insects with black markings above, the last-named butterfly somewhat hairy on the under surface, and the first and the last with much wariness and activity. *Hamanumida dædalus*, a ground-settler, is a grey-brown butterfly above with guinea-fowl spotting, and is also active and wary, as is *Pyrameis cardui*, the well-known "Painted Lady." *Leptis* and *Eurytela hiarbas* are small, black, foliage-haunting butterflies with a white band across both wings on each side and a flicking flight. The larger *Charaxes* are very heavy-bodied, strong, fruit-eating butterflies—*C. brutus* being like a large *Eurytela hiarbas*, black, with a white diagonal stripe across both fore and hind wing. *C. neanthes* is a small species, rather *Atella*-like in coloration, but paler and with tails.

Of the Satyrines used, *Yphthima*, *Mycalesis*, and *Henotesia* are small, brown, low-flying butterflies, the first two with feebler flight and relatively fearless habits, the last, a paler brown, better at hiding itself, and usually warier.

In the Piniæ, or "Whites," *Terias* comprises the small bright yellow butterflies so common in South Africa, *Belenois* medium-sized whites with dark margins and (often) nervures, *Mylothris* with an orange base to the wings, and *Leptoria* the small, delicate, dainty "wood-whites." All four, and the last two particularly, seem to come low in the estimation of the average bird, and they possess mimics. *Catopsilia florella* is the common, large, strong-winged "white," with some females white, some yellow, and with a very active flight. The removal of its strongly-attached stiff wings sometimes gives a bird much trouble.

The Papilioninæ comprise our Swallow-tails—some, it is true, without the swallow-tail. Of those to be mentioned, *Papilio demodocus* (often in Agricultural Journals called *demoleus*, but that is the Indian form) is the very large yellow-and-black-chequered butterfly, the larva of which is so destructive to orange-trees. *P. lycus* is the large, common, black butterfly with a metallic blue or green bar across both wings (represented by white on the male's underside). *Papilio angolanus*, also common, is white with a broad, black, white-spotted margin that in the fore wing occupies in addition the whole apical half, and with crimson bars to its wings on their under surface. *Papilio dardanus* is, in the male, a very large lemon-yellow butterfly with swallow-tails, a black fore-wing margin and apex, and a broken, black, submarginal band in the hind wing. Its females nearly resemble it in Madagascar, but in Africa resemble closely instead various quite unrelated butterflies belonging to the Danainæ and Acræinæ, lack the swallow-tails, and are known as forms *cenea*, *hippocoon*, *trophonius*, &c.

The remaining insects used hardly require description here. It will be seen that on *Crateropus* (of the birds here dealt with) I tested various other defences besides nauseousness. Birds' methods, as against each of these, and other

interesting considerations arising out of the experiments, I will deal with in my concluding remarks.

Irrisor erythrorhynchus (Lath.).

1909, Jan. 9.—Three Wood-Hoopoes of this species were brought to me to-day by Isitiki. He had just taken all three roosting together in a hole in a large Mutsatsa-tree (*Brachystegia randii*) ten or eleven feet from the ground. He had had to enlarge the hole with his axe in order to insert his hand.

Now, all three birds had the red bill, though it was perfectly obvious, from their mutual behaviour, that at least one of them was the young of one of the others. This was at once interesting, for it suggested a date by which the red bill is assumed (the young bird being unlikely to date from before the previous breeding-season), and at the same time showed that the young remain with their parents and are still, to some extent, under parental guidance in matters of food-choice, &c. [a later incident will illustrate this well], for, at any rate, close on a year after birth.

The birds were rather shy (as was natural), but, with a little timidity, accepted food from me at once (the large dull-coloured Noctuid moth, *Sphingomorpha chlorea,* and, rather less readily, grasshoppers). Not only so, but they *thank* me (as I judge) for what I give them, in the most quaint and fascinating manner. Accepting each insect in the point of the bill, the bird rises up and down, bill held vertically upwards, tail dragging backwards and forwards on the floor of the cage (for the birds, even when using the perches, still descend at my approach) in the quaintest of oft-repeated bows, and only after this will it jerk the food into the back of its throat and swallow it. It will swallow it, that is, if it has not already been taken from it by one of its companions! [That the birds should have been too friendly at once is to be regarded, I think, as correlated with the fact that they are probably highly disliked by enemies. At any rate, such bird-eating animals as I have

myself offered the species to have shown the very *greatest* repugnance to it.

My offering of butterflies to these birds will be criticised by those who are only superficially acquainted with their well-known bark-searching habits and with the habits of the butterflies that inhabit the same wooded pastures. That cockroaches, wood-lice, and bark-haunting beetles and larvæ would have been *better* may be at once admitted. But many butterflies rest on bark, some, as *Crenis* and some Lycænids, habitually, whether temporarily or for their prolonged rest. Again, this *Irrisor*, as I have occasionally seen, will sometimes attack insects passing close on the wing; and *Danaida*, *Acræa acara*, and various smaller Acræinæ, *Yphthima*, various species of *Precis* and of some other Nymphaline genera, and *Terias* and *Belenois* amongst Pierines, are not only the most conspicuous of such passing insects, but they are so abundant in *Irrisor*'s hunting-ground that they are really quite likely to be the fairly frequent mark of such attacks, experimental or for food, as I have referred to. My own experience of the bird by no means leads me to endorse the view that it necessarily feeds chiefly on cockroaches, and the stomachs of six specimens collected for me by Odendaal in 1907–8 also suggests a very varied diet. The contents are spread before me as I write this, and a glance over them shows that beetles come easily first in importance—beetles of various families, and not all of them of bark-haunting species. Next come larvæ, including two moth-larvæ that feed on the foliage of *Brachystegia*. Grasshoppers, spiders, green Pentatomid bugs that frequent foliage, cockroaches—one or two of each,—and a Tipulid fly (I think) are also present. No butterfly-remains are visible, but I have placed a small sample of débris from each stomach under the microscope, and in one (Odendaal's No. 309) have found the scales and socketed membrane-scraps of some Lepidopteron—whether moth or butterfly, I cannot say.

Expt. 501. Jan. 10.—It became fairly clear in the course of the following experiment that A, with long bill and tail and the usual adult green gloss on the head, was a parent

of C. B, with the same green gloss and long tail, had a shorter bill and her relationship was less obvious, as she was timid and kept in the background. C had a shorter tail and a short but red bill and a blue head. A takes the lead in everything, from bowing to attempting to demolish the cage. He is probably the male parent, B the female parent, and C the young bird.

I placed in the cage a number of grasshoppers and locustids of various species intermingled with ten individuals of the common, fairly large Noctuid moth *Sphingomorpha chlorea*, very greatly liked by my birds generally, a small heap of larval migratory locusts, and twenty-four butterflies, also the sluggish and unpleasant-seeming whitish day-flying moth, *Olapa nuda*.

They were put in at 9 A.M. Shortly afterwards the birds began to feed, selecting only the Sphingomorphas. At 10 A.M. the locust-heap was still fairly intact, *all* the Sphingomorphas were gone, wings and all (only one individual wing left), the *Olapa* lay unmolested though conspicuous (probably known and disliked by the birds in their wild state), and nearly all the grasshoppers had been eaten. Six were still left.

At 12.20 P.M. all the locusts and the remaining six grasshoppers were gone completely, with the exception of one or two insignificant fragments. The butterfly results were unreliable, for the weather was unusually hot and dry and the thorax, at least, of all but the form *Papilio angolanus* was already fairly dry and the wings stiffening before the experiment began. Still a *Hamanumida dædalus*, a *Precis natalensis* (wet-season form), a *Precis archesia* (wet-season form), two *Precis artaxia*, a *Precis ceryne*, a *Precis cebrene* (out of three, the others much broken up, but very dry in any case), and a *Precis boöpis*, var. *madagascariensis*, and a *Belenois mesentina* had been eaten (with the exception, in some cases, of battered-off fragments. The moth *Olapa*, the four *Papilio angolanus*, the Pierine butterflies *Belenois severina* (two), *Teracolus phlegyas*, *Mylothris* sp., *Terias* sp. (two), and *Pinacopteryx pigea*, also the only *Acræa* of the

experiment—*A. areca*, ♀, a large species normally well supplied with readily exuding poppy-flavoured fluid—were uneaten, with the exception of an abdomen each of a *Belenois* and the *Teracolus*. On my opening the tray a *Belenois severina*, which had fallen behind it, was picked up and swallowed.

It is probably more than a coincidence (making all allowance for the drying of the butterflies) that all the Nymphaline butterflies of the experiment should have been eaten or (in the case of the two remaining dry *Precis cebrene*) heavily attacked—all of them, with the defences of procryptic underside or great activity and wariness strongly developed; while the white and bright yellow Pierines except *Belenois*, a highly conspicuous black and white *Papilio* with crimson underside wing-bases, and a sluggish day-flying moth were left—tried indeed (but the *Pinacopteryx* and *Catopsilia* showed merely very slight wing-damage), but rejected.

In general, the Noctuid moth *Sphingomorpha* had been preferred to dull-coloured grasshoppers, these probably to the larval migratory locusts, and these again to any butterflies —though the drying of the latter (some of which were attacked early) may have accounted sufficiently for their low placing.

502. Jan. 10 (later experiment).—In this I offered the butterflies individually by the forceps, mostly through a narrow crack in the woodwork of the cage. With the exception of the butterflies specified and of the first *Papilio angolanus*, left over rejected from the previous experiment, but used again because still supple, all were probably caught, and the birds' general attitude towards them contrasted with the disinclination displayed for the more or less dry butterflies of the previous experiment.

A took the *P. angolanus* in the point of his bill and dropped it, having obviously no use for it (it was wingless, too), but he tasted well and readily ate two *Precis artaxia* (dull brown and very leaf-like underside) and wrenched from the forceps a thorax of *Precis natalensis* (dry-season form), C taking the abdomen. I offered a dry one. He ran it from side to side

through his bill and dropped it; but ran through his bill for a few seconds and *swallowed* a fresh one. Rejected another dry one, but tasted and at once swallowed a further fresh one and a *Precis madagascariensis*. He then took a *Catopsilia florella*, tasted it, and turning right round to C, who was behind him, gave it to her; tasted a second one and ate it himself; accepted a *Papilio angolanus*, ran it from side to side in the point of his bill, bowed to me several times, still holding it, then ran it through his bill again and swallowed it; took the very favourite moth, *Sphingomorpha chlorea*, away from C and swallowed it himself; accepted a *Byblia*, but allowed C to have it; and accepted five larval migratory locusts. He swallowed the first three of them, but deliberately turned round and passed on the fourth to C. The fifth he also offered to C, but, on the latter bird's ignoring it, he ate it himself.

C tasted and readily swallowed two *Precis artaxia*. I offered a third. This time she was watching the crack eagerly and darted her bill right into it, seized the butterfly directly it appeared on the other side, and promptly swallowed it, treating a fourth in exactly the same way; then wrenched from the forceps the abdomen of the *P. natalensis*, of which A simultaneously secured the thorax, swallowed it; accepted, tasted, and readily swallowed the *Catopsilia florella* handed her by A, and a second, also a *Papilio angolanus*, a *Terias*, two more *P. angolanus*, two *Byblia* (species not stated, but probably *goetzius*), and an *Ypthima* near *impura*; accepted a moth, *Sphingomorpha chlorea*, but (as already related) had it taken from her by A; then took from A, with his apparent consent, a *Byblia*; accepted and ate the first larval migratory locust offered her by A, and ignored the second.

B, on my accidentally dropping a wingless *Precis natalensis* at the commencement of the experiment, rushed forward from the back of the cage, picked up, in apparent mistake for it, the wingless *Papilio angolanus* that A had just rejected, tasted it, and swallowed it—then found and ate the *Precis*, too. Later in the experiment she tasted and ate a *Terias brigitta*.

Comments.—The incident in which A rejected dry, but ate

fresh, butterflies of the same species is instructive for its bearing on the last experiment. His offering to the younger bird, C, two butterflies and a migratory locust, yet wresting from her the *very* favourite Noctuid moth *Sphingomorpha* was of interest. I judge, though I do not find it definitely stated, that the butterflies of this experiment were all offered without wings. All that can be said about preferences (unless the rejection of the first *P. angolanus* by A be regarded as reliable) is that the birds were obviously hungry enough to gladly eat any of the butterflies used, and that they had no objection to eating them when they *were* hungry enough.

503. Jan. 11.—The birds were first supplied with food in order that their acceptances might not be the result of hunger. While they were engaged in feeding, I offered—with a view to ascertaining to what extent, if at all, they were hampered by the wings of butterflies and moths respectively—first, a *Catopsilia florella*. A took it and, after a good deal of difficulty and ineffective fumbling, succeeded in taking off all but one hind wing with the point of his bill and swallowed the butterfly. He *easily* swallowed a *Sphingomorpha chlorea*, head first, wings and all; but of a second clipped the wings off with his bill close to its sides before swallowing the body. He then took the huge brown moth, *Nyctipao macrops*, so common under eaves and in out-houses, and, after some slight ineffectual attempts to clip off the wings, succeeded in getting its abdomen in a firm grip between claw and pouch, and then with comparative ease and precision levered off each wing separately at its junction with the body, using the point of his bill. He then jumped with it to the ground (probably to escape the unwelcome attentions of C), and with several snips of the basal half of the bill severed the abdomen from the thorax. The former he swallowed himself, and the thorax he offered to C. C accepted and swallowed it readily. She had just before taken from me a *Catopsilia florella* and swallowed it head first, wings and all, with a great deal of jerking and difficulty.

It seemed that while wings hampered the birds, they

failed to deter them. The methods employed were quite interesting.

The rest of the experiment ran as follows:—A ate a *Precis archesia* (wet-season) and a *P. artaxia*, C three *P. artaxia*. The last she eagerly swallowed down without even waiting to give it the usual preliminary tasting, and both she and A at once eagerly stretched up to the crack for the next that might be coming. A secured it and, having tasted it, handed it over to C, who eagerly swallowed both it and another. She then ate two *Precis natalensis* (wet-season). A third was taken by A and passed on by him to C. C held it for a few seconds in the point of her bill without swallowing it, whereupon A again seized the butterfly with apparent impatience at C's dallying, extracted it after a short struggle from C's grip and swallowed it himself; then accepted and ate two more *P. natalensis* without troubling to offer them to C. Each bird then ate a *Belenois mesentina* and A a Painted Lady (*Pyrameis cardui*). C took a *Papilio angolanus*, but delayed, as before, to eat it, and A, as before, grew impatient and suddenly snatched away the thorax; C promptly swallowed the abdomen, and turning on A reannexed the thorax and swallowed it too, then ate two more of the Papilios in quick succession. A *Papilio lycæus* (large, black, with blue diagonal stripe) that C next accepted was taken from me by A,and by him tasted and at once swallowed. C quickly ate a *P. angolanus* and a *Byblia*. A took a *Terias* (small, bright yellow butterfly) twice in the point of his bill, and each time threw it away without bothering to taste it. It was picked up by B, who was all the time at the bottom of the cage—the more timid of the three birds,—and dropped, picked up again, and when I saw it last, several minutes later, was still being held in the point of the bill uneaten.

Apart from this rejection of the *Terias* and the hesitation to eat it shown by B, the main interest of the experiment lies once more in the attitude of A to C. A was quite prepared to offer food to C, but said "If you are not hungry enough to swallow it promply, I am! You had better give it back again!" The *Lycæus* incident was probably in

line with that of the *Sphingomorpha* in the last experiment, a temptation too strong for A—for *P. lycæus* has been by nearly all my birds liked much better than *P. angolanus*. But A's general attitude was like that of some Bulbuls (*Pycnonotus layardi*) that I have since watched feeding a young bird. If the latter were insufficiently hungry for an insect brought, this was always taken back and eaten by the parent.

504. Jan. 11 (evening).—Five *Papilio angolanus*, a *Hypolimnas misippus*, four *Precis natalensis*, a *Neptis agatha* (wings and all), and an *Atella phalantha* were eaten between them by the three Hoopoes. No refusals, so the experiment merely indicates readiness to eat certain butterflies under certain conditions of appetite.

505. Jan. 12.—B ate three *Terias*, and A ate three *Terias*, wings and all, but took the next three by the wings and dropped them without further tasting. He ate, in the course of the experiment, four *Precis natalensis* (wet-season), nine *P. artaxia*, and one each of *P. archesia* (wet-season), *P. ceryne*, and *P. cebrene*—all these in rapid succession. He showed more and more eagerness during the offering of the nine *P. artaxia*, towards the end passing his bill through the crack in the wood through which I was passing them directly the preceding one was swallowed, and pushing and fumbling eagerly through till the next one came.

506. Jan. 13.—An interesting experiment. I placed in the birds' food-dish two *Danaida chrysippus* (a large chestnut butterfly with a white bar across the fore-wing tip, common everywhere and believed to be highly nauseous) and four dull Noctuid moths, *Sphingomorpha chlorea*. A and B at once tackled the latter, eagerly eating them all after stripping them of wings. A gave one thorax to C. He then picked up a *Danaida chrysippus* by the wing in a gingerly manner and dropped it again, and both birds (A and B) then retired to their perches and took no further notice of the butterflies.

I then offered, in the usual way, through the crack, a *Danaida chrysippus*. The wings were not seen, as I only placed the body in the crack. A, watching eagerly for what was coming through, tasted the thorax and refused to have

anything further to do with the butterfly, ate a *Sphingomorpha chlorea*, looked closely at a *wingless D. chrysippus*, and refused to take even this. On my offering the same butterfly through the bars directly to C, the latter at once took and swallowed it, probably hungry enough. But she refused a second without tasting, two or three times. I offered it to A. He would have nothing to do with it. But C leant across, snatched it from the forceps and began to run it through her bill. A most interesting scene ensued. A at once pushed up against C, rubbed his bill against the perch (a very common sign of dislike in insectivorous birds), croaked, once (after several attempts —a slight struggle) seized the *Danaida* as it projected from C's bill, and let go again in an emphasized manner, repeated these manœuvres—seemed, in fact, to be trying, by every means in his power, to dissuade C from eating the butterfly. C, however, continued to run it from side to side through his bill for a good many seconds after A had ceased his efforts, and then finally rejected it. I now offered a wingless *Hamanumida dædalus* through the crack. A regarded it with suspicion, took the abdomen and at once dropped it. C tasted the thorax *very* thoroughly and swallowed it. I offered another. A took it, ran it through his bill time after time, evidently suspicious of me and tasting it very thoroughly, and finally swallowed it. Then A, B, and C each ate a *Sphingomorpha chlorea*.

A's attempt to dissuade his nearly one-year-old offspring from eating a *Danaida chrysippus* was an incident of quite exceptional interest, as showing how long the parental influence in such matters may continue.

507. Jan. 15.—A readily accepted and ate, after tearing off all but one hind wing, a *Catopsilia florella* with wings, reached up twice and looked at a *Precis natalensis* (wet-season form reminiscent of *Acræa acara*) *with wings*, and sank down without attempting to take it. On my persisting in offering it to him, he just snatched it from the forceps with the point of his bill and threw it violently to the other side of the cage. But he accepted and readily ate two butterflies of the same species and form *without* wings, examining the first for a

second before taking it, but stretching up eagerly for the second ; and he afterwards bowed to me steadily for nearly a minute, with the latter in his bill, before swallowing it. I offered another to C, but A leaned over and snatched it away before she could reach it and at once ate it, afterwards readily eating two *Precis artaxia* in succession and a *Precis madagascariensis*, all without wings, and two more of the last-named species with wings (turned to show the eye-spots). Two more without wings were eaten, one by B and one by C, and one *with* wings was taken by C. After a great deal of trouble she stripped off the wings, but accidentally dropped the butterfly. She at once descended and made a great search for it, failing, however, to find it.

A ignored absolutely a *Danaida chrysippus* with wings, reached up and examined a *Byblia* with suspicion, and retired again. On my reoffering it, body first and with only one hind wing still attached, he tasted it and readily swallowed it, regarded with suspicion an *Atella phalantha* with its bright fulvous-orange upper surface displayed, but took it and nearly stripped it of wings, then dropped it. Reoffered, he tasted and this time swallowed it.

Now, very curiously, he accepted a *Danaida chrysippus* with wings, without apparently much more hesitation than in the case of the *Atella*—perhaps his experiences here may have suggested to him that he was sometimes wrong in his suspicions!—stripped it slowly of its wings, and finally dropped it. I offered another. This A partly stripped of wings, running it time after time through its bill. Eventually, to my surprise, he swallowed it. C, who had been watching her father eat it, with some hesitation accepted one too, stripped it of wings and swallowed it. A reached up to an *Acræa acara* with wings that I now offered, examined it, and at once sank back and refused to have anything to do with it. On my persistently reoffering it, however, he allowed himself to be persuaded. He took the butterfly, partly stripped it of wings, and swallowed it. B also fell a victim to my blandishments. She partly stripped a *P. chrysippus* and ate, at all events, the abdomen, leaving the greater part of the thorax.

"And then the troubles began to brew." Four minutes after his last acceptance A pointed his bill, wide open, downwards and commenced to strain. A brown fluid like tobacco-juice exuded in some quantity. This was followed by a small pellet composed of two wings of *Danaida* together with a mass of legs and smaller particles that perhaps represented the soft parts of the body. C then followed suit with exactly the same symptoms. Both birds looked the picture of dejection and misery, and kept on straining at short intervals without bringing anything up. A finally brought up another mass which I did not at once examine, but which presumably included the *Acræa acara* and some remnants of the *Danaida*. B had not been sick up to the conclusion of the experiment, but, like the others, looked dejected.

I next offered A and C *another Danaida* with wings. They both refused it several times in succession. After the first one or two offerings, they would, each time it appeared through the crack, both start rubbing their beaks against the sides of the cage and on their perches with every sign of disgust, looking at me all the time as much as to say "That isn't nice." Two or three times they reached up and (still with an eye on me!) nearly closed their bills on the *Danaida*, but flung their heads violently to one side before actually doing so, and reverted to the bill-rubbing performance. It was an exceedingly clear piece of bird-language.

I next offered a *D. chrysippus* with the wings removed. Both birds examined it closely and refused to touch it. I offered an excellent mimic of the *Danaida*—namely, female *Hypolimnas misippus*, with wings. It was refused by both birds, without tasting, several times. I then offered it without wings. The difference in colour between the two butterflies, even with wings removed, is but slight. The *Hypolimnas* is a little stouter and "Nymphaline," and there are one or two differences in detail—the white spots, for instance, extending conspicuously on to the underside of the abdomen in the mimic,—and there is a somewhat different appearance in the external "texture." A examined the insect

suspiciously, and finally decided against it. C examined it closely too, and ended by slightly tasting it and taking it from the forceps, but she too was very suspicious, and in the end dropped it. Even then she wavered, for she leant right over it and was obviously debating whether to pick it up again. But she didn't. A *Teracolus phleggas* ("Purple-Tip") was taken in its bill by each bird, but suspiciously dropped. A *Sphingomorpha chlorea* was eagerly eaten by each. The *Teracolus* was perhaps reminiscent of *Mylothris* or *Belenois*, both low-grade insects, or else, being somewhat low-grade itself, the birds were not hungry enough for it.

I reoffered the *H. misippus* after half an hour's interval. Both A and C still regarded it with the greatest suspicion, and refused steadily for certainly from two to three minutes to have anything whatsoever to do with it. Finally, C accepted it, ran it through his bill several times, tasting it very thoroughly, and swallowed it. I offered a *Teracolus phleggas* with wings. It was taken by A, thoroughly tasted and swallowed.

I later examined A's second pellet. It contained the abdomen, hind-wing ,and greater part of thorax of the *Acræa acara*, the thorax and abdomen of the *Danaida*, and the head of one or other of these two, as well as a few legs and smaller indistinguishable particles. No portions of other butterflies or of *Sphingomorpha chlorea*.

Comments. The experiment was full of interest. The refusal of *Precis natalensis*, offered for a change with wings, was presumably due to its resemblance to *Acræa acara*, which the birds should have met with fairly frequently when wild. The eating by A of the normally refused butterflies *Danaida chrysippus* (he had warned C against it only yesterday) and of *A. acara* under my persuasion was interesting, but the results were yet more so ; though they are paralleled by the effect produced by such butterflies on several other species of birds on which I have experimented. The lesson was effective, for the Hoopoes would not touch another *Danaida*. Then the language by which they tried to convey to me that they regarded it as unfit for food—in the then

state of their digestive capacities—was of the greatest interest. Bill-rubbing (though also used merely to remove fluff or saliva, &c.) is a widespread bird-term for refusal of food, and I have (as stated in another paper) produced the simultaneous wiping of several bills in various differently-inhabited cages by merely holding up a highly unpleasant insect in front of them. To almost close the bill on food and then draw away expresses the same meaning, and was indulged in by my captive Rollers too.

Finally, we had the persistent refusal of *Hypolimnas misippus* after an experience of its "model" *D. chrysippus*. That the relatively slight difference in appearance between the two bodies was detected by, at any rate, C is also fairly certain, though it was insufficient to completely dispel her suspicions. Later she did taste it properly and, reassured, eat it.

508. Jan. 16.—A and C have escaped. I offered B the great black and white Danaine butterfly, with gas-like smell, *Amauris dominicanus*. It was only just caught, quite undamaged and very lively, and it fluttered and banged against the wire at a great rate. The Hoopoe watched it with the greatest interest, and every time its movements ceased edged up to it carefully along the perches. Thereupon the butterfly would again begin to flutter. On the fourth occasion the bird succeeded in seizing it by the thorax, but she evidently received an unpleasant surprise for she dropped it almost immediately and edged away to the other side of the cage. She soon, however, again cautiously approached the *Amauris*, which was now lying disabled at the bottom of the cage, a drop of clear liquid exuding from the thorax, and her action was most interesting. For she bent over and examined the butterfly most closely, turned it over by a wing and studied the other side as closely, appearing to be taking in every detail. Then she again retired to the further end of the perch without an attempt to eat the butterfly. The latter was allowed to remain in the cage together with an *Acræa caldarena*, subsequently offered, for nearly an hour, but, although the bird ate moths, grasshoppers, and other insects

meantime, she made no attempt to renew her acquaintance with the two butterflies.

I put in an *Acræa caldarena* alive and fluttering. The *Irrisor* hesitated, then made for it, caught it with little difficulty by the thorax, and dropped it as promptly as she had done the *Amauris*, again retiring to the farthest end of the perch. But she at once seized, stripped of wings, and swallowed with the greatest eagerness a *Sphingomorpha chlorea*.

The above-described inspection of an insect found unpleasant has been exampled amongst my other birds too. The fact that birds will thus study the detailed appearance of their prey is one of very obvious importance entomologically and of interest generally.

509. Jan. 17.—Wet day, no butterflies, but in a momentary gleam of sunshine I captured a female *Hypolimnas misippus* (good mimic of *Danaida chrysippus*) near the house, and at once placed it in the Wood-Hoopoe's cage. It immediately began fluttering against the bars like the *Amauris dominicanus* of the other day, but with this difference that, whereas that highly nauseous butterfly banged itself about everywhere indiscriminately, the *Hypolimnas*, an insect that has to trust far more to *avoidance* of enemies, kept scrupulously to the corner of the wire farthest away from the bird, and on my pushing it back thrice to the centre of the cage always returned at once to that corner.

The *Irrisor* watched the butterfly intently at first, and once made a move towards it, but hesitated and turned back before reaching it, probably deterred by its *Danaida*-like appearance. She then remained on her perch for quite three or four minutes without taking much further notice of the butterfly. Finally, however, unable to resist the invitation of its fluttering, she again edged up to it, but when within two inches of it picked up a dead migratory locust instead and ate it. She then again turned to examine the butterfly. It was now at rest for a moment, and the bird finally plucked up courage to take it by the thorax and to give it two or three squeezes, evidently tasting it well. Then came the change from hesitation to eagerness that I

have on various other occasions seen when a bird, expecting the nauseous model, has found that he has the mimic instead. The Hoopoe edged back rapidly with the insect in her bill to her original end of the perch, placed it firmly between her foot and the branch, levered off the two fore wings and then, after running the remainder quickly and eagerly from side to side a number of times to thoroughly soften it, swallowed it with evident appreciation. I looked out for some time afterwards for bad after-effects, as in the case of *D. chrysippus* of two days ago (Jan. 15), but there were done. The bird remained exceedingly cheery.

The experiment was interesting for the light it threw on a bird's mental processes. The suspicion of an invitation to try an insect with an appearance associated in the enemy's mind with unpleasantness, the temptation produced by the prey's continued proximity, and perhaps by a realization that it did not look *quite* the same as *Danaida*, the final decision to *try* it, and the change thereafter from doubt to joy were all most interesting.

510. Jan. 18.—The bird accepted a *Papilio angolanus*, seizing it by the thorax, at once transferred it to her foot, and proceeded to pick off the wings and eat the butterfly. The method was that of an Owl or Shrike.

511. Jan. 20.—The bird had had a few larval locusts, but was probably still fairly hungry. The following butterflies were inserted, one at a time, alive. Two *Papilio lycæus* (each seized, stripped partly of wings, and readily swallowed), an *Atella phalantha* (unmolested for a time as it moved about, finally seized and, after very thorough tasting, swallowed, *Eurytela hiarbas*, two adult ant-lions (*Formicaleo leucospilus*), and an *Amauris lobengula*. The *Eurytela* when attacked at once dashed under the projecting edge of the bird's food-dish and remained there motionless and out of sight. It was then that I offered the *Atella*, and when it was eaten I reoffered the *Eurytela*, which, in spite of the pulling out of the tray, continued to remain motionless in its hiding-place. It was partly stripped of wings and readily eaten. The ant-lions were eaten wings and all. The

Amauris lobengula (black, with white spots in fore wing and a large buff patch in the hind wing) fluttered violently against the bars, greatly exciting the bird's curiosity. The latter finally took advantage of a lull in its movements to edge up to it and seize it by a wing, and, the wing holding, as only the wing of a Danaine or Acræine would have done, to transfer it to her foot and pick it to pieces. The abdomen was swallowed at once, the thorax dropped, but even this, with one fore-wing attached, was also swallowed readily enough on being reoffered.

"And then the troubles . . . ." Almost immediately after swallowing the *Amauris* the bird commenced to rub her bill violently against the perch and the sides of the cage, and continued to do so frequently during the next four or five minutes. Then she held her head down and ejected a dark-looking fluid followed by a small pellet composed of the abdomen and the thorax with a fore-wing. She strained twice afterwards, bringing up more of the dark fluid.

Twenty minutes later I captured a *Papilio dardanus*, female form *cenea*, and, removing the wings of one side to prevent possibility of escape, placed it in the cage. Its movements were sluggish, but the bird edged up to it almost at once, and after a certain amount of hesitation (the result, doubtless, of its resemblance to *Amauris lobengula*) took it. She also showed a good deal of hesitation or suspicion while tearing off the wings, and twice interrupted the operation and ate a migratory locust. Finally, however, she did complete the stripping, cut off and ran the thorax through her bill, doubtless tasting it well, and then swallowed it without further hesitation. Then with no hesitation or tasting at all she just tossed up the abdomen with a small portion of the thorax and a hind wing attached, caught it in the back of her bill, and swallowed it too. I watched for half an hour for bad results, but the bird brought nothing up and was particularly lively and cheery all the time. She is a great deal less timid since she lost her companions.

I then offered an *Amauris ochlea*, a Danaine with strongly contrasted black and white pattern and a gaseous smell that

always seems to me a little more pungent and ready for use than the same smell in the black-and-*buff* Amaurises. I may say that *Amauris* generally is not a genus that *Irrisor* would be likely to meet with much in its hunting-grounds round Chirinda—they are, in the main, forest-insects. At any rate, the Hoopoe attacked this one at once with the greatest eagerness, and after two or three failures succeeded in seizing it by the thorax, but at once threw it down again disabled. During the next few minutes she again picked the butterfly up three times, but each time, on tasting it, at once threw it down again, her attitude being that of being puzzled at not finding it good. Possibly she confused its appearance with that of some pleasanter black-and-white butterfly known to her. She then left it alone altogether and proceeded to nibble at the bases of *Papilio lycus* wings lying in the cage.

An *Acræa caldarena* (a small reddish species with black wing-tips and the usual poppy-flavoured juice) was seized without difficulty by the thorax, but at once dropped, the bird retiring to the far end of the perch. Half an hour later both the *Acræa* and the *Amauris* were still uneaten, so I placed both in a conspicuous position in the wire of the cage and returned in an hour. The *Amauris* had now been moved, showing further trial, but was otherwise intact, and the *Acræa* had been stripped of wings. Abdomen missing. No pellet had been brought up.

I then offered a second live *Acræa caldarena*. The bird at once seized it by the thorax, bit it two or three times, and dropped it, retiring to the other end of the perch with a disappointed air. A larva of the fine black and yellow Swallow-tail, *Papilio demodocus*, so destructive to orange-trees, had been offered shortly after the first *Acræa caldarena*. The bird at once seized it by the anal end and began to bang it about. Transferring her hold to the other end she caused the red filaments to be suddenly extruded with the usual strong bay-leaf smell. She hesitated distinctly for two or three seconds, evidently much struck, but then went on with

the softening of the larva, finally swallowing it whole without a sign of dislike.

I now left the second *A. caldarena* in the cage and kept the bird unfed for three hours. At the end of that time the abdomen had disappeared, but the thorax remained uneaten.

All the insects in this experiment were offered alive.

512. Jan. 21.—I placed alive in the cage:

(1) A *Danaida chrysippus*. It was at once seized, tasted, and dropped, the bird retiring with a discomfited air to the far end of the perch and taking no further notice of it.

(2) A *Papilio dardanus*, ♂ (large lemon-yellow Swallow-tail with black marginal and submarginal bands). It was caught after two or three attempts, taken to perch, transferred to claw, and picked to pieces and eaten with no show of hesitation.

To avoid acceptances being the result of hunger, I inserted larval locusts and allowed the bird to eat all it would. I then inserted

(3) A *Papilio demodocus*. It was seized and tasted, the hind wings were removed after much trouble, and the abdomen with the small portion of the thorax that usually breaks off with it was swallowed. The rest of the thorax with the fore wings attached was dropped. Reoffered thrice, it was each time simply taken in the point of the bill and dropped. I removed the wings and reoffered the thorax. It was at once softened up and swallowed. The bird had evidently not been hungry enough to feel inclined to go to the trouble of removing the strongly-attached wings.

Later.—B also escaped. These birds are expert lock-pickers. They spend much of their time when caged in probing into every crack in the woodwork, undoing the fastenings of the door through the crack between it and the cage, or (having found, in looking for insects at the back, they could do it) in levering the tray, if left unfastened, forward—and open—by inserting their bills at the back of it and using them as ordinary levers. I have seen them working together at this, and they are certainly birds of great intelligence.

513. March 12.—Two Wood-Hoopoes were brought me two days ago by a native who had taken them roosting together in a hole in a tree. Both have the red bill, D the long bill of a male, E the short bill of a female.

Each to-day persistently refused a *Precis natalensis*, the red wet-season form resembling *Acræa acara*, with wings, presumably suspecting it of being an *Acræa*, but each tasted and readily ate one without wings. Yet each accepted and diswinged a *Papilio demodocus*. D ate his, E finally held hers over to D, who broke off and ate the thorax, E then eating the abdomen.

514. March 14.—D ate readily four *Papilio lycus* in succession. The third was dropped through disinclination, but eaten a few minutes later. The fourth was accidentally dropped, and the bird at once descended, picked it up, and ate it.

515. March 16.—D ate readily three *Papilio lycus*, gave a fourth to E, who was craning over for it with open mouth, and ate the next three himself. E ate the eighth, then descended and ate some heads and scraps of thorax that had been dropped by D. All the insects were wingless. The birds had fed well just before the experiment, so it is likely that this *Papilio* (large, black, with a green-blue diagonal stripe) ranks fairly high in their estimation.

516. March 26.—In each case one wing was left attached to the butterfly to facilitate the birds' recognition of it. D ate two *Catopsilia florella*, threw down a third, evidently disinclined for more of it, but ate it when reoffered, and dropped a fourth and fifth. E readily ate them. D ate a *P. lycus*, but refused the next (eaten readily by *Coracias garrulus*). A little later D ate three white *C. florella*, but accepted a yellow female with a good deal of suspicion, probably reminded of the, to most birds, far more unacceptable Pierine, *Terias senegalensis*. He had barely, after much trouble, removed the wing when E took the butterfly from him and ate it. D took, but at once threw down, a second yellow female. E picked it up and ate it after much trouble in removing the wing.

517. March 29.—D ate readily five *Precis cebrene* and at once threw away a dead one. Illustrates necessity for care in providing the right material for experiment!

518. March 30.—Each ate readily a *Charaxes brutus* (large, heavy-bodied, fruit-eating butterfly) after the usual softening. D took three more from the forceps, but dropped each. E picked them up and ate them, as also a fourth, with evident relish. D accepted the next, went to much trouble in softening it, and then presented it to E, who ate it after further mastication. D found room for the next himself, refused a migratory locust, but accepted another *C. brutus*, softened it up very thoroughly, and ended by separating the thorax from the abdomen. He deliberately passed the abdomen up to E (on a perch above him), and, when E had finished eating it, leaned over, picked up the thorax now lying on the ground some distance away, and handed this too to E, who ate it readily. The next was also taken by D, but ungratefully snatched from her almost at once by E, and by her eaten, after the usual softening.

I handed a *Papilio lycus* to E. While she was hesitating D came up, snatched it away, and ate it, also a second. I offered four more direct to E, but D intercepted each (E holding back with her bill straight up in the air out of fear or deference). Instead of eating them D leaned over each time and dropped the butterfly on the floor, all on the same spot. When he saw that I had no more to offer he at once descended and battering each in turn ate it. Only now, when D had definitely finished, did E descend and get a thorax or two that had been broken off and left.

This assertion of authority by D (for that was what I could not but take it for) was very interesting, coming as it did on the top of an impudent snatching away of a butterfly from him by E. E's change of attitude to one of respect followed the snatching away from *her* of the *Papilio lycus* by D, or perhaps was indicated in her hesitation over its acceptance. Possibly some anger was shown in D's manner that was unnoticed by E, but escaped myself. The calm placing of each butterfly on the floor, whence E might easily

have taken them, seemed to be as much as to say "Don't *dare* to touch those!" and E accepted the rebuke in a properly deferential spirit.

D then ate a seventh *Papilio lycæus* (I doubt if he would have eaten *any*, had it not been for E's provocation of him!), also a *Precis cebrene*. He dropped the next and E picked it up and ate it, as also six more in quick succession, without further repression by D.

519. April 3.—E ate readily (had much other food in the cage) four male and one female *Hypolimnas misippus*. Ten minutes later she ate with equal readiness a fifth male and a second female. Each butterfly had a hind wing attached. The ten minutes' interval was to give time for unpleasant internal effects, if any, to be realized by the bird. Obviously the butterfly ranked fairly high in the Hoopoe's estimation, which is interesting in view of its close mimicry of the highly unpleasant *Danaida chrysippus*.

These birds also escaped. They were as expert lock-pickers as their predecessors. In the case of each of the two batches the birds did not fly away at once, but remained in the verandah picking up the insects that had dropped from the cages generally (for I had many insectivorous birds), and were quite friendly, allowing an approach to within a yard. It was only on my definitely attempting to recapture them that they flew right away, uttering their harsh chattering note.

Lophoceros leucomelas (Licht.).

The interesting point about these birds was the enormous numbers that they would eat of insects, one or two of which sufficed to nauseate the average bird unless he was sufficiently hungry, and his digestion sufficiently active to deal with them.

Two factors probably contributed to this: (1) that *Lophoceros*, like *Bucoraæ*, probably *is* able to eat *Danaida*, *Amauris*, *Acræa*, &c., up to a later point in the filling up of its stomach than is the average bird; (2) the fact (which I will deal with more fully later) that any rapidly-digesting bird is able

to go on eating any insect, however unpleasant, with a pause between (it may be) every two or three or more, provided no pleasanter food is forthcoming to carry the satisfaction of his hunger well beyond the point at which the unpleasant insect in question is normally refused. Actually these Yellow-billed Hornbills did, on several occasions, if one might judge by their discomfited manner, carry their eating of nauseous insects beyond safety-point; but this was only to be expected in the case of just-fledged birds deprived of parental guidance. And in any case they probably never ate them to at all near real repletion-point. The key to a proper understanding of all these experiments on *L. leucomelas* is provided by experiment 541 on *L. melanoleucus* (below).

520. Feb. 16.—Two fully-fledged nestlings now able to fly and picking up food for themselves. I have had them a few days. I offered the extraordinarily conspicuous gregarious larva of (probably) a Cuspidate moth. Brilliant red-black-and-white, with a pungent smell and two yellow filaments, which are waved when the larva is alarmed or annoyed, and are brought over—with a strong increase in smell—to touch the aggressor when the larva is seized, it had been offered to my Kingfisher (*Halcyon cyanoleucus*) and been treated by him as he only treats the vilest of objects. He had, on trying it, dashed it violently to the other side of the cage and remained for long afterwards "shaking his head, clapping his bill, rubbing the latter against the perch, and showing generally greater signs of disgust than I had ever previously seen him exhibit."

Lophoceros B pulled at the larva, and would have eaten it had I allowed her. I then let A pull at it well and, finally, swallow it. I offered a second larva immediately afterwards, and he tugged at it greedily, and would have eaten it too (as would B) had I allowed.

I let ten minutes elapse for after-effects. Then I again offered A the second larva. His manner had quite changed. He rejected it with absolute fury, raising his crest and hissing at me every time the larva was produced, and drawing back from it, still angry and hissing, when I pressed it

on him. B, however, not having had his experience of it, seized it and tugged at it, and was greatly annoyed because I would not allow her to have it.

The first larva had lost some of its virulent smell by the time it reached the Hornbills, but the second was fresh and would, nevertheless, at first have been greedily eaten by both birds.

Evidently they are not particular as to taste. Evidently, too, the larva relies primarily on its appeal to the bird's internal anatomy. Other interesting points were A's profiting from his experience, his recognition of the larva, seen again, by (doubtless) its appearance, both birds' lack of instinctive knowledge of what was fit to eat, and B's failure to profit by A's example.

521. Feb. 17.—A snatched and swallowed in turn the following butterflies with wings attached: *Acræa acara*, *Amauris albimaculata*, *Acræa natalica*. I noticed now that there was no food in the cage, so in case the acceptances should be due to hunger I gave the birds a good feed of locusts, then (to A) an *Acræa anemosa*, three *A. acara*, and three *A. natalica*. He swallowed recklessly at first, then with growing hesitation, and on my now offering yet another *A. acara*, he just took it in his bill and rejected it, as also a wingless *Charaxes brutus*. He now became extremely restless and apparently perturbed, wandering and finally rushing from perch to perch, clinging by his feet to the wire—a thing he has never done yet,—and banging his wings violently against it, seizing his companion by the long feathers of the occiput and shaking her violently to and fro, all the time with what seemed a look of terror. This went on for ten minutes or more, when he gradually quieted down again, and finally took up his usual position at one end of a perch. I now offered him an *Acræa natalica*.

He refused it absolutely without tasting. He at once ate the wingless *Charaxes brutus* reoffered. And he again for a time refused the *Acræa natalica*, but on my continuing to persist he finally snatched first the abdomen, then the thorax,

violently from the forceps and swallowed them. No further bad results were visible.

Meantime, B was greatly annoyed at not being given any Acræas. She did actually *snatch* two (*A. acara*) and swallow them, but without visible after-effects. She then ate two wingless *Charaxes brutus* and one wingless *C. candiope*.

I have little doubt that A overstepped the safety-point, whether this be high or low for these Acræas relatively to these birds.

522. Feb. 19.—Twelve large Acræas (*natalica*, *acara*, *anemosa*, and *areca*), of both sexes, were eaten by the Hornbills. No apparent after-effects. The last seven were offered as I came across them in sorting out the day's catch, so that there was a probable average lapse of several minutes between each—enough to spoil an experiment on a rapidly-digesting bird.

523. Feb. 21.—I gave A after a number of locusts five *Acræa acara* (two males, three females), fifteen minutes later two male *A. natalica*, and five minutes later again a male *A. areca*. All (with wings) were snapped up and eaten with avidity. No hesitation and no visible after-effects.

524. Feb. 24.—A ate greedily and without visible after-effects a gravid female *A. acara* and two male *A. natalica*.

525. Feb. 25.—A ate in succession, as usual alive and with wings, a female *Acræa areca*, two male *A. natalica*, and a female *A. acara*, just refused by the Roller (*C. garrulus*) and Kingfisher (*H. cyanoleucus*). No visible dislike or after-effects.

526. Feb. 27.—A ate, alive and with wings, five male *A. natalica* and one male *A. areca*—eleven large Acræas in all—with avidity.

Twenty minutes later, with equal avidity, a male *A. natalica* and a female *A. anemosa*.

Five minutes later a male and a female *A. natalica*, the latter with marked hesitation.

Five minutes later again a male *A. acara* and an *A. anemosa*, the first readily, the second with some little hesitation. Then, with increasing hesitation, a female and a male

A. natalica. A female *A. natalica* was then twice taken in a very hesitating and gingerly fashion between the points of the mandibles and let drop. Reoffered again repeatedly, it was refused every time without tasting. A larval migratory locust was taken with comparative readiness, but the bird gave me the impression of considerable uneasiness, and he now refused the female *A. natalica*, reoffered, repeatedly and persistently.

He was now huddled against the side of the cage with feathers ruffled and an air of depression—the result, I could not help thinking, of having slightly overstepped the safety-limit in the matter of eating Acræas. All had been very much alive when offered, the majority caught within the preceding hour or two, and the bird's bill was well bespattered with their abundant yellow juice. Nineteen had been eaten in all, but the intervals, which, often repeated, might enable him to go on eating such insects indefinitely, have to be taken into consideration.

527. Feb. 28.—As usual, live butterflies with wings. Both birds had previously had some locusts.

A ate a male *A. areca*.

An interval: then 7 *A. natalica* in succession (3 ♂ ♂, 2 ♀ ♀, and 2with sex not noted).

A five minutes' interval, then a ♂ *A. acara*.

A ten minutes' interval, then a female *A. natalica* (that refused yesterday). Then an unsettled five minutes, probably only in sympathy with B. Then the *Amauris lobengula* handed him by B (*v.* below). Then, after another short interval, a ♀ *A. natalica* and a ♂ *A. areca*.

In the afternoon (again after other food) he ate an *Amauris albimaculata* (snatched from B), and a few minutes later two *Acræa acara*, all readily.

B, in the morning, ate 7 *A. albimaculata* in succession, was very unsettled and restless during a short interval, then ate an *Amauris lobengula* (of similar appearance) readily enough, a second and third less readily, a fourth more readily, a fifth after hesitation and a preliminary rejection. She rejected a sixth, and on my reoffering it took it and did

her best to palm it off on A, following his movements and keeping it held round to his bill. A, apparently not understanding such unwonted attention, twisted and dodged and did his best to escape her, but she persisted and at last "cornered" him. Either perceiving for the first time that he was being offered food or else to get rid of her importunity, he now snatched the *Amauris* away and swallowed it after some difficulty with the wings. B meantime sat quite still beside him on the perch looking innocently away, but took an occasional sly glance round. A's ready acceptance may have reassured her, or else she may have been by now ready once more for *Amauris*, for, after a few minutes' interval, she readily seized a seventh. It was dropped, but perhaps accidentally, for on my reoffering it she ate it at once.

I then offered *Amauris ochlea* (the smaller of our black and white species). The first was eaten after considerable hesitation, the second rejected—thrown right away,—yet eaten on being reoffered. The third and fourth were eaten only after a great deal of reoffering and persuasion on my part.

Now came some interesting contrasted rejections and acceptances, the latter showing that the former were not due to sheer repletion. She tasted and refused an *Amauris albimaculata*, and thereafter refused it emphatically and persistently without tasting; but she *readily* ate a larval migratory locust. She again persistently refused the *A. albimaculata*, but readily ate *another* migratory locust. She refused the *Amauris* emphatically yet again, but very readily ate another butterfly, the Nymphaline *Precis cebrene*. She refused the *Amauris* yet again and repeatedly, yet readily ate another *Precis cebrene*.

In the afternoon I reoffered the same *A. albimaculata* (an easily recognised individual owing to peculiar wing-damage). The bird took it in the point of her bill, but made no attempt to eat it, simply holding it there for some minutes, though A made repeated attempts to take it from her. Finally, he succeeded, and ate it. B then, stimulated perhaps by A's

having taken the first, ate with apparent avidity an *A. lobengula* and 3 *A. albimaculata*. Fifteen minutes later she readily ate two *A. lobengula* in succession.

528. March 2.—B ate greedily an *Amauris albimaculata*. Twenty minutes later she ate similarly 4 *Amauris ochlea* in succession, but held an *A. lobengula* for a long time in the point of her bill without an attempt to swallow it. She ended by handing it down to A, who swallowed it greedily. Perhaps reassured by this she accepted an *A. albimaculata* (same type of colouring) and swallowed it at once.

Twenty minutes later she persistently refused without tasting another *A. albimaculata*, but greedily snatched a ♀ *Acræa natalica* from the forceps, and at once swallowed it.

A meantime ate the *A. lobengula* given him by B, then ten *A. natalica* (5 ♂ ♂ and 5 ♀ ♀) in succession, and, at intervals of two or three minutes, 2 ♀ and 1 ♂ *A. acara* and a ♀ *A. areca*.

I let twenty minutes elapse to allow for possible after-effects from this large dose to make themselves felt, then offered a ♂ *A. areca* (much the same colouring as the preceding butterflies). The bird at first refused it absolutely, then, on my persisting in holding it to him, just closed the point of his bill on it and at once, looking at myself, let go. It is a common form of refusal amongst birds. He then refused to take an *Amauris albimaculata* which I had been offering B and, persistently, an *Acræa natalica* ♀.

Fifteen minutes later, either recovering from the effects or, if there were none, merely ready once more to digest Acræas, he ate readily enough after a little initial hesitation an *Acræa natalica* ♀. B again refused without tasting an *Amauris lobengula*.

An hour and a half later A accepted and ate readily a ♀ *Acræa natalica*, and B, as readily, an *Amauris lobengula*.

Two hours later again A ate no less than 23 large Acræas, all greedily and without the least sign of hesitation. They were: 5 *A. natalica*; ten minutes later five more; ten later five more; ten later again 2 more. Twenty minutes later again 3 ♂ *A. acara*, and ten later 2 ♂ and 1 ♀ *A. areca*.

Comment. It is evident that, starting hungry enough, these birds can go on eating the most nauseous butterflies indefinitely and with apparent relish, provided intervals without pleasanter food are interspersed to keep them hungry enough, or to bring them back to that point when they have, by eating several, been brought up against the safety-limit. Not that in the case of these particular birds the hunger that will enable them to digest such insects need be great!

529. March 4.—Half an hour before the experiment I fed each bird on larval migratory locusts till it refused to eat more. The idea was to pit *Amauris* against large Acræas, and to see of which most would be eaten, and the locust-food was to equalize the start. A to be given the Acræas, B the others.

A ate readily 12 *Acræa natalica* with a 15-minutes' interval after the 7th, and two more with hesitation; an *Amauris albimaculata* readily, and, again after hesitation, a fifteenth *Acræa natalica*.

B ate 4 *Amauris lobengula*, and a fifth after hesitation, and repeatedly refused a sixth without tasting, and with signs of annoyance. But she *greedily* ate an *Acræa acara*, though she again repeatedly refused *A. lobengula* with what appeared to be marked dislike.

Fifteen minutes later A again ate 7 *A. natalica*, but with hesitation at the sixth and seventh. He repeatedly refused, without tasting it, an eighth.

B however refused absolutely to touch even *one A. lobengula*, though I reoffered it repeatedly. But she greedily ate an *Acræa esebria* (a small black-and-white species) and an *Acræa acara*, but again repeatedly refused *A. lobengula*.

Thereupon, to test whether she would be deceived by resemblances in her prey, I offered her a *mimic* of *A. lobengula*—namely, *Acræa johnstoni* form *confusa*, with the upper, mimetic, surface shown. The Hornbill at first ignored it absolutely, as she had done its model, but, on my continuing to hold it to her, she at last began to examine it closely and cautiously, and then, taking it in the point of her bill held it there for some time, turning it over and over

and over, and tasting it *most* thoroughly. She finally swallowed it.

Having done so (and been presumably reassured by doing so) she accepted and swallowed an *Amauris lobengula* without any further hesitation. But she refused the next *with anger* repeatedly.

A, however, leaned over eventually and took it, eating it promptly, but he emphatically and repeatedly refused an *Acræa natalica*.

This, however, was greedily eaten by B, who then once more refused an *Amauris lobengula*.

Comment. B had enough of *Amauris* long before A had enough of *Acræa*. Secondly, when she was refusing *Amauris* she still ate *Acræa*, and when A was refusing *Acræa* he still ate *Amauris*. This may have been due (1) to insufficient experience of *Acræa* by B and *Amauris* by A, or (2), more probably, to the fact that their protective properties are different, so that when to eat another *Acræa* (on the top of several others) would constitute an overdose, the eating then of an *Amauris* would not.

A third interesting point was the treatment of a mimic—at first evidently taken for its model, then examined more carefully and tried. Probably some of the actual points of difference (size and fore-wing spots) were noted, for birds are very observant.

530. March 5.—I exchanged the *rôles* to-day, A becoming the *Amauris*-eater and B the receiver of Acræas. This was as a control on the last experiment—to test individual difference between the birds.

A ate readily an *Acræa natalica*, then 7 Amaurises (4 *lobengula* and 3 *albimaculata*) with hesitation at the sixth and seventh. B at the same time ate with avidity 7 *Acræa natalica*.

15 minutes later A ate 7 *A. albimaculata* with hesitation at the sixth and seventh; B ate 7 more *A. natalica*, all with avidity.

15 minutes later again A ate 4 *A. albimaculata*, but with *marked* hesitation, requiring a great deal of persuasion to

eat the third and fourth; he turned his back and remained most of the time with it turned, refusing to look round. A fifth (he had now turned round) he refused with anger repeatedly, though he readily ate an *Acræa areca* ♂.

B, on the other hand, ate *greedily* 3 *Acræa natalica*, 3 *A. areca* and 3 *A. acara*, and seemed quite prepared to go on eating.

Comment. I think the experiments of March 3rd and 5th taken together indicate that *Amauris* is unpleasanter to these birds than *Acræa*. The fact that A ate so many of the former genus before commencing to refuse them is likely to have been in part the result of his relative inexperience of it.

As in the other experiment, both birds had been fed up on locusts half an hour before.

531. March 10.—Both birds were fed on migratory locusts till they would accept no more. Soon afterwards I gave A two *Amauris ochlea* with only one wing (right h.w.) attached. He ate two, the second with some hesitation, a third after five minutes, and refused a fourth with unmistakable annoyance repeatedly.

B ate two *Danaida chrysippus*, and five minutes later refused a third repeatedly, with signs of annoyance (again only one wing).

To reassure the birds I gave them Catopsilias. A ate his, first breaking it up well and making quite an effort to get rid of the stiff wings. Acræas and Danaines, with more pliable wings than this Pierine, are swallowed whole. But B's *Catopsilia* escaped, and A at once set off in chase of it. He seized it time after time by the wings as it was fluttering about the cage, and each time at once threw it up in his usual fashion in order to catch it in the back of his throat—a feat at which he is very skilful. But each time the bill clapped to, and to the bird's surprise, nothing reached his throat—and the butterfly, more active to escape than the species he was used to, was fluttering at the other end of the cage! At last he succeeded in capturing and eating it in the same manner as the first.

B now ate one, though with rather more suspicion than A;

but she lost a second. A finally captured and ate this too, after a long chase, in which B also finally joined. The latter bird (B) then occupied herself for some minutes in picking up all the small pieces of white wing which now littered the bottom of the cage, and in carefully handing them back to A, who threw each back to catch it in his throat, and seemed much disappointed and surprised when, instead of arriving there, it went floating off on the breeze.

A fifteen-minutes' interval, then A ate 5 Amaurises (one *A. ochlea*, the rest *A. lobengula*), the last three with marked hesitation, and absolutely refused a sixth. B ate a *D. chrysippus*, but refused to touch a second. Five minutes later, however, she snatched three in succession from the forceps and bolted them down quickly, and just afterwards two more.

A half-hour interval (without food). A now absolutely refused to touch an *Amauris albimaculata*, but ate a *Danaida*. B, after hesitation, snatched and ate—again with apparent impatience and anger, however—two *Danaida*. On my return immediately afterwards with an *Amauris* she was on the floor of the cage devouring earth, and she refused the *Amauris*.

She now ascended to one of the higher perches, and repeatedly again refused the *Amauris*, finally taking it in the point of her bill (Did she remember its mimic of March 4?), tasting it well, and dropping it. A at once most gallantly descended, picked it up in his bill, and climbed up again with it to B, placing it in her bill. She could no longer refuse a dainty so courteously offered, and swallowed it at once—again like a pill, however!—and a second in like manner.

A now ate two dead *Amauris albimaculata*, tasting each very thoroughly in the point of his bill before doing so. I had no more live Danaines, so discontinued the experiment.

532. March 15.—I fed both birds on locusts till they would accept no more. Soon afterwards B ate a *Danaida chrysippus*, but rejected a second after nibbling it in the point of her bill for some time. A ate readily 5 *Danaida*

and in five minutes two more, but refused the eighth without tasting—readily, however, eating *Amauris ochlea*. He then wiped his bill and refused to eat another *Amauris*.

B now ate an *A. albimaculata*, but refused a second, at first without tasting. She then took it in the point of her bill and occupied herself for several minutes in trying to force it into that of A. Finally, she dropped it.

Both birds now persistently refused *Danaida* and *Amauris*, but each after tasting them well ate two *Acræa natalica*.

533. March 16.—A ate 5 *Danaida* and was quite ready to go on. B ate 5 *Amauris albimaculata*, but refused the sixth with some show of irritation. A at once ate 5 more *Danaida chrysippus*, and was again quite prepared to go on. B angrily refused *Amauris albimaculata*.

10 minutes later A readily ate 5 Danaidas. B ate 5 *A. albimaculata*, but took the sixth with hesitation, and for a long time tried to push it into A's throat—evidently for an opinion, as she kept a tight grip on it, ready to pull it away at once had he given any sign of approval. Finally, as he would not take it, she dropped it*.

A now more hesitatingly than before ate 4 *Danaida* in succession, but absolutely refused the fifth—eagerly, however, snatching at an *Amauris albimaculata*. B hesitatingly took the latter in her bill, but made no attempt to eat it, trying instead again to force it into A's bill, but, as before, tightening her hold on it whenever he seemed disposed to take it. Though so eager for it before, he now, on the whole, resisted her, suspicious of such marked and persistent attention or, more likely, realizing that she would not let him have it.

10 minutes later A ate 4 *Danaida*, but refused to touch a fifth, while B refused irritably the *Amauris albimaculata*. A, however, readily ate an *Amauris lobengula*, but B angrily refused a *Danaida*.

15 minutes later A ate readily 4 *Danaida*, but steadily

* This method of obtaining an opinion is, as I have seen, practised by other birds besides Hornbills, so that the suggestion is not entirely far-fetched.

refused a fifth, though quite eager to take an *Amauris*. B absolutely refused both *Amauris* and *Danaida*, but

10 minutes later ate readily 3 *A. albimaculata*, refusing a fourth; while A ate 2 *Danaida*, and persistently refused a third, though still eager for *Amauris*.

10 minutes later A ate readily 8 Danaidas, but refused the ninth. B ate readily 4 *Amauris albimaculata*, then snatched away and ate two Danaidas in succession that I was offering A, and after this two more *Amauris albimaculata*, but refused the next.

15 minutes later A ate 3 *Danaida* and refused a fourth. B absolutely refused *A. albimaculata*.

10 minutes later B still persisted in refusing that butterfly, but A ate readily 7 *Danaida* and refused the eighth, B now again refusing the *Amauris*.

10 minutes later A ate one *Danaida*, but absolutely refused a second. B refused *A. albimaculata*, but readily ate a *Danaida* and wanted more, snatching persistently at the one I now offered A. A ate one more *Danaida* after hesitation, but persistently refused a second.

10 minutes later—it was now in any case commencing to get dark—both birds refused both butterflies.

The last *Danaida* eaten was dead, the remainder having been alive. A showed no ill-effects now or later from having eaten 50 *Danaida chrysippus* in little over two hours, nor did B from her 19 *Amauris albimaculata*, eaten during the first hour and fifty minutes of that time. They digest rapidly, and this, with the frequent intervals, enables them thus to eat large numbers of relatively indigestible insects without much overstepping the safety-limit.

Analysis. A ate 10 *Danaida* and was ready to go on, and 10 minutes later ate 9 more, but then at last refused the twentieth. But 10 minutes later he ate 4 more, refusing the next, 15 minutes later 4 more again, refusing the next, and after this only 2, refusing the third. However, 10 minutes after this partial rest he ate no less than 9, refusing a tenth. These had some more lasting effect, for 15 minutes later again he could only eat 3—only a temporary effect

even then, however, for in another 10 minutes he succeeded in eating no less than 7 in succession. But 10 minutes later he could only easily manage one, and with difficulty and after some persuasion a second. His refusals 10 minutes later may have been influenced by the fact that he was then beginning to settle down for the night.

B, however, at the commencement of the experiment could eat only 5 *Amauris* and then showed temper, and though she did, 10 minutes later, eat 5 more, she now for about 50 minutes would not touch another (*or Danaida*), missing entirely two sets of offerings. Now, however, she succeeded in eating, 3 and 10 minutes later, no less than 6; but this sufficed, and throughout the remainder of the experiment—quite an hour—she refused to touch another, though towards the end she readily ate *Danaida*.

B's digestion is evidently more sensitive than A's, so that the "control" experiment of the other day was worth while. Also, in spite of A's readiness to accept *Amauris* to-day when to have had another *Danaida* would apparently have been too much, it seems not unlikely, comparing this experiment with past ones, that *Danaida* is perhaps somewhat more easily digested by these birds than *Amauris*. Still, *starting* hungrier than previously, they might easily eat more *Danaida* now than they could *Amauris* then, even were the two insects equal in defensive powers, so that there is no certainty about it.

534. March 17.—Neither bird appeared the worse this morning for yesterday's extraordinary feed, and A, to celebrate St. Patrick, was quite willing to begin again. He ate readily 7 *Danaida*, and was eager for more, also an *A. albimaculata*. B absolutely refused the *Amauris*, but seeing A eat it accepted and swallowed one herself. But she obstinately refused to take a second. *Danaida*, however, she ate greedily—7 in succession, the seventh with some hesitation. She refused an eighth.

10 minutes later B refused both *Amauris* and *Danaida* without tasting, but A ate both readily. Each bird now ate

Acræa acara, but only after much hesitation and tasting. B, reassured, ate a second more eagerly.

The experiment seemed to confirm certain previous conclusions—that B is more sensitive than A, and that the order of "preference" is: (1) *Acræa*, (2) *Danaida*, (3) *Amauris*.

535. July 11.—*Lophoceros leucomelas* (not specified whether A or B, but the former was, I think, at this time the survivor) readily accepted two larvæ of *Acræa terpsichore* and ate them, the first after hesitation.

536. Sept. 9.—Ate, but with dislike, often holding them in the point of his bill for some time before swallowing them, 5 larvæ of *Acræa terpsichore*.

LOPHOCEROS MELANOLEUCUS (Licht.).

1911. 537. Jan. 14.—Two young birds, just feeding themselves, showed the greatest eagerness to eat an Amphisbænid, 2 ft. 2 inches long and nearly an inch thick. I showed it to my birds generally, and the old birds showed fright while the babies were fearless—an incident that supports the view that birds do not know by instinct, but learn, to fear snakes.

Aug. 4.—Two Crowned Hornbills, both adults, were sent to me this afternoon by David Odendaal*. One appears to be damaged. Both *very* bashful, hiding their heads on the ground in a corner or under their own breasts when approached, with an appearance of maiden modesty that is ludicrous in such ugly birds.

538. Aug. 7.—The damaged Hornbill is dead. The other is doing well, and is readily accepting food from the forceps. I carried out my first experiment on him this morning. It was also the first occasion on which he has been offered butterflies since his capture four days ago. I wished to ascertain whether he was already accustomed to feeding on them in the wild state.

I first fed him up well on Cape gooseberries (only eaten

* Mr. D. P. J. Odendaal, on whose collection of eggs an article appeared in this Journal in July 1911, pp. 1–20.

at first when very hungry), meat (offered now for the first time, and eaten readily and in quantity), and grasshoppers. He had begun to show some slight disinclination over some of these, but was still accepting greedily a species that is also my drongo's favourite when I commenced to offer butterflies.

He showed a distinct previous acquaintance with the latter, for he very readily accepted and ate a dark brown skipper (*Baoris fatuellus*), but refused for a time to have anything at all to do with a female *Acræa areca*, and on my withdrawing and reoffering it once more refused it. As I persisted in holding it to him, however, he finally took it, crushed it slightly, and threw it away. He then refused to touch an *Amauris albimaculata* or a male *Mylothris agathina* (a white Pierine with orange wing-bases and a strong scent), but very readily accepted, crushed, and after holding it for a few seconds (result of relative repletion?) swallowed a Painted Lady (*Pyrameis cardui*).

A little later he again refused the *Acræa areca* and *Amauris albimaculata*, as also a *Mylothris yulei* and a *Mylothris rueppelli*, but tried to seize a *Pseudacræa lucretia* var. *expansa*. It would be interesting to know whether he actually recognized it or perhaps associated it with the commoner *Neptis agatha*. The *Pseudacræa*'s "model," *Amauris ochlea*, has been absent from this locality for a very long time. I withdrew it, requiring it for other experiments, and offered the brown Satyrine *Ypthima* (near *impura*). This the Hornbill refused to touch, but he at once, and with the greatest readiness, accepted and ate a *Neptis saclava*; wished to take a *Papilio lycus*, but I reserved it; again refused the *Ypthima*, but readily accepted and, after crushing it well, swallowed a large brown-and-white skipper, *Rhopalocampta forestan*. He then descended and picked up, tried, and threw away a dry lump of mingled earth, excrement, &c., that was lying in a corner of the cage and had probably caught his eye far above.

Towards evening a dense mist had blown up while I was feeding the bird, and the light in the verandah was so bad

that I rather hesitated to experiment. However, I did so, holding each insect in such a way that what light there was might fall on it.

The Hornbill refused to have anything to do with a *Belenois severina* or a *Mylothris yulei*, but *readily* accepted and ate a *Precis elgiva*; refused a *Terias brigitta* (small yellow Pierine) and a *Mylothris yulei*, and accepted with, I thought, a little hesitation, an *Ypthima* near *impura*. He was probably nearly hungry enough for it, but he rejected it. He refused a second *Ypthima*, as also a *Henotesia perspicua* (another brown Satyrine); seemed doubtful over a *Crenis boisduvali*, underside shown, but on my pressing it on him accepted, crushed, and swallowed it; again refused *Mylothris yulei*, also *Leptosia medusa* (one "wood"-white); accepted a dead and dry *Leuceronia argia*, ♂, and after crushing it threw it away—probably the result of its dryness; refused for a time a white *Catopsilia florella*, perhaps taking it to be the dry *Leuceronia* reoffered, then tried it, and at once crushed and swallowed it. Then, to my surprise, took a piece out of the wing of a *Danaida chrysippus*, and followed this up by taking the butterfly from the forceps; but on tasting it he at once flung it right away. Refused to touch an *Amauris dominicanus* or again the *Leptosia*; readily accepted a *Precis clelia*, but in turning it to crush it lost it; readily ate a *Precis tugela* and a brown skipper *Platylesches moritili*; refused the *Leptosia* and a *Mylothris yulei*; accepted and swallowed the Guinea-fowl-spotted Nymphaline *Hamanumida dædalus* and a *Precis elgiva*; refused to touch the *Belenois severina* or an *Ypthima* near *impura*; but readily accepted, crushed, and ate a small yellow-and-brown skipper, *Padraona zeno*, a *Rhopalocampta forestan*, a *Pyrameis cardui* (Painted Lady), another small skipper, *Gegenes hottentota*, and the *Precis clelia* reoffered. He leaned out to take the *Mylothris yulei*, hitherto refused, but I withdrew it; then descended, picked up, and again tried and threw away the dry male *Leuceronia argia*.

The trial of the *Danaida*, and the bird's apparent readiness at the end to accept a *Mylothris* was curious, perhaps, for he

must, if he knew any butterflies (and he showed that he knew them well) have known *Danaida*, the commonest of all. I myself put it down to the bad light, and thought it extraordinary that the bird made as few mistakes as he did. On the other hand, the attempt to take the *Mylothris* may have been intentional, and to be accounted for by the stimulative effect that the eating of several, highly pleasant insects (here three skippers, a Painted Lady, and a *Precis*) so often exercises.

Comments. Assuming (as I thought was the case) that the bird was nearly hungry enough for *Ypthima*, but not for the butterflies refused just before it, we get from the experiment the following rough order of preference :—

(1) Three species of *Precis* (*elgiva*, *tugela*, and *clelia*) ; *Pyrameis cardui*; *Hamanumida daedalus*; *Pseudacrœa lucretia* (if recognized as itself) and *Neptis saclava*, and probably *Crenis boisduvali*; these amongst Nymphalines. Two Pierines —*Catopsilia florella* and probably *Leuceronia argia* ♂. A *Papilio* (*P. lycœus*). And five skippers (if the last of them was not eaten merely through the stimulative effect of its predecessors), namely, *Baoris fatuellus*, *Platylesches moritili*, *Padraona zeno*, *Rhopalocampta forestan*, and *Gegenes hottentota*.

(2) *Ypthima* near *impura* (probably).

(3) *Mylothris yulei*, *Belenois severina*, and *Terias brigitta*.

With (2) and (3) may be bracketed *Acrœa areca*, the two Danaines *Amauris albimaculata* and *Danaida chrysippus*, and the three Pierines, *Mylothris agathina* ♂ and *M. rueppelli* and *Nychitona medusa*. Also (if recognised as itself, which is doubtful) the small brown Satyrine *Henotesia perspicua*. Meat—preferred to Cape gooseberies.

The whole of these "placings," including that of the *Ypthima*, are simply confirmatory of those obtained from many other birds, and, in so far as they consisted of many acceptances and refusals without tasting, show that the bird was in the habit of attacking butterflies before he was captured. This is really the most interesting result of the experiment. The trial of the piece of earth was interesting

as showing lack of instinctive knowledge of what is good to eat.

539. Aug. 13.—Fifteen or twenty minutes after a meal—perhaps not a very full one, for the bird seemed hungry. He refused an *Amauris dominicanus*, but, on my pushing it up against his bill, seized another and swallowed it with what may have been irritation; refused a *Danaida chrysippus*, then snatched it from the forceps, and threw it violently down; treated a *Mylothris rueppelli* similarly, as also a *Terias brigitta*; but seized on a *Precis clelia* with the utmost eagerness, and swallowed it. The contrast in manner was great.

540. Aug. 14.—Shortly after a small feed of gooseberries and grasshoppers refused a *Mylothris rueppelli*, but, on my bringing it up to his bill, seized it and threw it back into his throat to swallow; but at once shook it up again (side to side shaking) and rejected it. But he very readily accepted and ate a *Belenois severina*.

541. Aug. 15.—Hungry. Ate five Cape gooseberries (*Physalis edulis*), eight to the ounce, the last two with growing disinclination, and threw away and then persistently refused a sixth. But he accepted, crushed, and without hesitation swallowed a *Danaida chrysippus*, an *Amauris lobengula*, a male *Acræa areca*, and a female *Mylothris agathina*; then ate seven smallish pieces of meat (20 to the ounce), the last with complete disinclination. He had thus eaten roughly one ounce of fruit and meat together—the equivalent in weight of many Danaidas—before commencing to refuse *Danaida*. He now definitely did refuse one, but changing his mind accepted, crushed, and swallowed it; more readily accepted, crushed, and swallowed an *Amauris dominicanus*; refused a second *Danaida*, but on my pressing it on him took it, crushed it, and threw it away; accepted and readily ate, after crushing it, an *Amauris albimaculata*, again treated the *Danaida* exactly as before, but readily accepted, crushed, and swallowed an *Acræa terpsichore*. He then took, but at once threw away, a piece of meat, and refused to take the next piece; accepted, crushed, and swallowed a dead and slightly dry *D. chrysippus*; rejected a live one after crushing it too; and crushed and threw away an *A. dominicanus*.

A few minutes later—a little hungrier again, no doubt—he ate the *D. chrysippus*, and refused, then crushed and rejected in turn, another *Danaida* and the *A. dominicanus*. But he readily accepted, crushed, and ate an *Amauris lobengula*.

A few minutes later again he accepted and ate the *Danaida*; refused, then crushed and rejected the *A. dominicanus*; took with disinclination, but, having done so, crushed and ate another *Danaida*; once more refused, then accepted, crushed, and threw away the *A. dominicanus*; but *readily* accepted, crushed, and swallowed an *Acræa areca* ♀, and refused persistently to touch a Cape gooseberry.

Shortly afterwards he once more refused the fruit, ate two pieces of meat with disinclination, took with disinclination a third and threw it away, refused the next piece, readily ate several grasshoppers; refused for a time, but on my continuing to offer it took, crushed, and threw away the *E. dominicanus*; refused an *A. albimaculata*, then crushed and threw it away, but, changing his mind, picked it up again and swallowed it. Showed some actual eagerness for a *Mylothris agathina* ♀, which, however, I withheld; and went on to pick up from the ground and eat a number of grasshoppers, which I now inserted to carry him to *Mylothris*-refusing point.

He next refused persistently to touch either a ♀ *M. agathina* or a *Mylothris rueppelli*. I even placed them on the ground in front of him, and they began to move about freely, one going so far as to climb up his leg, but, though he looked at them more than once, he made no attempt to seize them. Nevertheless, he accepted, crushed, and swallowed a *Belenois severina*, showing that he preferred it to *Mylothris*. A *Terias* was now persistently refused, even when allowed to move about with the two *Mylothris* (movement often tempts attack), and so for a time was an *Ypthima* near *impura*, but the bird ended by crushing and rejecting the latter.

He then crushed and rejected the black-and-white day-flying moth with tomato-leaf smell, *Nyctemera leuconoë*; refused for a few seconds a brown skipper, *Parnara detecta*, perhaps reminded of *Ypthima*, but on accepting and crushing it ate it without further hesitation and eagerly seized, crushed,

and swallowed a Painted Lady (*Pyrameis cardui*)—afterwards refusing the light brown Satyrine *Henotesia perspicua*. But he accepted, crushed, and swallowed a *Papilio lycæus* and a skipper, *Gegenes hottentota*; again refused the *Henotesia* without tasting, but accepted and ate a second *Gegenes*.

The portion of the experiment just described had been rather spoilt, and the progress of repletion accelerated, by the fact that the bird kept noticing and eating grasshoppers that he had previously overlooked; but he now definitely flew up on to one of the higher perches and remained there. He now accepted with disinclination, crushed, and dropped a *Papilio lycæus*, did the same on my reoffering it, and the same to a second, quite separate, one that I offered; but readily accepted, crushed, and ate the brown guinea-fowl-spotted Nymphaline *Hamanumida dædalus*. Accepted a much-rubbed and battered *Neptis agatha*, and threw it back into his throat, but shook his head violently from side to side as though to eject it when it was halfway down; but, failing, swallowed it. Again crushed and rejected the second *Papilio lycæus*, but readily ate a *Pyrameis cardui*, once more treated the *lycæus* as before, but readily ate a *Gegenes hottentota* and another *Parnara*, either *detecta* or *mathias*; crushed and rejected another skipper, *Padraona zeno*, but accepted and ate a *Gegenes*; refused to accept another *Parnara*, and for a time refused a *Melanitis leda* (great brown Satyrine with leaf-like underside), then accepted, crushed, and ate it. Refused, then crushed and rejected a *Salamis parhassus æthiops* (a great bottle-green and mother-of-pearl Nymphaline); accepted, crushed, and swallowed a Painted Lady and a skipper, *Andronymus neander*; refused, then again crushed well and rejected the *Salamis*; refused, then accepted, crushed, and held a *Hamanumida dædalus*. This he still continued to hold four or five minutes later, and he refused to relinquish it for either a Painted Lady, a common grasshopper with a round black spot in the centre of each thigh (*Catantops sulphureus*), or one of the earth-like grasshoppers so liked by the Drongo; but, on returning ten or fifteen minutes later, I found it on the ground. Evidently he was *really* replete.

As with the Ground-Hornbills the tasting is done in the tip of the bill. Yet the tongue is very short, and when the bird was crushing the Cape gooseberries, in the tip of the of the bill, I noticed that the tongue's base remained pressed tightly up against the roof of the bill, completely stopping the aperture to the throat. It was only lowered as the gooseberry was thrown back into the throat.

Comments. Several degrees of preference were indicated in this experiment :—

(1) Two Nymphalines (*Pyrameis* and *Hamanumida*), three skippers (*Gegenes*, *Andronymus*, and *Parnara*), and probably a Satyrine, *Melanitis leda*, were preferred to

(2) *Papilio lycus* and probably (to judge merely from behaviour) the black and white Nympaline *Neptis agatha*; also to the yellow-and-brown skipper *Padraona zeno* and probably to *Salamis*. The latter was refused very near repletion-point. *Belenois severina* also preferred to

(3) *Mylothris agathina*, and this to

(4) The two Aeræas (*A. areca* and *A. terpsichore*) and the two buff-patched species of *Amauris* (*A. albimaculata* and *A. lobengula*).

(5) *Danaida chrysippus*.

(6) The great *white*-patched *Amauris*, *A. dominicanus*, with or slightly above

(7) Meat (kind not specified).

(8) Cape gooseberries.

Below *P. lycus* and probably *N. agatha* would come *Mylothris rueppelli* and *Nyctemera leuconoë*, and with or below them would also come *Terias*, *Ypthima*, and (if it was recognised as itself, which is not certain) *Henotesia*.

This order is approximately that in which many other species of birds, species that had to be very hungry to eat even a single Danaine or *Acræa*, placed these insects : *Lophoceros*, like *Bucorax*, is just as finely discriminating as they, once he has reached *Danaida*- and *dominicanus*-refusing point. But it takes more food to bring him to that point ; and before reaching that point he is capable of eating with apparent impunity immense numbers even of Danaines and

Acræas. This is illustrated most strikingly in all my experiments on young *L. leucomelas*, and in the present experiment adult and experienced *L. melanoleucus* also only began to refuse these butterflies when he had already eaten the equivalent in weight of very many Danaidas.

This experiment is altogether of particular interest, for the way in which it supplements and explains my earlier and far less perfect, yet very striking, experiments on *Lophoceros leucomelas*. To-day I did what I did not do to *leucomelas*—I carried the filling of the bird's stomach well beyond the point at which Danaidas, &c., are refused, and so long as it was *kept* filled to beyond that point so long would the bird have continued to refuse those low-grade insects—it might be for hours or days together, excepting after the bringing up of a pellet.

Conversely, so long as the filling-up process was not carried and kept beyond that point by the presence of pleasanter insects, so long would *Danaida*, &c., have been continuously, with short intervals for subsidence, been preyed upon.

542. Aug. 20.—Ate several *Physalis*-fruits (7 or 8) and refused to accept another; refused, then took and threw away a ripe fruit of the tall Ebenaceous forest-tree, *Maba mualala*. Ate several pieces of meat (as the other day, the meat again running about 20 pieces to the ounce), and refused the next piece; ate eagerly a few grasshoppers. Then refused an *Acræa areca* ♀ and an *Amauris albimaculata*, but only a minute or two later, already ready for them, took, crushed, and swallowed both.

I have several times tried the bird with *Maba* fruit, and, even when fairly hungry, he has refused to eat it. One has lain uneaten in the cage all day, though *Physalis* fruits have been eaten at intervals whenever the bird was hungry enough. That when still hungrier he might have eaten the *Maba* fruit, too, is suggested by the fact that I have occasionally found these fruits in the stomachs of wild birds. This, again, suggests that we need not regard all things found in the stomach of a wild bird as necessarily highly liked by it. How do we know, in any particular instance in which

an object is not present in quantity, that it was not eaten under stress of hunger? And even where it *is* present in quantity, the performances of these Hornbills with relation to *Danaida*, &c., show that we must *still* be cautious in our deductions.

Crateropus kirki.

543. May 29.—The Babbler captured the day before yesterday had to-day just eaten a small meal, but was probably still slightly hungry, when I offered him a *Precis cebrene* and a *Neptis saclava*. He accepted and ate each very readily, crushing them before swallowing.

544. June 5.—May 29th's conditions and acceptances exactly repeated.

545. June 14.—Hungry. Crushed and swallowed the thorax of an *Acræa asema*, but rejected the abdomen; at once rejected after tasting it an *Acræa aglaonice*, pulled a wingless *Danaida chrysippus* about for some time, and seemed very doubtful about it, but finally abandoned it. He then crushed and readily swallowed a male *Mylothris agathina*.

My impression was that the *Mylothris* (as its acceptance actually showed) was preferred to other butterflies.

546. June 15.—Kept for a time without food, tasted and at once rejected *Acræa terpsichore*; battered and pulled about for quite a long time a female *Mylothris agathina*, but finally abandoned it; tasted and at once readily swallowed a *Terias brigitta*, a *Precis cebrene*, and a *Pyrameis cardui*.

I then placed in the cage a number of grasshoppers of various species. The bird attacked them, and when he had returned apparently satisfied to his perch I offered another *Terias*. This was tasted and rejected, but a *Pyrameis cardui* eaten with evident relish.

Without doubt the order of preference was: (1) *Pyrameis cardui* ("Painted Lady"), (2) *Terias brigitta*, (3) *Mylothris agathina* (female), (4) *Acræa terpsichore*.

547. June 19.—Very hungry, some time without food. Tasted well and readily ate a *Terias brigitta*, and gave a prolonged trial to a *Mylothris agathina*, pulling it about for

some time, but finally abandoned it, tasted and *at once* rejected an *Acræa terpsichore*.

Again there was no doubt of the order of preference.

548. June 22.—The bird was busy eating grasshoppers, which had just before been placed in the cage. I threw in amongst them a *Terias* and an *Ypthima* near *impura*. The first, a small bright yellow Pierine with feeble flight, was throughout ignored, the latter (a small brown Satyrine, also with feeble flight) was at once picked up, tasted, and rejected—and the Babbler proceeded with her feed. I then inserted an *Acræa terpsichore* and a *Danaida chrysippus*. The former (a small insect with the usual protective juice of the Acræas) was tasted and rejected, and the latter (a famous model for mimicry) was simply ignored. The Babbler now returned to her perch, satisfied, so far as small dull-coloured grasshoppers were concerned, but she still accepted and ate a *Hamanumida dædalus* with evident appreciation; refused without tasting one or two of the grasshoppers definitely offered to her, also another *Ypthima*; but accepted and ate a *Precis cebrene*, and then accepted and pulled about for some seconds a *Hamanumida dædalus*, but finally abandoned it, evidently through repletion. She now refused without tasting a *Charaxes neanthes*, a *Lampides betica*, and another *Hamanumida dædalus*.

The bird's liking for the two wary Nymphalines with procryptic undersides as against the previously offered butterflies, and as against even small dull grasshoppers, was very evident.

549. June 23.—Tasted and rejected in turn an *Acræa terpsichore*, a *Mylothris rueppelli*, a *Mylothris yulei*, and a *Nyctemera leuconoë*. The first is a small *Acræa* with brilliant upper surface and protective juice, the next two are white Pierines with orange wing-bases and a strong smell, the last is a tomato-leaf-scented, black and white, day-flying moth.

550. Aug. 21.—Accepted and, with the greatest briskness, crushed and swallowed a large strongly-smelling Coreid bug, *Holopterna alata*. No sign of dislike was shown, but

its exact "placing" is uncertain, as the state of the bird's appetite was not definitely ascertained.

551. Sept. 28.—Had been feeding not long before on termites and various Orthoptera. Tasted and battered well, and finally rejected, a *Terias regularis*, a *Mycalesis campina*, and a *Neptis agatha*. It was likely that none of these were liked *better* than the grasshoppers.

552. Sept. 30.—Had again been feeding, and had left several high-grade insects uneaten. She tasted and at once rejected a *Papilio angolanus*, and picked up and pulled about for quite a long time a *Leuceronia thalassina*, but finally abandoned it. I removed its one wing and reoffered it, when the bird snapped the thorax from the forceps, crushed and ate it, then refused to have anything to do with the abdomen or to taste a wingless *Precis sesamus* (black and blue dry-season form of *natalensis*). I *think* she, perhaps, regretted the eating of the *Leuceronia*'s thorax.

553. Oct. 1.—I have already described this experiment in full in a paper on "The Defences of *Charaxes*," read before the Entomological Society in May. Briefly, it amounted to this. The Babbler chased with persistence, but lack of success, owing to the breakage of the wings when seized, two of these very powerful fruit-eating butterflies. Finally, in the case of the second (a *C. brutus*), "the bird darted out its foot as the butterfly glanced past close to the ground, and, seizing it most skilfully in her claws, pinned it thereby to the ground, at once pulled off its head, and lost no time in disabling it further by pecking and pecking at the thorax with the greatest vigour. The whole butterfly then received a great pecking, battering, and crushing, but the Babbler, while it considerably reduced the size, failed to remove the wings, and finally abandoned the butterfly. I kept the bird for some time without food, but, though it renewed its attacks on the *Charaxes* more than once, its attempts to eat it were ineffectual."

From an entomological point of view, the experiment is interesting as illustrating the defences in virtue of which the larger *Charaxes* are so greatly mimicked by smaller

species. Ornithologically it is of interest as illustrating a Babbler's methods and limitations.

554. Oct. 10.—I presented a snake—a night-adder, probably *Causus rhombeatus*—before the cages of several of my smaller birds in turn to test the attitude of old and young towards it. "In every case the greatest alarm was at once displayed. . . . . The *Crateropus* was the only partial exception. She retired to her top perch, and there moved backwards and forwards in an agitated manner tail well up, legs at full length—at tip-toe, so to speak,—looking down all the time at the snake."

555. Oct. 21.—Method of attacking a large beetle. I placed a large beetle, *Scarabœus nigro-æneus*, in the cage. The Babbler, hungry, at once attacked it. She made no attempt to hold or crush it, but, in accordance with her usual method of attack, pounded it with great force with the points of the mandibles held slightly apart. The result was much the same as in the case of the Bulbul, for, nearly every time it was struck, the beetle simply shot across the cage, though the fact that the bill was somewhat open and struck simultaneously in two places had a steadying effect and sometimes prevented this. Once the lower mandible penetrated some joint in the armour, and there was a little difficulty in extracting it. The Babbler went on for some time with the attack, but gradually tired of it, and finally abandoned the beetle. On my removing and examining the latter, I could find no trace of injury anywhere. The beetle had remained all the time passive, its legs tucked lightly into their receiving-grooves, and even now, though placed out for some time on the table, continued to remain absolutely motionless.

I next gave the bird the dead millipede that the beetle had been rolling. She seized it by the head as it lay on the ground, and, by a sharp side-long twist of the bill, wrenched this off. She then retired to an upper perch and remained there motionless, holding the head in her bill for more than half an hour without an attempt to eat it—perhaps waiting

to be hungry enough to digest it. I have had many instances of this.

556. Oct. 23.—Readily ate a *Mycalesis campina* (small brown Satyrine butterfly), but tasted and rejected an *Acræa natalica* and the black-white-and-buff day-flying moth, *Aletis monteiroæ*; readily ate another *Mycalesis campina*, two small dull-coloured grasshoppers, and another *Mycalesis*. She then pulled at, but only ate portions of, two more grasshoppers, and refused to touch any others, going on to reject a *Myc. campina*, but to eat readily a *Neptis saclava*, a *Henotesia perspicua*, another *Neptis*; and, after it, her appetite doubtless stimulated by these acceptances, the *Mycalesis* previously rejected. She still refused grasshoppers, but ate another *Mycalesis*; again refused grasshoppers, but ate yet another *Mycalesis*; ate with relish twelve winged termites of a small species and rejected repeatedly, after tasting them, a *Mycalesis campina* and a *Neptis saclava* (wingless). She showed an inclination, nevertheless, to eat a wingless *Pyrameis cardui*, returning to it several times, but finally left it, apparently not caring for the trouble of preparing it. She rejected it *very* promptly when slightly smeared with honey, evidently suspecting the strange and strong taste, and hurriedly ate some termites, as though to take the taste away.

The order of preference was probably: (1) Termites, (2) *Pyrameis*, (3) *Neptis saclava* and possibly *Henotesia perspicua*, (4) *Mycalesis campina*, (5) *Acræa natalica* and *Aletis monteiroi*. If so, it agrees with the order of preference shown by all my various birds, except the few that transpose *Neptis* and *Mycalesis*.

557. Nov. 15.—Very hungry; accepted a *Mylothris yulei*, battered the wings on the ground, and then, holding it in its bill by the thorax, wings outward, literally *combed* the latter with her foot, reducing them to shreds. She then ran the butterfly through her bill and swallowed it. Given an *Aletis monteiroi* (day-flying moth), she pulled it about a little and abandoned it, but, returning to the attack, seized the abdomen and removed it from the thorax by dint of

battering the latter against a perch. She then threw the abdomen away, however, wiped her bill vigorously against the perch, and refused to have anything further to do with any portion of the moth.

I considered that *M. yulei* was preferred to the moth, though after a little more food the bird refused both and also a *Papilio angolanus*.

558. Nov. 16.—The ant, *Dorylus gerstaeckeri*, is always eaten by this bird, apparently with relish, whenever it enters its cage. To-day I offered her both this species and another common ant, *Myrmicaria eumenoides*, and each was readily eaten. The bird then pulled a wingless *Papilio angolanus* about for a time and finally abandoned it, but made a determined onslaught on the large, vinegar-scented, yellow and blue-black ichneumon, *Ospryncholus flavipes*, which it would seize by a leg or a wing and rub on the ground (with the "worrying" action of a dog that has seized a rat) until the limb came off. Finally, when the insect was not only disembowelled but thoroughly "pulped" through being battered and run through the mandibles, it was swallowed with no sign of dislike—an insect that is placed as low as *Mylothris* by others of my birds. The Babbler even went on to pick up each severed leg and wing, and, after running it through her bill and worrying it on the ground, swallowed it, though the nourishment it contained must have been nearly *nil*! She then accepted a wingless white Pierine, *Catopsilia florella*, and worried it for a time, but ended by abandoning it, transferred a wingless *Catacroptera cloantha* (Nymphaline) to her foot and thence ate it piecemeal with apparent relish; refused, then just took in her bill and dropped, the *C. florella* reoffered; nibbled slightly in the point of her bill and swallowed with apparent relish a *Henotesia perspicua*; pulled about and diswinged the Noctuid moth, *Sphingomorpha chlorea*, ate it with some avidity; then with stimulated appetite turned to the previously-rejected *C. florella*, now lying on the floor of the cage, and ate that, too—once more, however, rejecting the *P. angolanus*. She then ate readily two Pentatomid bugs, *Bagrada hilaris*,

larva and imago, and, after a good deal of worrying, two larvæ of the common ladybird beetle, *Epilachna hirta*, so destructive to potato-foliage. These larvæ have a bitter taste, and are intensely disliked by my other birds. She then broke up, but ended by abandoning, an imago of the same species, exuding the usual yellow juice, but persistently refused to touch a second. However, after an immense amount of persuasion, she took it and at once flung it away with every sign of disgust. She then ate with apparent relish a *Mycalesis campina* with all wings attached, and accepted after much hesitation, but at once wiped off her bill on to the perch, a larva of *Epilachna hirta*. Probably the first two had not agreed with her.

The liking of the Babbler for ants disliked by some of my birds requires no explanation, for *Crateropus* is an ant-eater. Whether her so ready acceptance of the ichneumon and of the Coccinelid larvæ is similarly due to specialization, or whether she was rash in eating them, can only be cleared up by further experiment.

559. Nov. 27.—Method of dealing with, and partial defeat by, a hard slippery beetle. Hungry, as I had purposely kept her without food for some time previously. On my inserting the hard glossy Cetoniid beetle, *Pachnoda impressa*, the Babbler turned it over on to its back and, with her head drawn right back and neck well arched, struck blow after blow at it with terrific force for so small a bird. I noticed that on this occasion the mandibles were kept closed. Often the beetle glanced away and the bird soon reverted to her old trick of steadying it with one foot while she struck the blow. Sometimes she would hold it in her claw and pull at the underside of the abdomen, and often she would seize it in her bill and bang or rub it on the ground. The insect's slipperiness, however, defeated and disconcerted her on all occasions. It was a considerable time before the chitin of the abdomen broke. The bird then drew forth and ate such of the contents as she could get at, and, after some more ineffectual hammering on both surfaces, abandoned the remains. On my re-offering it twice, she each time struck

at it two or three times, but then definitely abandoned it and took no notice of another (fresh) specimen that I then offered; but she eagerly ate some grasshoppers.

560. Nov. 29.—Do birds know by inherited instinct what is good for food? On my placing a glossy, *intensely* hard, large seed of the Ceara rubber-tree (*Manihot glaziovii*) in the cage (which, by the way, still contained uneaten grasshoppers and termites), the Babbler commenced to search about as she always does after her tray has been pulled out and pushed back again. Finding the seed after a few seconds, she subjected it to a tremendous hammering. Occasionally she would rub it in the earth, but more often she would steady it as already described in connection with Cetoniidæ, and launch blow after blow at it with all her force. I watched for ten minutes, and at the end of that time the bird was still continuing the attack with an occasional short interval for rest; and was, moreover, following the seed up with the greatest zest each time it glanced away from a blow.

561. Dec. 28.—Accepted a large water-bug, *Laccotrephes ater*, a most leathery and unpromising insect; deposited it on the ground and hammered at it with great force and persistence, sometimes steadying it with her claw, sometimes turning it over on to its other surface, but usually choosing the lower surface for attack. At the end of five minutes I removed the bug. It was covered with small shiny marks caused by the point of the Babbler's bill, but was actually perforated in only one place—on the lower surface of the abdomen. Both walking-legs on the left side were gone, the bird having once or twice seized it by a leg and battered it on the ground till that came off.

On my now reoffering the bug she at once renewed her attack, and at the end of a further five minutes succeeded in removing one of the elytra, after having already broken off the two remaining walking-legs. She had repeatedly attacked the claspers, but their attachment to the body must be exceedingly strong, for she quite failed to loosen them—a useful provision for an animal that uses them for capturing prey that may sometimes be large and active. Finally,

finding that there was below the wings yet another skin as tough as the first, the Babbler abandoned the insect entirely and refused to accept it when re-offered. But she eagerly attacked and ate some small grasshoppers which I placed in the cage.

1910. 562. Jan. 9.—Method of dealing with a wasp. The Babbler evidently realised that a large wasp, *Dielis bifasciata* var. *mansueta*, was not a thing to be played with, but showed the greatest energy and dexterity in dealing with it. The method was that of *Pycnonotus layardi*, but far more skilfully applied, and the pause after each attack was so infinitesimal that the wasp was allowed no opportunity to recover itself.

I first offered an insect from which I had removed both wings on one side. The bird at once snatched it from the forceps, threw it down, pounced on it, worried it on the ground for a second with the greatest violence, let go, again paused, worried and let go, and so on. Finally, the head came off and was swallowed, after which the bird completely changed her tactics and proceeded to break the insect up by her usual methods, pounding the thorax with the sharp points of her slightly separated mandibles, holding it down with one foot while she dragged at it with her bill, and so on. She finally ate the whole of it.

I now introduced a lively wasp with the full use of its wings, in order to see whether it would not escape between the attacks. Nothing of the kind. The bird never gave it a second's leisure, but piled in attack after attack—each short and crisp in itself—with lightning rapidity until the insect was completely exhausted, when she once more changed her tactics and proceeded to break it up and eat it in the most leisurely fashion.

A wasp once brought to ground by such a bird would have little chance of escape.

563. Jan. 9 (later in the day).—Disinclination for even dead wasps when fuller. After a good feed of various grasshoppers, &c., she pulled about a little and abandoned in turn a black wasp at present unidentified, a *Papilio angolanus*

with and without wings (a small portion was the second time eaten), and a *Mycalesis campina*, readily ate a beetle-larva found in termite nests, pulled about and rejected the yellow and black-banded wasp (*Dielis mansueta*), refused without tasting, persistently, a "woolly-bear" caterpillar (probably Arctiid), the urticating hairs of which come out easily, and then proceeded to make a great feed of small worker-termites.

Each wasp in this experiment was killed, or practically so, just before offering by the slight crushing of its thorax with my forceps. The idea was to arrive at their *food*-value in the bird's estimation without the complicating factor introduced by the presence of an active sting. They are obviously not amongst the bird's favourites.

564. Jan. 11. Treatment of a millipede. Hungry. Readily ate a small blue-black Phytophagous beetle, common now on the outskirts of the Chirinda Forest; pulled about and abandoned a larger yellow and green one; readily ate, after crushing it well, a second of the blue-black species; pulled about for a very long time, constantly rubbing it against the perch to remove the yellow juice, an adult "lady-bird" (*Epilachna hirta*), and finally swallowed it; snatched the next from the forceps, but threw it away; battered and ate the beetle, *Lagria villosa*; tasted and rejected the yellow and green species abandoned before, and very readily ate an adult ant-lion (*Formicales leucospilus*). She then ate several grasshoppers, and, retiring to a perch, went (literally) to sleep. I now placed a freshly captured scarlet millipede (*Spirobolus* sp.) close up to the bars in front of her. About three seconds later the bird awoke with a start, flinging herself back as the Shrike had done, and retiring quickly to a back perch. She at once recovered herself, however, and, snatching the millipede from the forceps, battered and rubbed it on the ground and perches for some time, as though to make it exhaust its pungent vapour. She even ate a small portion of it, but abandoned the rest (now broken into three fragments), and refused to touch it on my reoffering it. She then readily ate a *Mycalesis campina*, showing she was hungry enough for that, and

at once each time threw away a *Terias*—this fixing her state of appetite yet more exactly, but readily ate another *Mycalesis*.

565. Jan. 12.—Given a hard weevil (unidentified), the Babbler made a most prolonged attempt, in her very bold manner, to break it open; but she made no impression on it, and ended, after several minutes' hard work, in abandoning it. She readily and easily ate another (softer) weevil.

566. Jan. 14.—Readily ate a driver-ant (*Anomma nigricans*); crushed well and rejected the Coccinelid *Alesia bidentata* and the pupa of a second "lady-bird," *Epilachna chrysomelina* (a small portion of the latter was eaten and the rest abandoned); ate another *Anomma* worker, and, after much pulling about and rubbing on the ground, two larvæ of *E. chrysomelina*; tried and rejected two imagines of the same genus (*E. chrysomelina* and *E. hirta*); ate in the same way as before a third larva of the former species; tried and rejected the Chrysomelid beetle, *Exosoma bimaculata*, and the two "blister-beetles," *Cerocti's exclamationis* and *Mylabris oculata*, and readily ate a *Mycalesis campina*.

567. Jan. 31.—Hungry. Battered for a time at the large hard Coprid beetle, *Anachalcos spectabilis*, but, failing to pierce it, abandoned it; pulled the large weevil, *Brachycerus congestus*, in through the wires, struck at it once or twice only, then, having evidently readily gauged its intense hardness, far greater than that of its predecessor, at once abandoned it.

568. Feb. 2.—Battered the metallic-coppery Buprestid beetle, *Psiloptera cognata*, vigorously for a considerable time with the point of her bill, but finally abandoned it without having done more than break off a leg. This beetle is not a very large one, but is protected by hardness, torpedo-shape, and a glossiness that seems not to be nullified by the slight longitudinal fluting.

569. Feb. 7.—Attacked the large Cetoniid beetle, *Neptunides polychrous*. Its sharp claws caught in the bird's lores as she attempted to batter it, and she at once shook it free with much show of annoyance and refused to return to the attack.

570. Feb. 9.—Do birds know by inherited instinct what is good for food? I inserted, amongst other food, into the bird's tray three or four of the brilliant red seeds of *Trichilia chirindica*. The Babbler was attracted by them at once and tasted one. She quickly abandoned it.

571. March 27.—Tasted and rejected the black gregarious larva, three-quarters of an inch long, of a moth still unidentified, and each time it was reoffered merely pulled it about a bit, then abandoned it or else ignored it completely; battered well and ate without apparent dislike the young green larva, one inch long, of a large Saturniid moth, *Gonimbrasia* sp.; absolutely ignored the full-grown larva, $3\frac{1}{2}$ inches long by three-quarters of an inch in diameter, of a third moth, covered with branching spines; readily accepted, crushed slightly, and swallowed a large driver-ant (*Anomma nigricans*), and as readily ate a *Papilio angolanus*, a *Belenois mesentina*, and a *Terias brigitta*, the last two butterflies with wings, the other with only one.

572. March 28.—Readily ate an ant (No. 31, not identified) and a *Belenois mesentina*, but refused, then tasted and rejected, a Phytophagous beetle (157).

Later, hungrier, she readily ate a large driver (*Anomma*); refused, then tasted and rejected, the black larva; readily ate the green larva of *Gonimbrasia* and the "blister-beetle," *Mylabris oculata*; pulled at once or twice and abandoned a large larva, just mutilated and abandoned by the Shrike; readily ate a *Belenois mesentina*; tasted and rejected an *Acræa caldarena* without wings; pulled about and readily ate a wingless *Danaida chrysippus*; ate a portion of a small, sluggish, black fly (No. 19) much disliked by many animals, but wiped off the rest of it on to the perch; then readily accepted and ate ant 31.

573. March 30.—Very hungry. Readily ate two hive-bees, a *Mylothris yulei* (after battering the wings), and, after having broken them up in his usual manner by pounding, two large hard Tenebrionid beetles (*Amiantus globulipennis*). She then pulled about and battered a great deal an *Acræa caldarena*, but ended by abandoning it.

574. April 10.—In most cases the insects in this experiment were pulled about a good deal before being finally swallowed or abandoned.

The bird tasted and rejected an *Epilachna*, but ate a *Mylabris oculata* and a wingless *Acræa natalica*, rejected an *Acræa arca* ♀ and a second *A. natalica*, ate a "frog-hopper," rejected a large grey millipede with almond smell; readily ate four small bright orange-coloured centipedes, but refused to touch any more, rejected a beetle with protective fluid (not identified), but readily ate a *Belenois severina* with wings.

Concluding Discussion.

We are perhaps inclined to take somewhat too much for granted a bird's relations to its prey. We shoot, say, a Puff-back Shrike and find in its stomach two wasps, the fragments of a Coprid beetle, and a *Precis* butterfly. We record the bare fact in our next paper, but otherwise think no more about it. Yet it would be most interesting to enquire whether the above insects represent its normal food or were only eaten under temporary stress of hunger; to know just *how* that Puff-back Shrike went about to circumvent the stings of the wasps, to break up the hard chitin of the beetle, and to capture so wary a butterfly; and whether other species of birds do these things in the same way or by other methods. It would be interesting, also, to notice that neither the wasps, the Coprid, nor the butterfly were about in large numbers, yet insects that *were* abundant were not represented in the bird's stomach. Why? And, if we decide that there must be some repugnance to, or fear of, or inability to catch or deal with, these more obvious insects, in virtue of what limitations on the bird's part does it exist, and how did the bird learn to avoid them? And so on.

Methods of attack.—That some species of prey have special defences that other species lack will hardly be denied, and it is open to a bird to deal with them (1) by employing special methods of overcoming the defence in question, or (2) by avoiding its possessor and exhibiting a preference

for insects that are not thus defended. Actually, both things are done, and in the majority of cases it will depend on the bird's state of hunger which course will be chosen. A bird that is nearer repletion will not trouble to break up a dung-beetle or attack a wasp—however delightful it may be to eat it, if someone else will do it for him!—will often when a little hungrier attack with the greatest energy and skill; and the methods of attack that different birds apply to the different defences are of the greatest interest. Some received illustration in the experiments I have described above.

Take stings. The Babbler in experiment 562 showed how completely helpless a powerful wasp may be against even a weak-billed bird that has once got it on the ground. Attack after attack was piled in, giving no time for recovery; yet each attack was crisp and brief, so that no opportunity of using the sting was given. Bulbuls (*Pycnonotus*) attacked similarly, as would, no doubt, any of the birds—as *Telephonus*—that habitually batter their prey on the ground, or, being willing to attack wasps, are, nevertheless, too weak in the bill to do so with any success aerially. Stronger and longer billed birds attack the wasp they are hungry enough for when and where they can get it, but seize by the thorax and pinch as they seize. If the pinch fails—that is, if the thorax is not at once crushed—they let go again, unless the insect has so short a reach that they have nothing to fear from the sting. If, on the other hand, the pinch succeeds, the bird throws off all caution, at once either swallows the prey or brings into operation his usual methods for reducing any insect to an edible condition. I have already described (Journal S. A. O. U., Dec. 1913, p. 97) the quite similar methods employed against a large snake by Ground-Hornbills—the attacks directed exclusively at the head, the latter's immediate release every time the "pinch" failed, and the abandonment of caution directly the head crunched.

The Babbler's methods as against hardness and gloss were in no degree less interesting. Experiments 555, 559, 561, 565, 567, 568, and 573 all bear on this point, though the

full method is best illustrated in 559. The bird, "with head drawn right back and neck well arched," would strike "blow after blow with terrific force for so small a bird" at the prostrate insect. It would steady it if necessary by holding it firmly in one foot while it struck the blows, as a man does sometimes to a stone he is shaping. It would often, in the case of a slippery insect, strike with mandibles somewhat open, and thus partly arrest the prey's tendency to glance away. And it realized that the underside of the abdomen was the most vulnerable spot, for it specially turned the insect on to its back before commencing to hammer. That the method was a highly effective one is shown by the fact that the Babbler succeeded (559) in breaking into and partly extracting the contents of a large hard flower-beetle that not only my Bulbuls, but a Roller (*Coracias garrulus*), failed to negotiate, and that my most powerful batterer of all, a Kingfisher (*Halcyon cyanoleucus*), took twenty minutes to make any impression on. My Shrike (*L. collaris humeralis*) experienced the very greatest difficulty with one, but, finally, holding the beetle in one foot and tearing at the underside of the abdomen with its bill, it succeeded in doing just what the Babbler did: it extracted the contents of the abdomen but failed with the thorax. With the Coprid of experiment 555 the Babbler failed in good company—the Roller, the Bulbul, and the Shrike. The Kingfisher's "first five smashing blows" (the beetle being held in its bill and struck against a branch) "produced, I noticed, no result, but a few blows later the chitin of the thorax cracked right across." As for the weevils of experiment 565, *all* the above birds failed with the harder species, whether batterers, hammerers, crushers, or tearers, but a Swempi (*Francolinus coqui*) just swallowed it. Even the Swempi, however, had difficulty with a yet larger weevil (*Brachycerus congestus* of 567) owing to its holding its very toughly attached legs straight out together instead of keeping them tucked in like a dung-beetle. The Kingfisher, too, succeeded only with the *Anachalcos*, and it was the Kingfisher alone that successfully dealt with the gloss and torpedo-

shape of the Buprestid beetle of experiment 568. But the Babbler's methods were once more vindicated in experiment 573, when she broke up two Tenebrionid beetles of a species that the Roller tried for a few seconds to crush "through sheer bill-pressure," but, failing, threw away. The Shrike failed, too.

Finally, the attack on the water-bug (experiment 561) was most interesting, the Babbler's full methods as against hardness being brought into play here as against leatheriness. Its failure was again in good company. The Shrike failed to damage the bug, the Roller "crushed it in every conceivable position," and, the insect at once resuming its former shape each time the pressure was relaxed and its claspers seizing everything within reach and jerking it repeatedly from the bird's bill, "at last flung it away in a rage." The Kingfisher swallowed it, but even *his* preliminary battering had failed to open a way for the digestive fluids to enter, and the bug was brought up in the next pellet quite undigested.

The methods of attack I have dealt with include methods of reduction (to an edible state). Some birds commonly forego these preliminaries. A Francolin or Guinea-fowl will swallow the hardest of prey—*Brachycerus*, for instance, which I have taken from their crops—intact, and leave the muscle of the latter to do the rest. Other birds, as Kingfishers and Rollers, quite roughly break up the chitin by battering against a branch or crushing with the bill and then swallow whole. Most Picarians, in my experience, swallow whole, as do Swallows and a few other Passerines. Many Passerines, on the other hand (and some Picarians), prepare their food more thoroughly, "pulping" the parts eaten, and going to some trouble to remove superfluous chitinous parts that may be an obstacle to swallowing. Shrikes of the genus *Lanius*, Paradise Flycatchers, Weavers, and Whydahs, and numerous other birds hold the insect firmly in one foot, the tarsus resting on the branch, and tear or lever off the undesired parts (which commonly include the wings of butterflies) with the point of the bill. My Wood-Hoopoes

were adepts at this (*vide* experiments 503 and 510). The "batterers," on the other hand, which include Bulbuls, some Bush-Shrikes, and a number of other birds, seize the part they desire to remove and batter the insect against the ground or a branch till the part comes off. The method is well illustrated in experiment 558. The "combing" of the wings of a *Mylothris* in experiment 557 is an unusual operation. "Snipping," too, is rare. The Wood-Hoopoes attempted it, sometimes unsuccessfully as regards the removal of the wings, but successfully in removing an abdomen from a thorax (experiment 503). Mr. G. A. K. Marshall, however (Trans. Ent. Soc. 1909, p. 339), refers to the interesting fact that certain Indian Bee-eaters "cut off" the wings of butterflies, while African Bee-eaters swallow these insects whole. *Merops viridis* and *M. leschenaulti* are apparently the Indian species specially referred to, and W. Davison ('Stray Feathers,' vi. 1878, p. 68) is quoted with regard to the latter:—".... You hear a little click of the bill, and as the bird flies off the pair of wings come slowly fluttering to the ground." It must be a very neat performance. The wild Bee-eaters of my own observations (I have seen more than a hundred attacks on butterflies by wild *M. apiaster* and a few by *M. persicus*, *Mel. bullockoides*, and *M. meridionalis*) have always swallowed their prey whole, and my tame European Bee-eater always did the same, merely crushing it first. *Lophoceros* of these experiments (520–542) was also a "swallower," but not quite a typical one; for, owing, I suppose, to the length of its bill and the shortness of its tongue, it had, in order to swallow, to *throw* the prey back from the tip of its bill straight into its throat, and this gave rise to the very amusing incidents of experiment 531. The same applies to *Bucorax*, and I have already ('Ibis,' 1908, p. 407) described the very wasteful swallowing of figs in the same way by *Bycanistes*.

One of the neatest actions that I have witnessed on the part of a bird was the capture of the *Charaxes* by the Babbler in experiment 553. It darted out its foot as the butterfly glanced past, and, seizing it most skilfully in its

claws, pinned it thereby to the ground. The method is one that is more likely to have been employed in the bird's wild state in relation to grasshoppers and fast-running ground-beetles than to butterflies. That the rather larger butterflies are well protected against birds by their broad expanse of wing was well illustrated in what preceded the above capture. That such tough butterflies as the largest species of *Charaxes* are additionally well protected against such relatively weak and small-billed birds as *Crateropus* was well shown by what followed that capture, as also by difficulties of the same kind experienced by my Bulbuls, *Pycnonotus* and *Phyllastrephus*. The two points together tempt one to a brief discussion of the attitude of birds to butterflies. That they do attack them, and that very largely, I am convinced through having myself witnessed in the field many hundreds of attacks by very various (and in some cases very unlikely) birds in a single very circumscribed locality, and through having seen damage of a kind that one sometimes finds in the wings of nearly every high-grade butterfly being actually inflicted by birds both wild and tame (for instances of the latter see experiments 538—wing-damage to *Danaida*—and 553). Mr. Marshall, too, has collected and published (Trans. Ent. Soc., Sept. 1909) about 600 records from various parts of the world, including some of a very striking nature. At the same time the pleasanter butterflies are possessed of great wariness and a difficult flight, while the brittle wing ever interposed between themselves and an enemy must frequently provide the latter with disappointment. So that, as Marshall long ago suggested, it is probable that the average small bird not possessed of the extreme skill in aerial capture that characterizes Bee-eaters, Swallows, Drongos, and some Fly-catchers will probably make most of his attacks on butterflies when he finds them resting, engaged in some absorbing occupation, passing quite close to his perch, or for some other reason in or beside cover. This, and the fact that butterflies go to ground and stay there when at all systematically attacked by birds, probably, with lack of special observation, accounts for so few attacks on them being

ordinarily witnessed. The facts bearing on the subject that figured in the experiments described above were (1) the really very excellent knowledge of his butterflies shown by adult *Lophoceros melanoleucus* on entering captivity (experiment 538), the probable previous knowledge shown in *Irrisor*'s initial treatment of the highly nauseous butterflies *Danaida chrysippus* (in experiment 506) and *Acræa acara* (in experiment 507), and that displayed by another bird of the same species in experiment 513; (2) the evidence touching the question, "Does the necessity for removing or swallowing the stiff, strongly-attached wings act as a deterrent to attack on butterflies?" On the strength of experiment 503 (on *Irrisor*) I decided that, "while wings hampered the birds, they failed to deter." On the whole, however, a relatively replete bird *is*, I think, slightly deterred, just as he does not then care greatly to attack such beetles, wasps, and grasshoppers as tend to give him a little trouble. The treatment of *P. demodocus* in experiment 512 supports this view.

The only method of *search* that was illustrated in the above experiments consisted in the probing of all the cracks of their cage by the Wood-Hoopoes with their long thin bills. Many of the methods by which birds obtain their prey are not readily capable of illustration by caged individuals. Such are the extraordinarily minute search of bark and twigs and leaves and ground by Warblers, Tits, Creepers, *Phylla-strephus*, and so many others of our small birds; their trials of inanimate objects, based doubtless on past experience of twig-, bark-, and excrement-resembling larvæ, leaf-resembling butterflies, and lichen-like moths * (*Lophioceros melanoleucus*, however, in experiment 538, tried a lump of mingled earth and excrement); the great mixed hunting-parties, in which birds of numerous and very diverse species join to "drive" the woodlands; the attendance on these parties of Drongos and Flycatchers; attendance on driver-ants, on grass-fires, on flocks of seed-eating birds, and even on man and monkeys, for what they may flush; the sharp sight that enables Swallows and Kites

* Both facts have a bearing on the argument that such resemblances constitute hypertely.

instantaneously to pick out from amongst masses of ash and unacceptable objects racing upwards in the smoke and wind of a grass-fire just such insects as are acceptable to them; the methods by which insectivorous birds circumvent winged and wary prey—the furtive approach, culminating in a sudden quiet nip, of a *Telephonus* or a *Dryoscopus guttatus*, the short, sharp attack on an insect flying past of the average small bird, the longer-range attacks and bolder pursuits of a Drongo or Paradise Flycatcher, the yet bolder and more graceful work of Bee-eaters, Swallows, and Kites, the headlong drop after an insect that falls, and the ensuing search should it reach the ground, the flying wing-fragments, the marvellous twistings and doublings, the empty bill-snappings that characterize the headlong fall should the insect be a butterfly, the mid-air struggle to hold a *Charaxes* imperfectly caught, and the rush to the spot of the bird's companions on his losing his exclusive right to the insect through its escape from his bill. None of these things are readily illustrated by birds in captivity, but all should be mentioned in any discussion of the relations of birds to their prey. The one thing that *was* illustrated above was the normal response of a butterfly to attack. *Eurytela hiarbas* in experiment 511 "took cover" and stayed there, using the projecting rim of a saucer as in nature it would have used a leaf.

We have now, so to speak, discussed how our hypothetical Puff-back Shrike slew his wasps, reduced his beetle, and captured his very wary butterfly. We have yet to consider why, out of vastly more abundant species that were present at the time, he should have chosen to eat these three. We have to discuss, in other words, his digestive limitations and how he came to realize them.

The existence of nauseating qualities in certain prey was well attested by certain incidents in the experiments on the Wood-Hoopoes. A, the wisest of them, was over-persuaded by myself and ate a *Danaida* and an *Acræa acara*. C followed suit with a *Danaida*. B ate only the abdomen of a *Danaida*. Even B became fairly miserable. The other two

were completely nauseated, and, after much straining, vomited up all that they had eaten of the offending butterflies. This was in experiment 507. In 511 C was similarly nauseated by an *Amauris*. But many other butterflies were eaten without the slightest apparent ill-effects. Here we at once have an opening for such preference as we suppose our Shrike to have shown. A similar contrast in after-effects is to be found in every insect order, and a similar inability to eat low-grade insects without nauseation beyond a certain point in the process of repletion has been evinced by numerous species of birds beside Wood-Hoopoes. Even *Lophoceros leucomelas* A showed great uneasiness after having eaten the brilliant strong-smelling moth-larva of experiment 520, and refused another with anger; and again apparently somewhat overstepped the safety-limit in experiment 521 and, probably, 526. These instances were in relation to *Acræa*. B did the same in relation to *Amauris*. Whether her eating of earth after her Danaidas of experiment 531 indicated a similar condition it is not easy to say.

It is a curious fact, nevertheless, that even those birds with the smallest capacity for eating nauseous insects are able to eat one or two with apparent impunity, and even eagerness, when their stomachs are empty and appetite good. Thus the average bird may quite readily eat Danainæ or Acræinæ several times in the day—in the early morning or after some other long interruption to feeding and after the ejection of each pellet. As it fills up somewhat, it rejects such very low-grade prey, but eats other species, some of which, in time, it finally rejects when slightly fuller, though still eating the others. And so, through the successive elimination of many grades, right up to repletion-point. The main difference between *Lophoceros* (and *Bucorax*) and the more normal birds I have experimented on is that the Hornbills are able to accept and digest such insects as *Danaida* and *Acræa* in larger numbers and up to a far later stage in the filling of their stomachs. Once, however, they reach the point at which such insects become unacceptable, their preferences follow the course of most other birds. First the Danainæ

are discarded, then the Acræniæ, then *Mylothris*, then *Belenois*, *Terias*, and some Lycænids, then *Mycalesis*, *Neptis*, a skipper or two, and various mimetic genera in Nymphalinæ, Pierinæ, and Lycænidæ, then *Eurytela* and *Leuceronia*, next certain Papilios, and after them *Precis*, &c. Finally (if the bird is capable of easily swallowing or reducing it), *Charaxes*; also some skippers. These would in most cases be eaten nearly to repletion-point, but the average bird will still find room for one or two such Noctuids as the *Sphingomorpha* of the above experiments, while in birds that specialize in some one order—as a Drongo in Diptera—several grades of that order will often still intervene between the rejection of the pleasantest insects of the remaining orders (including, it may be, butterflies) and actual repletion-point.

As well as these more general "specialists" and birds—such as Hornbills—that are indiscriminating up to (but not beyond) a certain point, we have yet another class—the specialists in some one family or subfamily of highly nauseous insects. I believe that our common Bulbul (*Pycnonotus layardi*) is to some extent specialized to digest Danaines, the individuals on which I have best tested them placing them as high as *Mycalesis*; and it seems probable that the Ashy Wood-Swallow of India (*Artamus fuscus*) is even further specialized in the same direction *. That this specialization of the digestion in a particular direction (if I am right in believing it to be present) has perhaps been accompanied by loss of power in another direction is suggested by the fact that my Bulbuls, that placed Danainæ thus relatively high, placed Pierinæ generally quite unusually low. The transposition of these two groups constitutes the greatest divergence from normal tastes that I have come across, but, while the order I have indicated above is generally held to, small differences of taste, small transpositions of contiguous

* There are probably few birds that are not specialists, and so indiscriminating, in one direction or another. There would also seem to be a gradation between the more usual birds which in most things discriminate from the outset and those, like *Lophoceros*, which commence late.

insects, occur as between any two species of birds, and, for that matter, any two individuals of the same species.

It is interesting to note how the experiments described in this paper bear on the above. Nauseation of *Irrisor* by Danainæ and Acræinæ eaten beyond their respective safety-limits has already been referred to. The quaint shaking up again of a swallowed *Mylothris* in experiment 540 by *Lophoceros melanoleucus*, and the same bird's attempted shaking up again of the yet higher-grade butterfly, *Neptis*, on another occasion, are probably to be explained on the same lines: each had been rashly eaten after its normal refusal-point had been passed. I have had numerous other instances of insects swallowed and brought up again at once, and it seems to me that many birds, at any rate, are often able to gauge an insect's effect directly it approaches the glandular stomach, perhaps through sensations arising from the stimulation and inhibition, respectively, of the digestive secretions *. In this last point we have, I believe, the whole explanation of the phenomena we have been considering. In my later and more knowledgeable experiments I found myself able to restore my animals' fading appetites, and to enable them to eat with impunity prey that they were already refusing, by giving them special dainties, and (in carnivorous animals) to spoil their appetites and make them refuse what they would otherwise have readily eaten by letting them see, smell, or taste the equivalents of *Acræa* and *Danaida* when they were by no means ravenous enough for them. It is probable, in other words, that certain insects, eaten eagerly to repletion-point, have the stimulative effect on a bird's digestive secretions that roast beef and certain soups have on our own, while others, such as the Danainæ, tend definitely to inhibit the secretions, and can only be digested, or even retained,

* Applied to frugivorous birds, this, with parental guidance, might explain sufficiently their learning to avoid poisonous fruits without being killed in the process. It is also no doubt perfectly true that fewer fruits are highly poisonous to birds than to us. The fact that birds are readily destroyed by powerful poisons concealed in foods in which they have learned to place perfect confidence is no objection.

without discomfort when these are in great strength relatively to the amount of food contained in the stomach—when even the Danainæ may stimulate them. It is impossible to go into the subject more fully here. Suffice it to add that just as the taste, smell, or even sight of certain foods that we can eat with impunity may in themselves, by unconscious association, be sufficient to promote a flow of the gastric secretions and give us thereby a feeling of appetite and eagerness, while the mere sight or smell of things that disagree with us produce a feeling of disinclination for them, so, too, with birds, choice probably becomes, with experience and practice, instinctive. A bird, seeing a well-known and lately experienced *Amauris* when not in a position to eat it with impunity, probably does not have to cast back in his memory for his previous experiences of it, or to calculate how full his stomach is. He merely feels disinclined for it.

One point, discussed at the end of experiment 541 and in 528, and illustrated abundantly throughout the experiments on *L. leucomelas* (and in other experiments not described here), is worth mentioning again. It is that a rapidly-digesting bird is able to go on eating the most nauseous insects indefinitely, with frequent short intervals for subsidence, provided that no higher-grade insects are available to carry the filling of its stomach well beyond the point at which those nauseous insects are usually refused, and to keep it there.

The actual preferences shown in these experiments may be summarized as follows:—*Irrisor* preferred the Noctuid moth *Sphingomorpha* to the pleasantest Acridians and Locustids, and these to larval migratory locusts. The locusts were, in the first experiment, preferred to dead and drying butterflies, but the latter were far better relished in subsequent experiments in which they were offered alive. In fact, in experiment 502, there was an indication that a larval migratory locust was, at any rate, not *better* liked than *Byblia*—a butterfly as low-graded as *Neptis*. Amongst the butterflies themselves, *Hypolimnas*, *Hamanumida*, *Catopsilia*, the three Papilios—*dardanus*, *demodocus*, and *lycæus*—the larva of

P. demodocus and members of the genus *Precis* were probably preferred not only to the genera that caused nauseation (*Danaida*, *Amauris*, and *Acræa*), but, with *Belenois*, to the moth *Olapa* and the butterflies *Mylothris*, *Terias*, and *Papilio angolanus*. *Lophoceros leucomelas* showed an apparent preference for a migratory locust and for *Precis cebrene* as against *Amauris albimaculata* and *A. ochlea*, and for Acræinæ as against Danainæ. The preference for *Danaida* as against *Amauris* was less certain, but very probable. Even Danainæ, however, were probably liked far better—placed higher—than the brilliant moth-larva of experiment 520, and I thought at the time that greater repugnance was shown for the larvæ of *Acræa terpsichore* in experiment 536 than had been shown for adult Acræinæ and Danainæ. If so, it would be only in line with my results from other birds. It was interesting that each bird could eat an *Amauris* or else an *Acræa* when it seemed to have had as much as it could safely eat of the other. This seemed to indicate that their protective qualities are very different. The difficulty experienced with *Catopsilia florella*'s stiff wings in experiment 531 as against the pliable, easily-swallowed wings of *Danaida* was also interesting.

L. melanoleucus's preferences were ascertained a little more fully. I was now learning to experiment better, and had the advantage of dealing with a bird that was adult and full of experience and formed opinions when captured. The preferences seemed to be:—(1) *Pyrameis*, *Hamanumida*, *Melanitis*, and the skippers *Gegenes*, *Andronymus*, and *Parnara*; (2) *Padraona*, *Salamis*, *Papilio lyaus*, and probably *Neptis*—with (1) and (2) would be bracketed *Precis* spp., *Catopsilia*, *Pseudacræa lucretia*, if recognized, and probably brown *Crenis* and *Leuceronia argia*, also the skippers *Baoris*, *Platylesches*, and *Rhopalocampta*; (3) *Ypthima* (probably); (4) *Belenois*; (5) *Mylothris*—with (4) and (5) might be bracketed *Terias* and *Leptosia*; (6) *Acræa acara*, *A. terpsichore*, and the two buff-patched Amaurises; (7) *Danaida chrysippus*; (8) *Amauris dominicanus*; (9) meat; (10) Cape gooseberries; (11) *Maba mualala* fruits. Read backwards,

this list represents the order in which the objects comprising it would be discarded as the bird filled up from emptiness to repletion, or near it. Ten or eleven grades in all, and with further experimentation they would have been increased.

The Babbler's preferences, in so far as they were ascertained, stood in the following order:—(1) Termites; (2) *Pyrameis*; (3) *Neptis* and possibly *Henotesia*; (4) *Mycalesis campina*; *Ypthima*, and the pleasantest grasshoppers would come here or in (3), and *Hamanumida*, *Precis*, the ants, and the moth-larvæ in or above that grade; (5) *Terias*; *Belenois* and the young green Saturniid larvæ here or higher; (6) *Mylothris*; (7) *Aletis*, *Danaida*, and *Acræa*—with (6) and (7) would be bracketed the unpleasanter gregarious moth-larvæ and some of the Phytophagous beetles, and with (5), (6), and (7) the millipede, Arctiid larva, wasps, blister-beetles, and pupal and imaginal ladybirds. The Babbler was more inclined to eat the latter, and especially their larvæ, than any of the other birds, seeming to get rid of much of the juice, and with it presumably some of its objectionable qualities, by much rubbing. Vigorous rubbing was also used to exhaust the pungent but volatile defence of the millipede in experiment 564. The moth *Sphingomorpha* was much liked, *Osprynchotus* (the ichneumon) was placed high (an unusual occurrence), certain strong-smelling bugs were also placed high (by no means so unusual), *C. cloantha* was preferred to *C. florella* and *P. angolanus*, and the second-named butterfly probably to the third. The unusually high placing of the ants, the ichneumon, and the Coccinelid larvæ suggest that *Crateropus* is perhaps a specialized bird, and that it would have been of great interest to pursue its general preferences further. The resemblance of its butterfly preferences to those of *Lophoceros melanoleucus* is marked.

The preferences we have dealt with so far are the *enforced* preferences of birds. These *have* to let pass an *Acræa* or a Coprid, let us say, because their digestion is insufficiently vigorous to deal with the former or their strength to break the latter. But there are two other kinds of preference—the choice of the largest, and the turning of the whole atten-

tion to the commonest, insect that they are at the time hungry enough for. Absorption in the search or watch for one particular kind of insect is, I believe, fairly frequent, and it probably pays the bird; it certainly accounts for a number of the instances of neglect we witness. And the selection of the largest insect present that the bird is hungry enough to eat—resulting, it may be, in the taking of an *Amauris dominicanus* in preference to the far higher-grade but smaller *Precis cebrene*—is, as I have seen in both tame birds and wild, the rule where the bird *has* a choice and troubles to make it.

It is interesting to inquire how birds come to know that some insects may be eaten with impunity at a given moment and others not. Prof. Lloyd Morgan's experiments on young birds are well known. He found no indication that they possessed any inherited instinctive knowledge of what could and could not be eaten. I have myself carried out a similar series of experiments on some of our African birds—with the same result. Even the experiments I have described above contain some evidence bearing on the point, in the trial of a lump of earth and excrement by the Crowned Hornbill, its rejection after swallowing it of a *Mylothris*, in the actual nauseation of the Wood-Hoopoes by insects that they had eaten, and, for that matter, in the continual rejections that took place after tasting (see, too, experiment 560). I have, in all my experiments, come across no evidence of visual instinctive recognition, but plenty of evidence to the contrary. Whether rejection by *taste* is equally non-instinctive is another matter. Watching a bird going through a long experiment, and noting the accuracy and relative lack of hesitation with which he pronounces his decision on insect after insect, by taste, one is almost convinced that the selection is instinctive. Yet, in view of one's experience with very young birds, and of such mistakes as those made by the Wood-Hoopoes and Crowned Hornbill, it is probably more correct to say that, with practice, recognition of deeper qualities by taste *becomes* instinctive, just as the playing of the piano does, only far more easily.

Two factors remain: parental education and personal experience. The latter is certainly by far the most important of the two, and we have seen in these experiments that birds readily profit by experience. But that parental influence is an important and long-lasting factor is suggested by the fact that so many young birds continue to go about with their parents almost up to the commencement of the next breeding-season, and by the most interesting attempt at dissuasion from eating a very low-grade insect by the older *Irrisor* in experiment 506. Here the young bird must have been nearly a year old. In this particular instance, the younger bird did not allow itself to be persuaded quite at once, but that birds do allow themselves to be influenced by the acceptances and rejections of others I have many times seen. It has happened with other birds, as it did with *Lophoceros* above, when two birds have been caged together, that one has gone so far as to offer an insect of which he was (one supposes) doubtful to the other while keeping a tight hold on it, and that he has swallowed it down himself if the other wanted it and thrown it away if it ignored it. I had for some time a hand-reared *Hirundo puella* caged with a captured *H. rustica*, and it was almost pathetic to see how the former watched the latter and relied on its acceptances and refusals.

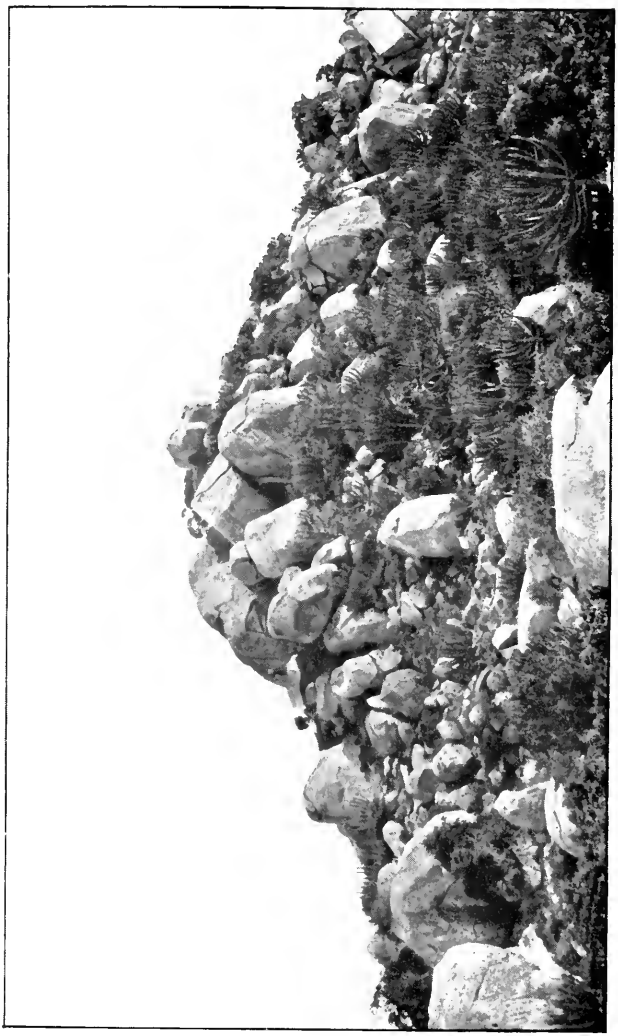
The whole relations of old birds to young in the matter of food is a most interesting question for study. I have myself watched wild Bulbuls feeding their young, and I came to the conclusion that there the old birds captured what they were hungry enough for themselves. If the young bird refused the offering (as it sometimes did, so early does a knowledge of the qualities of prey and visual recognition of it commence) it was taken back and eaten by the old bird. Similarly, in experiment 502, *Irrisor* A gave *Catopsilia* and locusts to C that he was hungry enough for himself, and took back and ate what C did not want. Yet he deprived C just afterwards of the greater dainty *Sphingomorpha*! In experiment 503, A gave C *Precis artaxia* and *natalensis* that he had been eagerly awaiting himself. But on C's holding the *P. natalensis* without eating it, "A again seized it with

apparent impatience at C's dallying, extracted it after a short struggle from her grip, and swallowed it himself," and ate the next two himself without troubling to offer them to her. The experiment continued to be interesting along the same lines. In the case of the second lot of Hoopoes, D and E, the relationship was probably not that of a parent and child, but matrimonial, and each gave to the other. The male, however, was the chief giver, and he was certainly a most generous and painstaking husband until his wife *snatched*. Then he gave her a most comical but effective lesson in discipline and manners (experiment 518).

It is impossible to carry out a long series of food-experiments without deciding that bird-language is really a very adequate instrument of communication, and that human beings talk too much. Nothing could have been clearer than the rebuke administered in experiment 518 and the fact that *Irrisor* E accepted it in a duly chastened spirit. Again, nothing could have been clearer and more unmistakable than A's actions in attempting to dissuade C from eating the *Danaida* in experiment 506, or than the actions of both birds in announcing to me their unwillingness to accept the last *Danaida* in experiment 507. Bill-wiping is a very widespread signal of dislike and refusal—not that it is used for this alone, for the bill often has to be merely cleaned. The light closing of its tip on the object offered, followed by an immediate withdrawal (in experiment 507), is also a common mode of refusal. My Owl (*Syrnium*), in refusing thus, would indulge in what I could only call "apologetic nibbling," her bill sometimes not even closing on the object "nibbled." Turning the back is a last and most emphatic form of refusal, and used to be indulged in by my Roller: it occurred in experiment 530. Anger was vividly expressed in experiment 520, probable request for information in experiments 527, 532, and 533, and gallantry to the opposite sex (or was it practical joking?) in 531. Eagerness has also its special signs—used, as I have seen, even by wild birds in soliciting prey captured by a companion—and so has disappointment. Even thanks was expressed in the bowing of the Hoopoes. Add the expressions of affection that are

so frequently exchanged by birds, the actions of the male in courtship and of both sexes in the training of the young, the warnings against enemies and the threats and reminders to the same, and the signals by which birds keep in touch with one another, and we have a language that for all practical purposes is tolerably complete.

Behaviour in face of a snake (experiments 537 and 554) —not that an Amphisbænid is a snake!—the close study of the appearance of a rejected *Amauris* by *Irrisor* in 508, and the deception of birds by resemblances in their prey (experiments 507, 509, 511 (perhaps), and 529), are, I think, almost the only remaining points to which I need call attention. The last point has been illustrated in numerous other experiments, and, taken together and in due relation to the fact that the same appearance is often brought about in unrelated prey by utterly different pigments, they suggest that birds see colours very much as we do. That some species are very blind, and others sharp-sighted, in relation to motionless objects (all depending on their general habits), I had, I think, little or no evidence in these experiments, but much in others. Both this fact and the above-mentioned study of the *Amauris* have an interesting bearing on the question of hypertely. Of the other senses of birds, smell only is worth referring to here. The ridiculously short tongue of *Lophoceros* and other hornbills, and the fact that they, nevertheless, base their acceptances and refusals on tastings performed with the very tip of the long bill, suggests that we have here a case analogous to smelling rather than true tasting. I have seen short-billed birds, on the other hand, bring the tips of their tongues into actual contact with the objects tested. That even these birds appreciate odours—though they do not, like mammals, use them for recognition—is shown by the behaviour of *Crateropus* in experiment 564 (a very extreme case, of course) and by the fact that my Swallows showed discomfort when strong-smelling insects (such as the moth *Xanthospilopteryx*) were brought at all close to them.



CURIOUS SITE FOR HERON'S NEST.

VII.—*Occasional Notes.*

1. Hearty congratulations to Mr. C. G. Davies, M.B.O.U., on his promotion from Sergeant 1st S.A.M.R. to Lieutenant 3rd S.A.M.R.—a promotion, we feel sure, he well deserved. Mr. Davies, we believe, is as good a soldier as he is naturalist and artist. An interesting letter from his pen is printed herein.

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2. Curious Form of Blue-breasted Waxbill.

Last week I procured, between a lot of ordinary Blue-breasted Waxbills (*Cryptuthus angolensis*), an example with red cheeks or "ear-coverts," similar to those of *C. bengalus*, but nothing like so large as those of the northern species. The bird, unfortunately, died, and upon dissection proved to be a male. F. E. O. Moers.

De Kroon, P.O. Brits. Transvaal,
August 4th, 1915.

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3. The following letter was written to the Editors from Usikos, G.S.W.A., under date June 13th, 1915:—

"As one approaches this place, the country improves in appearance—a good deal of bush and more mountainous in character—and is of great interest to a naturalist.

"We are camped here in a dry sandy bed, with numbers of fine shady trees (camel thorns) about, and bird-life is common and all new to me. Big game is numerous, and the burghers have been having a good time amongst kudu, gemsbuck, zebra, &c.

"Near Walvis Bay I first saw the Yellow-nosed Albatross, and sea-birds of all kinds were common. The only land-bird I saw was *Corvus scapulatus*, but I picked up the remains of a Button-Quail, which must have lost its way.

"At this place I noted the Black Crow, Bulbuls, Sparrows,

Glossy Starlings, Weavers, a Hornbill, the Grey Lourie, two species of Wood-Hoopoe, a Barbet, a Woodpecker, a Ground-Thrush, a Wren-Warbler, an *Erythropygia*, two Chats, a Drongo, a Guinea-Fowl, a Francolin, a Bush-Francolin, Rueppell's Korhaan (fairly plentiful); also a small Fly-catcher.

"I have not had time to shoot any for identification, but hope to do so later on. Yours sincerely,

C. G. Davies,
3rd S.A.M.R."

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4. Distribution of Francolin in the O.F.S.

Roughly speaking, a line can be drawn north and south through Thaba Nchu.

North-east of this line, you find no Francolin except *F. africanus* right away through to Harrismith; yet, just south-west of the line afore-mentioned (south-west of Thaba Nchu), I have shot *F. africanus* and *F. garispensis* on the same ground within a quarter of a mile of each other. *F. gariepensis* is non-existent in East Thaba Nchu, Ladybrand, Ficksburg, although the localities are quite suitable for the species. Why is this? K. Cowper Johnson.

Westminster, O.F.S., Jan. 1st, 1915.

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5. *To the Editor, Journal of the S.A.O.U., Pretoria.*

I am enclosing herewith a photograph for publication in your 'Journal,' if you think it to be of sufficient interest. When Mr. C. J. Swierstra and I were travelling from Pietersburg to Woodbush on the 11th December last, we outspanned to rest the mules at a place about 12 miles from the latter. Near the road is the kopje shown in the photograph. In a stroll round this kopje we observed a Heron (*Ardea melanocephala*) standing on the top of the large Euphorbia indicated by an arrow. Mr. Swierstra stayed down below, while I climbed up to investigate, and, as I did so, the bird first walked across the top of the

Euphorbia and then took to flight, circling about overhead for some time. I found that the Euphorbia contained about six nests of this species, in one of which I could, from above, clearly make out about four green eggs. Later on, I found some more nests on a Euphorbia on the left of the kopje, just out of sight from where the photograph was taken. This nesting-site is a novel one for the Black-necked Heron, and should interest ornithologists. The Euphorbiæ are, of course, well protected by thorny branches, and about 15 feet high, so that it would have been a difficult matter to get at the nests; in addition, this part of the kopje seemed also to be shunned by the native herd-boys, probably on account of the matted overgrowth of bushes and cacti, which would be an ideal spot for poisonous snakes. The kopje itself is also typical of those found in the vicinity of Pietersburg, and usually the only places where sheltering vegetation is to be found. I have to thank Mr. C. Swierstra for the photograph.

Transvaal Museum, Pretoria,
February 3rd, 1915.

AUSTIN ROBERTS.

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6. *To the Hon. Secretary, S.A.O.U., Pretoria.*

For the last week or ten days a pair of *Cossypha caffra* have been in attendance on a young *Cuculus solitarius* in the vicinity of my office.

The call of the young bird resembles that of a young *C. caffra* so closely that, until I saw it, I was under the impression it was the natural offspring of the Robins.

Could you, or any of your readers, tell me whether this is the natural call-note of the young Cuckoo, or is it part of the "game of deception" to imitate the note of the young of its foster-parents?

J. C. J. KNOBEL.

Tokai, P.O. Retreat,
December 3rd, 1914.

[The usual call of the adult *C. solitarius* is a loud "Piet-myn-vrouw," whence its Dutch name. The call-notes of young birds often vary considerably.—EDD.]

7. The following appeared in the *Union Gazette*, under date April 5th, 1915:—

* No. 20 (Administrator's), 1915.]

PROCLAMATION

By the Honourable the Administrator of the Province of Transvaal.

UNDER and by virtue of the powers vested in me and the Executive Committee by sub-section (*f*) of section *three* of the Game Preservation Ordinance 1905 as amended by the Game Preservation Further Amendment Act 1909 and section *eighty-one* of the South Africa Act 1909 I do hereby proclaim, declare and make known that the birds described in the Schedule hereto shall, on account of their general utility be protected and not be hunted or destroyed in all districts of the Transvaal Province as from the date hereof.

Proclamation No. 14 (Administration) of 1910 shall be and is hereby cancelled.

God Save the King.

Given under my Hand at Pretoria this Sixth day of April One Thousand Nine hundred and Fifteen.

JOHANN RISSIK,
Administrator of the Province of Transvaal.

SCHEDULE.

General Utility Birds and Locust Destroyers.

English Common Nomenclature.	*Dutch Common Nomenclature.*	*Scientific Nomenclature.*
Stork, white-bellied	Grote zwarte sprinkhaanvogel	Abdima abdimi.
Stork, white	Grote witte sprinkhaanvogel	Ciconia ciconia.
Starling, wattled.....	Leispreeuw	Perissornis carunculatus.
Egret, buff-backed	Bosluisvogel.....	Bubulcus ibis.
Jays: Roller, European (blue jay)	Kleine trouwpand	Coracias garrulus.
Jays: Roller, racquet-tailed	Breedstaart trouwpand ...	Coracias spatulatus.
Jays: Roller, Mosilikatza's	Trouwpand	Coracias candatus.
Jays: Roller, purple	Grote trouwpand.....	Coracias mozambicus.
Jays: Roller, cinnamon...	Geelbek trouwpand.....	Eurystomus afer.

All birds belonging to the families Oedicnemidae, Glareolidae,

and Charadridae of the order Limicolae, including the whole of the plover species and in particular the following :—

English Common Nomenclature.	*Dutch Common Nomenclature.*	*Scientific Nomenclature.*
Pratincole, black-winged .	Kleine sprinkhaanvogel...	Glareola melanoptera.
Pratincole, red-winged ...	Roodvleugel sprinkhaanvogel	Glareola fusca.
Dikkop or (*of*) Thicknee .	Dikkop	Oedicnemus capensis.
Water Dikkop.....	Water dikkop	Oedicnemus vermiculatus.
Burchell's Courser	Dravertje	Cursorius rufus.
Two-banded Courser	Dravertje	Rhinoptilus africanus.
Crowned Lapwing	Kiewit or (*of*) Kiewitje....	Stephanibyx coronatus.
Blacksmith Plover	Bonte kiewit	Hoplopterus speciosus.

VIII.—*Short Notices of Ornithological Publications.*

1. '*The Ibis*': *Quarterly Journal of Ornithology.* July and October, 1914 ; January, 1915.

This famous journal continues its valuable papers on ornithology from the four quarters of the globe. In the July number the only paper of general interest is one on "Some Species of the Genus *Thalassogeron*," by C. Salvadori. In the January number, Mr. C. H. B. Grant gives us the first instalment of an account of a collection of birds from British East Africa and Uganda, presented to the British Museum by Capt. C. S. Cozens. This includes the groups Struthiones to Pelicaniformes, and contains field-notes by the collector, Mr. Willoughby P. Lowe. The paper is illustrated by two plates (a map of the country and a coloured plate of *Francolinus hildebrandti altumi*) and two text-figures. The African Quail was collected on the 22nd of September, the Harlequin-Quail on October 11th ; the Kurrichane Button-Quail was obtained at Mt. Suswa on the 27th September. We notice the Red-eyed Cape Turtle-Dove's generic name is altered to *Streptopelia* in this paper, and the Senegal Dove to *Stigmatopelia*. The African Moorhen is elevated to a separate subspecies and called *Gallinula chloropus meridionalis* Brehm., and is said to be smaller than the European bird, and to possess a distinct blue colour on

the wings. The Great Crested Grebe is likewise converted into a separate subspecies and called *Podiceps cristatus infuscatus* Salvad. The Treble-collared Sand-Plover is not recognisable to us under its new outlandish generic name of *Afroxyechus*. The Sacred Ibis is now called *Threskiornis*, and the Wood-Ibis receives the generic name of *Ibis*. The local Knob-bill Duck is relegated to a separate subspecies, *S. melanotis africanus* Eyton, being "always smaller than specimens of the typical form from Ceylon." In the October 1914 and January 1915 numbers, Mr. David A. Bannerman publishes two parts of the report on the birds collected by the late Capt. Boyd Alexander, part 1 being on the birds of Prince's Island and part 2 on those of St. Thomas Island. Many mainland, and especially South African, forms are mentioned.

2. '*The Avicultural Magazine*' (3rd Series), Vol. vi. Nos. 1–12.

The November 1914 number contains an interesting article by R. A. Holden on the breeding in captivity of the various members of the genus *Hyphantornis*.

"Cranes in Captivity" forms the subject of an interesting paper (anonymous) in the December 1914 number. Short accounts of various species are given, including the South African Stanley and Crowned Cranes.

Dr. Butler gives us an article on "Reasoning in Birds" in the January 1915 number. He cites the discriminating powers of Parrots as instances of reasoning. The February number contains, *inter alia*, a short account by Mr. H. D. Astley of the Brown-necked Parrot (*Poicephalus fuscicollis*) in captivity. Mr. G. H. Gurney, F.Z.S., gives us in the April number an account of the breeding in captivity of the South African Coly (*Colius striatus*). Mr. Gurney is probably the first aviculturist to breed this bird in confinement.

The August number contains an article on the Vulturine Guinea-Fowl (*Acryllium vulturinum*), by Dr. Graham Renshaw, with a photo half-tone illustration of the bird.

3. '*British Birds.*' 1915. 12 numbers.

While there is little of special interest to South African ornithologists in this magazine, it contains articles of great general interest, especially those on the life-histories of English Birds by Miss E. L. Turner, Maud Haviland, E. B. Dunlop, and others. These are invariably illustrated by beautiful photographs.

IX.—*Proceedings of the South African Ornithologists' Union.*

Report of the Twelfth Annual Meeting.

The Annual Meeting was originally held in the Transvaal University College on Monday, July 5th, 1915, at 4.30 p.m., when Sir Arnold Theiler took the Chair. After the preliminary business had been transacted, it was found necessary to adjourn the meeting on account of other matters pertaining to the Science Congress, and the adjourned meeting was held in the Office of the Director of the Transvaal Zoological Gardens on the following Wednesday afternoon at 3 p.m., when the Rev. Noel Roberts (Johannesburg) took the Chair, in the unavoidable absence of the President. There were present :—Messrs. Austin Roberts, D. Kehoe, C. E. Gyde, and Ivan Ayres, of Pretoria ; Mr. F. W. Fitzsimmons, of Port Elizabeth ; and the Hon. Secretary (Mr. A. K. Haagner). The Secretary's report and Treasurer's statement are printed herewith.

The subject of the protection of birds was again discussed, and a Sub-Committee was appointed to consider the matter. This consists of the Rev. Roberts (Chairman), and Messrs. C. E. Gyde, A. K. Haagner, Austin Roberts, and Ivan Ayres (Hon. Secretary).

A new Sub-Committee was also appointed to discuss the matter of bird-migration, and to try and infuse a little more enthusiasm into the subject. This Committee includes Messrs. A. K. Haagner (Chairman), Ivan Ayres, G. A. H.

Bedford, Dr. H. G. Breyer, Rev. Roberts, and Mr. Austin Roberts as Secretary.

Three new Members were elected to the Union:—Messrs. H. B. Papenfus, of Johannesburg; Mr. Gurth Edelsten, of Sepani; and Mr. C. G. Worman, of Durban.

Several Members were removed from the roll for non-payment of subscriptions.

The office-bearers for 1916 were elected as follows:—

President	Sir ARNOLD THEILER, K.C.M.G., Pretoria.
Vice-Presidents	Dr. L. PERINGUEY, S.A. Museum, Cape Town. C. M. G. JOHNSTON, Bloemfontein. E. C. CHUBB, Durban. C. F. M. SWYNNERTON, Rhodesia.
Hon. Sec. & Treas...	A. K. HAAGNER, Zoological Gardens, Pretoria.
Retiring Editor	B. C. R. LANGFORD (for a further term of three years).

Members of the Council.

For Cape Colony	F. W. FITZSIMONS.
„ Natal	Dr. J. E. BRISCOE.
„ Transvaal.....	A. ROBERTS.
„ Orange Free State	K. C. JOHNSTON.
„ Basutoland	J. P. MURRAY.
„ Port. East Africa	P. A. SHEPPARD.
„ Rhodesia.....	Rev. S. S. DORNAN.

A vote of thanks was accorded to Mr. B. C. R. Langford for his past services to the Union, with the Union's hearty good wishes, on his departure for England.

Report for 1914.

THE year 1914 has been the worst for the Union so far experienced, as, owing to the strike, the war, and the rebellion, the country has been in a fairly unsettled state. Some of our most active Members have been attending to more serious duties than bird-watching, and papers for the 'Journal' have been very scarce, with the result that only one number of the 'Journal' could be issued last year. This contains 51 pages letterpress and two photographic plates. A short number of the 'Bulletin' series was also issued,

containing a key-list of the first 12 families of South African birds.

I can only reiterate what I said in my last Annual Report, viz., that if Members will not take a warmer interest in the Society, and try and send the editors some publishing material from time to time, their task becomes a hopeless one. I would again appeal to those of our Members who can assist in this direction.

Membership.—Three new members seek election into our ranks: Messrs. H. B. Papenfus of Johannesburg and Gurth Edelsten of Sepani, O.F.S., the former proposed by myself and the latter by Mr. K. C. Johnston of Westminster; also Mr. A. C. Worman of Durban. I would suggest removing from the roll of Members seven names, some of which have not paid up since 1908 and others—of whom two officers who have left South Africa—since 1909. The total membership at date, including those to be elected, but excluding those I have just mentioned, totals 83 ordinary and three honorary.

Bird-Protection.—At the last meeting I mentioned that a Joint Committee for this purpose had been appointed in Johannesburg, on which two of our Members were elected as delegates from the S.A.O.U. No meetings of this Committee have been held—at any rate, I have received no notification to attend any,—probably on account of the unrest in the country. I would suggest that a strong recommendation be made to the Town Council of Pretoria that all small birds be protected on the Town Lands of Pretoria, with the exception of the Weaver and Bishop Birds. I saw a boy last week with a powerful air-gun shooting several Larks, and these birds are of great utility to the farmer and market-gardener. I would suggest that a small Sub-Committee be appointed to draw up a bye-law and wait upon the Mayor and Town Council in order to explain the reasons for our suggestion.

Migration.—Little has been done recently in this matter,

partly on account of the lethargy displayed by the public, partly on account of the troublous times, and partly by reason of my inability to give the matter the attention I was wont to give it. I would suggest the election of another Member of the Society as Secretary for this work.

Pretoria,
June 28th, 1915.

A. K. HAAGNER,
Hon. Sec.

Cash Statement for 1914.

1914.		£	s.	d.		£	s.	d.
Jan. 1.	To Balance	54	11	11				
Dec. 31.	Subscriptions	22	11	6				
	Sales of Journal (1913 incl.)	10	3	0				
	Illustration Fund	1	11	6				
	Entrance Fees	2	12	6				
	Witherby & Co.		12	7				
	By Printing and issuing Journal	....				25	1	2
	Postage and Stationery (Secty.)..	....				1	14	3
	Comm. and Bank Charges (Secty.)	....					11	8
	Index (Witherby & Co.).....	....				2	2	0
	Sundries (Witherby & Co.).....	....					9	3
	Witherby & Co.	....				10	0	2
	Balance	....				52	4	6
		£92	3	0		£92	3	0

THE JOURNAL

OF THE

SOUTH AFRICAN ORNITHOLOGISTS' UNION.

Vol. XI. **DECEMBER 1916.** **No. 2.**

X.—*Observations on the Birds of the District of Humansdorp, Cape Province.* By B. A. Masterson.

Common Vulture (*Gyps kolbii*).—This bird has entirely disappeared from this district, not one having been recorded for the last fifteen years. Formerly (up to 1898) it bred here regularly in a big krantz on a farm about nine miles from the town.

The reason the farmers give for the disappearance of the Vulture is that they died through having eaten of the flesh of cattle which died of rinderpest.

The nest is a big heap of sticks, usually placed on a ledge or rock. Breeding season August.

It lays one egg of a dirty-white colour.

Black Vulture (*Otogyps auricularis*).—Disappeared at the same time as *Gyps kolbii*. Did not breed here.

White-necked Raven (*Corvultur albicollis*).—Becoming very rare. Only three pairs recorded since 1912. One pair breeds in a krantz near the Gamtoos River: the nest is placed in a hole in the krantz, and is composed of sticks, twigs, and grass lined with fibre and hair.

Breeding season November to January.

It lays three eggs of a bluish colour, spotted and blotched with brown.

Not uncommon along the coast.

Jackal-Buzzard (*Buteo jackal*).—I have not found any nests.

Bataleur (*Helotarsus ecaudatus*).—Common in the mountains and kloofs. I have not found the nests.

Black-shouldered Kite (*Elanus cœruleus*).—Common. It usually builds in isolated trees. The nest is composed of sticks and twigs, lined with grass and hair.

Breeding season August to February.

It lays four to five greenish-coloured eggs, spotted and blotched with brown.

Yellow-billed Kite (*Milvus ægyptius*).—Common in certain parts of the district. It nests in krantzes on a ledge under an overhanging rock.

Breeding season November.

It lays in a depression in a rock three whitish eggs with red-brown blotches.

Spotted Eagle-Owl (*Bubo maculosus*).—Very common. Its nesting-place is usually on the bare ground under an overhanging rock.

Breeding season September to January.

It lays two white eggs.

Bush-Owl (*Syrnium woodfordi*).—Not uncommon in the bushveld and bushy kloofs. I have not found any nests.

Marsh-Owl (*Asio capensis*).—Common in certain parts of the district. I have not found any nests.

Barn-Owl (*Strix flammea*).—Common. I have found their nests in lofts, in a thick patch of rushes along a river, in the deserted nest of a Hammerhead, and between the roof and ceiling of the Dutch Reformed Church in Humansdorp—this latter pair caused quite a commotion. For some time, as soon as the organ started playing, two or three frightful screeches would be heard, and at last a rumour got about that the church was haunted. One evening as I was

passing the church the organ started playing, and I heard two screeches and recognised them at once as the screech of the Barn-Owl, and after watching for a little while I saw one of the birds fly out of a round air-hole in one of the gables of the church, so the next day I offered to rid them of the ghost, which I did by setting two traps and caught both birds; and on examining the space inside, on the ceiling, I found the nest, a hollow in a heap of shavings; there were three eggs, which are now in my collection.

Breeding season September to March.

They lay from two to four white eggs.

Scops Owl (*Scops capensis*).—Not uncommon. I caught a pair in the hollow stump of a willow-tree in Hankey; I presented them to the Port Elizabeth Museum. Before sending them away I had them in a cage, and the one laid an egg on the floor of the cage; the egg is pure white.

Secretary-Bird (*Serpentarius secretarius*).—Common in some parts of the district. It builds a large saucer-shaped nest of sticks on the top of an isolated tree about ten or twelve feet from the ground.

Breeding season November to January.

It lays two white eggs.

Greater Flamingo (*Phœnicopterus roseus*).—An occasional visitor.

Blue Crane (*Anthropoides paradisea*).—Very common. I have counted fifty-five together, flying to the marshy ground and sand-hills at the mouth of the Gamtoos River in the evening; but during the breeding season they are found in pairs all over the district. They usually lay on a mound in a marshy place or at the side of a vlei or river. The young ones are very easily reared and become very tame.

Breeding season November to January.

They lay two light brown eggs, spotted and blotched with dark brown.

Grey Heron (*Ardea cinerea*).—Very common. It builds a nest of sticks, rushes, and straw, usually placed on a ledge on the face of a cliff or krantz, and sometimes on the tops of high trees, such as Euphorbias.

Breeding season September to December.

The eggs are of a pale blue colour.

White-backed Heron (*Nycticorax leuconotus*).—I have only seen one on the banks of the Klein River at Hankey. I shot it and presented it to the Port Elizabeth Museum.

Cape Thick-knee (*Œdicnemus capensis*).—Very common. I have counted eleven in one flock during the winter, but they separate in the breeding season, and are then only found in pairs. They lay in a depression on the bare ground.

Breeding season October to February.

They lay two greyish-brown eggs, spotted and blotched with dark brown.

Water Thick-knee (*Œdicnemus vermiculatus*).—Common along certain rivers. It has a peculiar, plaintive, whistling call, quite distinct from that of the Cape Thick-knee. Its nest is a slight depression in the ground near a river or vlei.

Breeding season October to February.

It lays two greyish-brown eggs, spotted and blotched with dark brown.

Crowned Lapwing (*Stephanibyx coronatus*).—Very common. I have counted seventeen in one flock during the winter; in the laying season they separate into pairs. The nest is a slight depression in the ground, surrounded by sticks, dry grass-roots, and pieces of dry cow and horse dung.

Breeding season September to March.

It lays three greyish-brown eggs, spotted and blotched with dark brown.

Three-banded Plover (*Charadrius tricollaris*).—Very common in some parts of the district along the rivers and vleis. I have not found any nests.

Sand-Plover (*Charadrius varius*).—Very common along the coast. I found one nest in November, among a lot of loose stones and rocks, on the beach at Jeffreys Bay. The nest was a slight depression in the sand, and contained two greyish-brown eggs, spotted and blotched with dark brown.

Black-backed Gull (*Larus dominicanus*).—Very common on the seashore, especially at fisheries, where they act as scavengers, eating the offal from the fish. They lay two brownish-grey eggs blotched with brown on the sand, usually beside a log, or boulder, or a bush. The young ones are very easily reared and tamed.

Breeding season September to March.

Hammerhead (*Scopus umbretta*).—Very common along the rivers, water-furrows, and vleis. It builds on krantzes and in the forks of high trees, usually over water. About two years ago I found a nest on the top of a high rock about five miles away from any water. The nest is a large dome-shaped structure of sticks, mealie-stalks, hoop-iron, bits of tin, bones, rags, and almost any kind of rubbish; it measures from two to three or four feet in diameter, it is plastered with mud on the inside.

Breeding season October to February.

It lays from three to four dirty-white eggs.

Egyptian Goose (*Chenalopex ægyptiacus*).—This bird has entirely disappeared from the district; it has not been recorded here for the last eight years. Formerly it bred regularly along the Gamtoos River. It builds a saucer-shaped nest of coarse grass on a ledge in a high cliff and in long grass near water.

Breeding season September to January.

It lays from five to nine white eggs.

Yellow-billed Duck (*Anas undulata*).—Very common on the open rivers and vleis. It builds a nest of rushes, grass, and aquatic weeds, usually in the rushes or reeds growing in or along the side of the water, but I have found

a nest in long grass on a hillock about three miles away from water.

Breeding season May to February.

It lays from five to nine greenish-white eggs. I have heard of a nest being found with eleven eggs, but cannot vouch for the truth of the statement.

Red-billed Teal (*Anas erythorhyncha*).—An occasional visitor. In 1895 we had very heavy and continuous rain, and all the vleis were full of water; that season they bred here. I saw several broods of ducklings, but could not find any nests; the biggest brood I saw was five, in the month of September.

S.A. Pochard (*Nyroca capensis*).—An occasional visitor. It bred here the same season as the Red-billed Teal. The ducklings appeared from September to November. I could not find any nests.

Moorhen (*Gallinula chloropus*).—Common in certain parts of the district. It builds on the water among the rushes a nest of rushes and aquatic weeds.

Breeding season September to January.

It lays from four to seven greyish-brown eggs marked with brown spots.

Red-knobbed Coot or Bleshoen (*Fulica cristata*).—Very common on most of the open rivers and vleis. Its habits are exactly the same as the Moorhen; but in this bird the forehead is a pure white, instead of red, and its eggs are slightly larger.

Cape Dabchick (Little Grebe) (*Colymbus capensis*).—Common on the rivers and vleis. It builds a nest of aquatic weeds, floating on the water at the inner edge of the rushes or reeds growing in the water.

Breeding season July to March.

It lays from five to nine dirty-white eggs.

Hadadah Ibis (*Theristicus hagedash*).—Common in some parts of the district. During the winter they fly about in

large flocks—I have counted fifteen in one flock; they separate into pairs during the breeding season. They build shallow nests of reeds, rushes, and coarse grass on a ledge in a krantz. I found a nest on the top of a Hammerhead's nest in the fork of a wild fig-tree about fifteen feet from the ground.

Breeding season October to February.

They lay three to four yellowish-brown eggs streaked and blotched with dark brown.

Black Crow (*Corvus capensis*).—Very common. In the winter they congregate in very large flocks, especially towards eventide. They usually build in isolated trees in the veld, the nest being composed of sticks, twigs, and rootlets lined with hair.

Breeding season October to February.

Eggs from three to five and of a pinkish colour with brown spots.

Red-winged Francolin (*Francolinus levaillanti*).—Common in certain parts of the district; they are usually found in flocks or covies up to sixteen in one covey. The nest is composed of grass in a depression in the ground under a thick bush or bunch of long grass.

Breeding season November to January.

They lay from five to nine eggs of a dirty-white colour.

Grey-winged Francolin (*Francolinus africanus*).—Common in certain parts of the district. They are found in flocks or covies of five to eleven. The nest is composed of grass; in a depression in the ground under a thick bush or tuft of long grass.

Breeding season November to January.

Eggs from five to seven and of a dirty-white colour, resembling those of the preceding species.

Cape Red-necked Francolin (*Pternistes nudicollis*).—Common where there is any bush about. In habits very much like the domestic fowl, only more pugnacious. The

nest is composed of grass and leaves; in a depression in the ground, usually under a thick bush or shrub.

Breeding season September to March.

It lays from five to eleven eggs of a yellowish colour.

Rock-Pigeon (*Columba phæonota*).—Very common. They are found in large flocks on newly sown and newly reaped lands. They do not build, but nest in holes or crevices in the krantzes. They have bred in captivity.

Breeding season August to March.

They lay two white eggs.

Olive Pigeon (*Columba arquatrix*).—Common in the forests. They live principally on berries and wild fruits, especially wild figs and the ripe berries of the Yellow-wood.

Breeding season November to February.

They lay two white eggs on a platform of twigs in a high tree.

Red-eyed Turtle-Dove (*Turtur semitorquatus*).—Very common. The nest is a platform of twigs in a high tree. They are usually found feeding with the Turtle-Doves.

Breeding season September to March.

They lay two white eggs.

Cinnamon Dove (*Haplopelia larvata*).—Common in the forests, where it is usually found on the ground under the trees picking up berries and seeds or perched on a branch near the ground. The nest is a platform of twigs in a low tree. Eggs white and two in number.

Breeding season October to March.

Green Fruit-Pigeon (*Vinago delalandii*).—Common in the forest, especially when the Yellow-wood berries are ripe. I have not been able to find the nest.

Cape Turtle-Dove (*Turtur capicola*).—Very common. The nest is a platform of twigs in a bush or tree. Two white eggs.

Breeding season August to March.

Laughing Dove (*Turtur senegalensis*).—Very common in certain parts of the district, especially along the Gamtoos River. The nest is a small platform of twigs in a bush or tree. Eggs two in number, pure white.

Breeding season September to March.

Tambourine Dove (*Tympanistria tympanistria*).—Common along the Gamtoos River, where it is usually found perched in the castor-oil trees or on the ground under the trees picking up the castor-oil seed.

The nest is a small platform of twigs in a low bush or tree.

Breeding season November to February.

It lays two white eggs.

Emerald-spotted Dove (*Chalcopelia afra*).—Common in the bushveld and bushy kloofs. The nest is a small platform of twigs in a low bush or tree. Like the other Doves it lays two white eggs.

Breeding season November to February.

Namaqua Dove (*Œna capensis*).—Common in a few localities. The only nest I have seen was a small platform of twigs, on a bush fence, in the Oudtshoorn district; December 1896. There were two white eggs in the nest.

Knysna Plantain-eater (*Turacus corythaix*).—Common in the forests and bushy kloofs. About Hankey they are very destructive in the apple-orchards. The nest is a platform of sticks in a dense tree or bush about ten or fifteen feet from the ground.

Breeding season November to February.

It lays two to three pure white shiny eggs.

Black-headed Coucal (*Centropus burchelli*). — Very common. It builds a domed nest of sticks, rushes, and coarse grass, usually in a thick bush, near the ground, but I found one nest in the top of an orange-tree about ten feet from the ground.

Breeding season October to February.

It lays from three to five white eggs.

Pied Starling (*Spreo bicolor*).—Very common. The nest is built in a hole in the bank of a river or donga; the nest is composed of grass, weeds, bits of string, feathers, and hair. This bird is very often the host of the Honey-guides.

Breeding season August to March.

It lays from three to six dark green eggs.

Red-winged Starling (*Amydrus morio*).—Very common. It builds on a wall under the roof of a house, on the beams of a house, in krantzes, and in trees. The nest is a very untidy cup-shaped structure of grass, rags, bits of string, dry cow and horse dung, and mud, lined with feathers and hair.

Breeding season October to March.

It lays from three to five green eggs, spotted and blotched with brown.

Glossy Starling (*Lamprocolius phœnicopterus*).—Very common in certain parts of the district. It builds a nest of grass, lined with feathers and hair, in a hole in the stump of a tree or pole.

Breeding season November to February.

It lays from three to five green eggs spotted with brown.

Wattled Starling (*Creatophora carunculata*).—Very common in some parts of the district. They are usually found in the company of *Spreo bicolor*. I have not seen their nests.

Giant Kingfisher (*Ceryle maxima*).—Common along the rivers. The eggs are laid in a hole about three or four feet deep in the bank of a river; it builds no nest.

Breeding season September to November.

It lays four to five white eggs.

Pied Kingfisher (*Ceryle rudis*).—Very common along the rivers. It breeds in a hole about three feet deep in the bank of a river. Like the preceding bird, it builds no nest.

Breeding season September to January.

It lays from five to nine pinkish-coloured eggs; pure white after they are blown.

Brown-hooded Kingfisher (*Halcyon albiventris*).—Very common along the rivers and vleis. The nesting-habits are exactly the same as those of the preceding birds.

Breeding season September to March.

It lays from three to six white eggs with very minute black dots.

Malachite Kingfisher (*Corythornis cyanostigma*).—Very common along several of the rivers. The nesting-habits are the same as those of the preceding birds.

Breeding season September to November.

It lays from four to six pinkish eggs; pure white when blown.

Ground-Woodpecker (*Geocolaptes olivaceus*).—Common in the mountainous parts of the district. I have not found their nests.

Knysna Woodpecker (*Campothera notata*).—Common in the bushveld and along the rivers where willow-trees grow. I have not found their nests.

Wood-Hoopoe (*Irrisor viridis*).—Common in the bushveld and where there are willow or euphorbia trees. I found a nest in a hole in the stump of a dry willow-tree along the Gamtoos River; it contained three eggs of the usual size and one of only half the size of the others, but of the same colour. I do not know if it was an abnormal egg or if laid by some parasitic bird. I have these eggs in my collection. This bird lays in a hole in the stump of a tree.

Breeding season November to January.

It lays three to four green eggs.

African Hoopoe (*Upupa africana*).—Common. Its nest is usually in a hole in an ant-heap or in a hole in a stone wall or in a krantz.

Breeding season October to January.

It lays from three to five bluish-coloured eggs.

S.A. Nightjar (*Caprimulgus pectoralis*).—Common in the bushveld. It does not build a nest, but lays its eggs on the dry leaves under the trees, and if disturbed will shift the eggs or young ones. On one occasion I had a nest under observation, and several times I had to hunt for some time to find the nest, as it had been moved, and once when there were young ones, they were moved fully three feet in twenty-four hours.

Breeding season November to January.

It lays two eggs of a pinkish-yellow colour lightly blotched with brown.

Black-headed Oriole (*Oriolus larvatus*).—Common in the bushveld. It builds a cup-shaped nest of moss (old man's beard), which is very often suspended in a bunch of the moss hanging from the branch of a high tree from ten to fifteen feet from the ground.

Breeding season October to January.

It lays two to three white eggs, spotted and streaked with brown.

Fork-tailed Drongo (*Dicrurus afer*).—Very common, especially where there are high trees and bees. It builds a neat saucer-shaped nest of twigs, moss, and cobwebs in the fork of a branch or between two twigs in a high tree.

Breeding season October to February.

It lays from two to four eggs—in some localities white with brown spots, in others pinkish with brown spots.

Paradise Flycatcher (*Terpsiphone perspicillata*).—Common in the bushveld, plantations, and orchards. It builds a neat little cup-shaped nest of fibre, covered with moss, at the end of a branch, very often overhanging a pool of water.

Breeding season October to March.

It lays three eggs of a cream-colour spotted with brown.

Cape Flycatcher (*Pachyprora capensis*).—Common in the bushveld and bushy kloofs. It builds a neat little cup-shaped nest of very fine twigs, fibre, and hair, covered with

moss, and is often very hard to find, as it is usually built very closely into the fork of a branch or on the top of a branch, where it is firmly fixed with cobwebs.

Breeding season October to February.

It lays two eggs of a bluish-white colour spotted and blotched with brown.

Dusky Flycatcher (*Alseonax adusta*).—Common in a few localities, especially in plantations.

I have not found the nests.

Yellow-throated Honey-Guide (*Indicator major*).—Common in the bushveld and bushy kloofs. While living in Hankey I saw a Honey-Guide (*Indicator major*) make a dart at a hole in the river-bank, and then fly away; it went through this performance several times, and at last went into the hole, but I was called away before it came out. The next day I went there and opened up the hole, and found three eggs of *Spreo bicolor* and one smaller white egg which I took to be the egg of the Honey-Guide. The year before that I found a similar egg in a nest of *Spreo bicolor* about three feet from the one just mentioned, so I wrote to Mr. R. H. Ivy, in Grahamstown, giving him the particulars, and he wrote saying it must be one of the Honey-Guides.

Bronze Cuckoo (*Chrysococcyx klaasi*).—Very common along the lower part of Gamtoos River. I could not find any of their eggs.

Didric Cuckoo (*Chrysococcyx cupreus*).—Very common along the lower part of Gamtoos River. I could not find any of their eggs.

Fiskal Shrike (*Lanius collaris*).—Very common. It builds a cup-shaped nest of grass, weeds, rags, twine, etc., lined with wool and feathers, in a bush or tree. On November 10th, 1914, I found a nest at the end of a bushy kloof, which contained three eggs of the usual size and another one nearly half as large again, but of the same colour. These eggs are in my collection.

Breeding season September to March.

It lays from three to five greenish-grey eggs spotted and blotched with brown.

Tchagra Bush-Shrike (*Telephonus tchagra*).—Very common along the Gamtoos River. It builds a shallow cup-shaped nest of twigs and fibre, usually in the fork of a branching dwarf aloe.

Breeding season October to January.

It lays three eggs of a white colour spotted and streaked with brown.

Greater Puff-backed Shrike (*Dryoscopus ferrugineus*).—Very common in the bushveld and bushy kloofs. It builds a saucer-shaped nest of fibrous roots in a thick bush.

Breeding season October to January.

Eggs three and of a bluish colour with brown spots.

Bakbakiri Shrike (*Laniarius gutturalis*).—Very common. It builds a cup-shaped nest of twigs and weeds, lined with fibre, wool, and hair in a dense bush or shrub.

Breeding season October to February.

It lays three greenish-blue eggs spotted and blotched with brown.

Noisy Robin-Chat (*Cossypha bicolor*).—Common in the bushveld and bushy kloofs. It builds a cup-shaped nest of fibrous roots in a krantz or dense bush.

Breeding season September to January.

It lays three eggs of a brownish colour, mottled with darker brown.

Brown Robin-Chat (*Cossypha signata*).—Common in the bushveld. I have not found any of their nests.

Cape Robin-Chat (*Cossypha caffra*).—Common in certain parts of the district, especially the bushy kloofs of the zuurveld. I have not found any of their nests.

Black Bush-Robin (*Tarsiger silens*).—Very coomon in

the bushveld and bushy kloofs. It builds a cup-shaped nest of twigs and weeds in a dense bush.

Breeding season October to January.

It lays three greenish eggs mottled with brown.

Cape Ground-Robin (*Erythropygia coryphæus*).—Common. It builds its nest under a bush, on the ground, surrounded by a lot of sticks. Some of the sticks, being far too heavy for the birds to carry, are dragged into position. The nest itself is cup-shaped, and is composed of twigs and grass roots lined with hair.

Breeding season August to February.

It lays three bluish eggs, spotted and blotched with brown.

Bulbul (*Pycnonotus capensis*).—Common in certain parts of the district. It builds a cup-shaped nest of fine twigs in a dense bush.

Breeding season October to January.

It lays three pinkish-coloured eggs mottled with brown.

Sombre Bulbul (*Andropadus importunis*).—Common in the bushveld and in orchards. It builds a neat saucer-shaped nest of twigs and moss on an overhanging branch.

Breeding season October to February.

It lays two light grey eggs, blotched with brown.

Cape Thrush (*Turdus olivaceus*).—Common in the forests and bushveld. It builds a cup-shaped nest of twigs and moss (old man's beard) in a tree.

Breeding season November to January.

It lays two greenish eggs, spotted and blotched with brown.

Cape Rock-Thrush (*Monticola rupestris*).—Common in the mountainous parts of the district. It builds a shallow cup-shaped nest of twigs and roots lined with hair, usually in a hollow under a stone or rock, or in a hole in an ant-heap.

Breeding season November to January.

It lays three greenish eggs with brown spots.

Sentinel Rock-Thrush (*Monticola explorator*).—Common in the mountainous parts of the district. It is a smaller bird than *M. rupestris*, but the habits are the same.

Ant-eating Chat (*Myrmecocichla formicivora*).—Common in some parts of the district, especially where there are ant-heaps and antbear-holes. It builds in a hole in the side of an antbear-hole or in a hole in an ant-heap.

Breeding season November to January.

It lays three white eggs.

Capped Wheatear (*Saxicola pileata*).—Common in some parts of the district; it is usually found where there are stone-wall kraals. It builds a saucer-shaped nest of grass lined with hair in a hole in a wall.

Breeding season November to January.

It lays three eggs of a pale green colour.

Familiar Chat (*Saxicola familiaris*).—Very common. It builds a cup-shaped nest of grass and wool, lined with hair.

Breeding season September to March.

It lays three blue eggs, spotted with dull brown at the thick end.

Sickle-winged Chat (*Emarginata sinuata*).—Common in some parts of the district. It builds a cup-shaped nest of grass and wool lined with hair in a hole in the bank of a furrow or donga, or in a hole in an ant-heap, or in a hollow under a stone.

Breeding season September to January.

It lays three light blue eggs, with dull brown spots on the thick end.

Stone-Chat (*Pratincola torquata*).—Very common. It builds a nest of grass lined with fibre and hair in a hole in an ant-heap, in a bank, in a hollow under a stone, or under a dense shrub. I found one nest in a two-pound golden-syrup tin lying on its side.

Breeding season August to March.

It lays three pale green eggs spotted and blotched with brown.

Cape Wagtail (*Motacilla capensis*).—Very common. It builds a cup-shaped nest of grass, rags, and twine, lined with wool and hair, in a hole in the bank of a river or water-furrow, under a tuft of grass, or in any convenient place in an outhouse or stable.

Breeding season September to March.

It lays three brownish-yellow eggs mottled with dark brown.

African Pied Wagtail (*Motacilla vidua*).—Confined to certain localities. I have not found any nests.

Golden-breasted Bunting (*Emberiza flavirentris*).—Common along the Gamtoos River. It builds a neat cup-shaped nest of grass and twigs, lined with hair, usually in a Mimosa tree, about ten or twelve feet from the ground.

Breeding season November to January.

It lays three to four white eggs spotted and streaked with brown.

Cape Bunting (*Fringillaria capensis*).—Common in the mountainous and rocky parts of the district. It builds a cup-shaped nest of grass, lined with fibre and hair, in a hollow under a rock.

Breeding season October to March.

It lays three to four greenish eggs spotted and blotched with brown.

Rock-Bunting (*Fringillaria tahapisi*).—Common in the mountainous and rocky parts of the district. It builds a cup-shaped nest of twigs and grass, lined with fibre and hair, in a hole in a krantz or in a hollow under a stone.

Breeding season November to February.

Eggs greenish spotted with brown, and three in number.

Cape Canary (*Serinus canicollis*).—Very common. It builds a cup-shaped nest of twigs and weeds, lined with wool and hair, in a tree or in a low dense bush.

Breeding season September to March.

It lays three to four pale blue eggs, spotted and streaked with brown.

White-throated Seed-eater (*Serinus albigularis*).—Common in some parts of the district. It builds a cup-shaped nest like the Cape Canary, but slightly larger, and lays three pale blue eggs spotted and streaked with brown during the months of October to January.

Streaky-headed Seed-eater (*Poliospiza gularis*).—Common in some parts of the district. It builds a nest similar to the Cape Canary in the top of a high tree, the breeding season being October to February.

It lays three bluish eggs spotted and streaked with brown.

Mountain-Canary (*Alario alario*).—An occasional visitor. I have not seen its nest.

Cape White-eye (*Zosterops capensis*).—Very common. It builds a neat little cup-shaped nest of fine fibre, moss, and cobwebs during the months of October to March, and lays four to five pale blue eggs.

Speckled Mouse-bird (*Colius striatus*).—Common in certain parts of the district. It builds a shallow cup-shaped nest of twigs and weeds, lined with leaves and wool, in a tree.

Breeding season November to February.

It lays three to four eggs of a dirty-white colour.

White-backed Mouse-bird (*Colius capensis*).—Common in certain parts of the district. It is also called the Wild Mousebird, being very shy.

Breeding season November to February.

I have only found two nests, one in November, which had two creamy-white eggs, and another in February, with two young ones just hatched.

Red-faced Mouse-bird (*Colius erythromelon*).—Very common in certain parts of the district; this bird is sometimes called the Tame Mousebird.

It builds a cup-shaped nest of twigs, weeds, and moss, lined with leaves, wool, down, and bits of twine.

Breeding season October to March.
It lays three to four eggs of a dirty-white colour.

Common Waxbill (*Estrilda astrild*).—Very common. It builds a domed nest of grass seed-tufts, lined with feathers, on the ground, under a tuft of overhanging grass or under a dense shrub.
It lays during October to January four to nine pure white eggs.

Ruddy Waxbill (*Lagonosticta rubricata*).—Common in some parts of the district. I have not been able to find any nests.

Swee Waxbill (*Estrilda dufresnii*).—Very common in some parts of the district, especially along the Gamtoos River. It builds a domed nest of grass seed-tufts in a tree, about five feet from the ground, and lays from four to seven pale blue eggs during the months of October to January.

Masked Weaver-Bird (*Hyphantornis velatus*).—Very common in certain parts of the district. It builds a kidney-shaped nest of grass, lined with down and feathers, the entrance is from underneath; it is usually suspended from the branch of a tree overhanging water or between two reeds.
Breeding season September to January.
It lays three eggs, which—as is well known—vary very much in colour.

Cape Weaver-Bird (*Sitagra capensis*).—Very common. It builds a nest exactly like that of the Masked Weaver, only slightly larger.
Breeding season September to January.
It lays two to four greenish-blue eggs.

Bottle Weaver-Bird (*Sitagra ocularia*).—Common in the bushveld. It builds a kidney-shaped nest with a long neck hanging downwards, which forms the entrance to the

nest; the building-material is a red fibre, torn from the edge of the leaf of a plant that grows in the bushveld.

Breeding season October to February.

It lays three pinkish-white eggs spotted with brown.

Forest Weaver-Bird (*Sitagra gregalis*).—Common in the bushveld. It builds a kidney-shaped nest of fine tendrils of creepers. The nest has a long neck, this being the entrance to the nest; it is suspended from the branch of a high tree, sometimes overhanging water.

Breeding season October to January.

It lays two eggs of a bluish colour, spotted and blotched with brown.

Cape Bishop-Bird (*Pyromelana capensis*).—Very common. It builds a domed nest with the entrance at the side near the top; it is made of fine grass, lined with grass seed-tufts. It is usually placed in the long grass or bushes growing beside a stream or pool of water.

Breeding season October to January.

It lays two to three eggs of a bluish-grey colour spotted and mottled with slaty.

Long-tailed Widow-Bird (*Coliopasser procne*).—Common in certain parts of the district. It builds a domed nest of grass, with the entrance at the side near the top. It is placed in long grass on the ground, usually in a marshy place.

Breeding season October to January.

It lays three bluish-grey eggs spotted and blotched with greyish brown.

Pin-tailed Whydah (*Vidua principalis*).—Very common. I found a nest of the latter with nine eggs, five of the usual size and four slightly larger and rounder, the four I took to belong to the Whydah.

What I am about to relate may assist in establishing Mr. Roberts's claim in connection with the nesting-habits of the Pin-tailed Whydah (*Vidua principalis*).

On the morning of the 12th October I took a short walk from my store on to a slight rise, and while looking about I saw a hen Whydah fly past with a feather in her bill and alight in some long grass in a marshy spot about fifty yards from where I was standing; so I waited, and as soon as she flew away (without the feather) I went to look and found a nest, but did not touch it, so I went back a little distance and watched, and then saw a Waxbill with grass in its beak go to the same spot. Shortly afterwards the Whydah came back with another feather, and while she was at the nest the male kept bobbing up and down in the air just above the locality. I did not go near again until the 17th when I went to get the nest, and as I got there the Waxbill flew out; so I took the nest, and found five pure white eggs of the Waxbill and two a little larger, also pure white, which must have been laid by the Whydah. I trust this will be of some interest.

Red-shouldered Widow-Bird (*Urobrachya axillaris*).—Confined to the Gamtoos River. I have not been able to find any of their nests.

Malachite Sunbird (*Nectarinia famosa*).—Very common. It builds a domed nest of grass, fibre, and twigs, lined with hair, feathers, and wool, the entrance is at the side near the top; it is suspended from a branch or bush, usually overhanging a pool or stream or a donga.

Breeding season October to January.

It lays two eggs spotted and blotched with brown.

Lesser Double-collared Sunbird (*Chalcomitra chalybeus*).—Very common in the bushveld. It builds a domed nest of twigs, fibre, and moss, lined with wool and feathers, the entrance being at the side near the top.

Breeding season October to March.

Eggs two and of a grey colour thickly spotted with slate.

Black Sunbird (*Chalcomitra amethystinus*).—Common in the bushveld. I have never found any of their nests.

Orange-breasted Sunbird (*Anthobaphes violacea*).—Very common in the high veld or zuurveld. It builds a domed nest of twigs, grass, and wool, lined with vegetable down. This bird is a winter layer.

Breeding season June to August.

It lays two greyish-white eggs mottled with grey-brown.

Cape Sugarbird (*Promerops capensis*).—Common in certain parts of the district, where the Protea grows. It builds a cup-shaped nest of twigs and grass, lined with the downy seeds of the Protea. This bird is a winter layer. The nest is usually placed in a Protea bush about four or five feet from the ground.

Breeding season May to July.

It lays two pinkish-white eggs, spotted, blotched, and streaked with brown.

Larger Stripe-breasted Swallow (*Hirundo cucullata*).—Very common in summer. It builds a globular nest of mud, with a long tunnel-like entrance, usually along a beam in a house or under the eaves of a roof.

Breeding season October to April.

It lays two to three white eggs.

Lesser Stripe-breasted Swallow (*Hirundo puella*).—Common along the rivers where there are high cliffs. It builds a nest like the larger bird, but a little smaller, and usually under an overhanging rock.

Breeding season October to February.

It lays two pure white eggs.

White-throated Swallow (*Hirundo albigularis*).—Common. It builds a cup-shaped nest of mud against a beam in a house or under an overhanging rock.

It lays during the months October to February three to four white eggs spotted with brown.

Pearl-breasted Swallow (*Hirundo dimidiata*).—Confined to certain parts of the district. It builds a saucer-

shaped nest of mud, usually against a beam in an outhouse, lining it with wool and feathers.

Breeding season October to January.

Eggs three to four, small and of a pure white colour.

Black Rough-winged Swallow (*Psalidoprocne holomelæna*).—Confined to certain parts of the district. It bores a hole in the sand-bank of a river, usually about three feet deep, and in this hole it lays its eggs, which are laid during September to January and are two in number and pure white.

Rock-Martin (*Ptyonoprocne fuligula*).—Common in certain parts of the district. It builds a cup-shaped nest of mud under the eaves of a roof or under an overhanging rock.

Breeding season October to February.

It lays three cream-coloured eggs spotted with brown.

White-bellied Swift (*Cypselus africanus*).—Common in one or two localities in summer. I have not found any of their nests.

White-rumped Swift (*Cypselus caffer*).—Very common in the summer. It lays in the nests of the Swallows.

Breeding season October to February.

It lays two pure white eggs.

Orange-throated Longclaw (*Macronyx capensis*).—Common in the zuurveld or high veld. It builds a cup-shaped nest of grass, lined with fine fibre and hair, under a tuft of grass or shrub.

Breeding season September to January.

It lays three greyish eggs spotted and blotched with brown.

Tawny Pipit (*Anthus rufulus*).—Very common on the open flats, where it builds a cup-shaped nest of grass and rootlets, lined with hair, under a tuft of grass.

Breeding season October to February.

It lays three greyish eggs mottled with brown.

Cape Quail (*Coturnix africana*).—Some years they are very plentiful on the lands. They lay in a depression in the ground under a tuft of grass or in a land among the crops.

Breeding season November to January.

They lay from five to fourteen light brown eggs, spotted and blotched with dark brown.

Harlequin-Quail (*Coturnix delegorguii*).—An occasional visitor.

Hottentot, Mountain, or Button Quail (*Turnix lepurana*).—Not uncommon. It lays in a depression in the ground under a tuft of grass or bush.

Breeding season November to January.

It lays three to five grey eggs, thickly mottled with slate.

XI.—*The Summer Migration of* 1915–16 *as observed in the Eastern Districts of the Cape Province.* By Rev. Robert Godfrey, Somerville, Tsolo.

During the winter of 1915 that tantalising species, the White-bellied Swift, paid us a visit on July 21. On that day a pair were flying about over Alice, and, after a month's absence, the species reappeared on August 20. On the latter occasion five birds were careering over Lovedale in the heat of the day, and finally retired in the direction of Alice.

The true harbinger of the migratory host proved to be the White-throated Swallow, which was detected a few days earlier than usual. The first was noticed on the Keiskama beside the railway bridge at Middledrift on August 25, and on September 10 the species was present in some numbers along that part of the Tyumie which flows through Lovedale grounds. In my new centre of observation I find this Swallow widely spread in summer. They remained in the neighbourhood of Tsolo till April 2, but I believe that the Blue-backed Swallows met with on May 2 and 5 belonged

to this species, though they did not give me an opportunity of satisfactorily identifying them.

No records are to hand this season of the movements of the South African Cliff-Swallow. On the last day of November, in a hurried visit to the time-honoured haunt at Blaney goods-shed, I saw that four nests indicated their present strength there. My efforts to elicit the date of first occupation of the goods-shed have so far proved unavailing, yet I feel sure that this information is in the possession of some of my readers, and I make a further appeal to them to clear up this point for me. Unless the information is obtained now, it may be irretrievably lost.

On the morning of September 21, after a night of slight but steady rain, I heard at Pirie the call of the Greater Stripe-breasted Swallow, and looking up saw a pair flying in the misty drizzle. At Tsolo this species remained till April 23, and the last individuals were seen next day by the Inxu.

Very little information is forthcoming regarding the movements of the Lesser Stripe-breasted Swallow, and during the past season the species was personally met with on one occasion only. On November 29, a day of terrible wind on the open beach, I was out for a ramble alongshore at East London, and, in a sheltered valley covered with dense scrub, I came on five of these Swallows quartering over the tree-tops, uttering their harsh cries and settling repeatedly on the bare stumps of dead trees that projected above the bush level. The scene reminded me of the kloof where I first examined the nest of this species, and I suspect the birds were nesting in this valley. The only Black Saw-wing observed during the season was met with at the same time and place.

The European Swallow eluded observation till December 16, when one was encountered on the Debe Flats. By Christmas they were quite numerous, gliding obtrusively to and fro over the veld. In the Tsolo district, where the species is widespread and abundant during the season, they were in evidence till April 2, though on April 23 I saw

a straggler not far from the Tsolo itself. On February 18, in the Tsitsa valley, I noticed European Swallows resting on long grass. I cannot recall having previously observed this trait in this species in South Africa, though I have observed it by the side of a Scottish loch.

The Black Swifts escaped notice altogether at the time of their arrival, but were under careful observation towards the end of the season. On May 9 a single bird was seen crossing the col between the Tsitsa and the Ntywenka; on the 20th at midday a flock of twenty or so kept circling about near the mission-house at Somerville for a considerable time; and, on the 26th, three were careering about between the mission-house and Tsolo Mountain and finally disappeared in the direction of Bele.

In connection with the Cuckoos, greatest interest centred, as usual, round the Red-chested Cuckoo or Piet-mijn-vrouw. News was brought to me at Lovedale on September 8 that one had been heard at Alice that day. Though this date anticipates by several weeks the ordinary recognised date of the bird's arrival in the Buffalo Basin, it is not without one parallel record as far as Alice is concerned. Mrs. Green, of Alice, has informed me that in 1913 she heard the bird there on September 7. Judge of my delight and surprise when two days later, in a ramble by the Tyumie, Mr. James Chalmers and I heard Piet-mijn-vrouw call close beside us three or four times, and yet, with all this evidence, I should be glad to handle a specimen obtained in the first half of September. At East London the species was not heard till October 20. This Cuckoo remained in song at Somerville till February 11.

A Great Spotted Cuckoo, shot near Whittlesea on October 27, was forwarded to me by Rev. D. B. Davies, of Peddie.

The only other Cuckoo claiming attention in the present report is the Didric, which was heard singing repeatedly in Tsolo village on March 8 and at Tsitsa Bridge on the following day.

On previous occasions questions have been raised regarding the status of the Paradise Flycatcher in our district, but but my own experience still leads me to place it among the migrants. The first recorded during the current season was seen at Pirie on October 18 by Miss Jennie Erskin, and the last was observed in the Somerville mission-garden on March 22.

An even more interesting Flycatcher that appears in these migration reports for the first time is the Northern Spotted Flycatcher. Though this plain-plumaged species has been obtained in the Buffalo Basin, it has hitherto attracted little attention. In our new quarters we were delighted to receive a visit from one of these birds at the end of February; it arrived in our garden on the 26th, forcing itself under our notice at once by its call, and it remained with us till March 2.

Of migratory birds of prey, the Egyptian Kite was the first to put in an appearance. Towards evening on August 29, one was quartering fearlessly along the Nkosiane stream at Pirie, and later in the season the bird was one of the regular features in the landscape about Ntaba Kandoda. Around Somerville, this species is quite as conspicuous as it is at Pirie, and was seen up till March 7, a week later than the latest Pirie record.

Naumann's Kestrels were as numerous as usual about King Williamstown from the 10th of November to the last week in March, and established themselves at Colonel Style's house. On January 4, I saw a number of these little Hawks at their former haunt in the old cemetery, and that same evening I visited their new haunt in company with Mr. Arthur Weir. On being disturbed, the roosting birds issued forth from their chosen tree in a series of extended rippling waves that suggested the widening circles set in motion by the dropping of a stone on the surface of a quiet pool.

While staying at Fenwick Cottage, on the watershed between the Buffalo and the Keiskama, we were visited by a small flock of these Hawks on the evening of December 11;

we saw five playing about the top of a gumtree, and about a dozen others close at hand. On removing to Somerville, we hoped to have further opportunities of observing this Hawk, as we had previously heard of their frequenting the gum-trees at the mission-house. During the latter half of the season, however, we saw only a single pair sitting fearlessly on one of the trees on the morning of March 13.

One of the great surprises in store for us at Somerville was the occurrence there of the Eastern Red-legged Kestrel, a migrant from China. Previously I had handled an East London specimen in Mr. Center's collection, but I had not seen the bird alive. From the middle of January to the 26th of February we had numbers of these birds in the neighbourhood of the mission-house. They first attracted attention as they came to roost on some low oak-trees near the house, and were especially active just before dark. Later on they came during the glaring mid-day heat, and after playing in the air for a while settled for their siesta in a tall blue gum right in front of the door. In its habits this species is a typical Kestrel, seeking its prey by periodically hovering in the air and scrutinising the ground below. It may be easily distinguished from its congeners by the silvery shimmer of its wings and in the adult males by the pure white under wing-coverts, which show up so conspicuously when the birds are sporting in the sunshine. The greatest number seen together was fifteen.

A still further surprise awaited me when the Curator of the King Williamstown Museum, Mr. Pym, informed me in a letter written on February 21 that this species was associating in large numbers with Naumann's Kestrel at King Williamstown. As we have watched the wave of migration of Naumann's Kestrel for a number of years reach nearly to East London, we should be prepared for a similar wave of migration of the Eastern Red-legged Kestrel, and all observers are requested to be on the look-out for the appearance of both species next November.

The first White Stork of the season was recorded from

Pirie by Miss Fanny Ross on October 4. A long interval ensued before others were reported. On November 29 they were seen near Lovedale by Miss Betty Henderson, and on December 4 they were met with by Mr. D. A. Hunter between Lovedale and the Hogsback. At Somerville the birds were common enough from the time of our arrival on January 7.

At Pirie, where there is such an extensive forest and also wide mimosa-tracts, the White Storks roost in trees, but at Somerville, even though there are still large enough patches of forests on the mountain-sides, the Storks prefer to roost among the inequalities of the tremendous dongas that form such a feature in the landscape.

Readers may remember that reference has been made occasionally to the clappering of the Storks, and that observations were asked for in this connection. One day I chanced to be giving an object-lesson on the Stork to the school-children at Somerville, and I found that the children could imitate the sound from their having heard it in the dongas already referred to.

At Somerville two Storks were observed walking in the smoke of some burning grass on March 23, and that same evening a number were observed at their roosting-place in one of the dongas. My wife saw the last belated individual pass the window on April 8.

Much more information regarding the movements of the Northern Waders has come to hand this year than in any previous year. Mr. John Wood, of East London, informed me that Mr. Center and he obtained a Little Stint at East London on September 11, and that thereafter they obtained a number of other specimens. Towards the end of November I had an opportunity of handling about half-a-dozen specimens obtained by these gentlemen, and on three different occasions I met with the species myself at the mouth of the Blind River. When we remember that the breeding-grounds of the Little Stint are in the extreme north of Europe and

of Siberia, we are led to wonder when those early arrivals on the shores of the Indian Ocean left their northern home.

On the same day on which the first Little Stint was obtained, a European Sandpiper was also shot, a few days earlier than the earliest previous record. During the last week of November, I repeatedly met with this species on the Blind River, and, on our removal to Somerville, I met with a solitary individual twice on the edge of the Inxu, the latter occurrence being on the 1st of February.

A Ring-Plover was obtained by the same gentlemen at East London on October 13 ; this specimen also was handled by me on the occasion of my visit in November. On the 29th of the latter month I had the pleasure of seeing a pair in company with a Little Stint at the mouth of the Blind River.

On October 17 these gentlemen added to their records a Wood-Sandpiper and a Sanderling, both of which also I had the opportunity of handling. No other record of the Wood-Sandpiper came to hand during the season, but I believe that the Sanderling was not uncommon alongshore in the first half of the season.

Once more I desire to tender my thanks to all my correspondents for letters and for specimens, and I would again urge them and others to continue their valued help in advancing our knowledge of our local birds.

XII.—*Occasional Notes.*

8. Nesting of the Black Stork (*Ciconia nigra*).

The Editor received the following note in a letter dated 29th October, 1915, and thinking it of more than ordinary interest, hereby publishes it :—

" It may possibly interest you to know that Black Storks (*Ciconia nigra*) are regular visitors to this game-reserve, and for many years they returned regularly to the same nest, which is about a mile from this lodge, so that I had ample

opportunity of studying the habits of this beautiful bird. About two years ago, although a pair returned to the old nest, they did not lay there, and it was only last month that I discovered the new nest on a ledge in a krantz about 200 ft. in height. It contained two half-grown young ones. I have four eggs in my collection, and in 1912 I sent a tame bird down to the Durban Zoo. It was one of the nicest pets I have ever had. I have seen the Black Stork repeatedly in Basutoland. R. E. Symons."

Game Lodge, Tabamhlope,
P.O. Estcourt, Natal.

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9. *To the Editor, Journal of the S.A.O.U., Pretoria.*

A discussion took place at the April meeting of the B.O.C. on the possibility that eaters of birds' eggs possess preferences. The point is of interest, for the explanation that preference would afford us of much that is now puzzling in the coloration of eggs.

A detailed account of the subject will appear shortly in the 'Ibis.' I write here, however, in case any of my fellow-members of the S.A.O.U. should have any observations for or against the view, or should come across anything bearing on it during the remainder of the present season.

Points to be borne in mind are : (1) that in other classes of prey, at any rate, it is apparently relative indigestibility rather than taste that is the basis of preference ; (2) that a hungry enough animal can digest and will readily accept and eat the most indigestible species of prey ; (3) that a recent shortage of a particular class of prey in an animal's diet sometimes produces a temporary special craving, under the influence of which even species that are normally quite low-grade will be accepted and digested as readily as a high-grade species.

It follows from all this that mere acceptance is no proof that the species of prey accepted is eaten normally to repletion-point—is practically never refused. Nor is the fact that a particular species of enemy has been known to eat all kinds of eggs a proof that he never refuses any of them.

This makes good evidence against preference hard to obtain. Similarly, unchecked refusals, on the other hand, may mean merely that the animal was *utterly* replete, and this makes good evidence *for* preference difficult to get. Refusals by an animal that is obviously searching for food are another matter ; as are contrasted refusal and acceptance and special persecution of a particular species of prey to the apparent neglect of other species as abundant and easy to obtain as itself.

Acceptances by captive animals are also subject to the considerations I have mentioned. Even slight delay in acceptance is worth "controlling" by the immediate offering of some known favourite food to ascertain if the animal be really replete.

I am collecting all the evidence I can get, both for and against preference, and will be very glad indeed to hear of any.

Other points worth observing are : (1) the animals that eat eggs (with Moorhen and *Centropus* as inveterate egg-eaters it is possible that many other birds that we do not at present suspect may also be enemies of eggs) ; (2) the special enemies of Weavers' eggs ; (3) evidence on the view that the different types of Weaver eggs are useful in enabling the different parents to recognise their own in a colony of many ; (4) ejection of Cuckoos' eggs or desertion as a definite result of their having been placed in the nest.

Gungunyana, Melsetter, Rhodesia.
Nov. 6th, 1915.

C. F. M. Swynnerton.

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10. *No. 68 (Administrator's), 1915.]

PROCLAMATION

By the Hon. the Administrator of the Province of Transvaal.

UNDER and by virtue of the powers vested in me and the Executive Committee of the Province by sub-section (*a*) of section *three* of the Game Preservation Ordinance, 1905, as amended by

the Game Preservation Further Amendment Act 1909, and section *eighty-one* of the South Africa Act 1909, I do hereby proclaim declare and make known that the annexed Schedule of Game shall be and is hereby substituted for the Schedule of Game (Parts I and II) prescribed by Proclamation No. 15 (Administration) of 1910 and Proclamation No. 2 (Administrator's) of 1912, both of which Proclamations shall be and are hereby withdrawn.

GOD SAVE THE KING.

Given under my Hand at Pretoria this Twenty-second day of December One thousand Nine hundred and Fifteen.

JOHANN RISSIK,
Administrator of the Province of Transvaal.

SCHEDULE.

Part I.

English Common Nomenclature.	*Scientific Nomenclature.*
Guinea-fowl, common	Numida coronata.
Guinea-fowl, crested	Guttera edouardi.
Pheasant, red-necked	Pternistes swainsoni.
Pheasant, Cape or noisy Francolin	Francolinus capensis.
Francolin, coqui or shrimpy	Francolinus coqui.
Francolin, crowned	Francolinus sephoena.
Francolin, Orange River	Francolinus gariepensis.
Francolin, Shelley's	Francolinus shelleyi.
Francolin, Natal	Francolinus natalensis.
Cape redwing	Francolinus levaillanti.
Cape partridge or greywing	Francolinus afer.
Namaqua partridge or sandgrouse	Pterocluras namaquus.
Sandgrouse, spotted	Pterocles variegatus.
Sandgrouse, yellow-throated	Pterocles gutturalis.
Sandgrouse, double-banded	Pterocles bicinctus.
Shoveller, Cape	Spatula capensis.
Pochard, South African	Nyroca capensis.
Sheldrake, South African	Casarca cana.
Duck, white-masked	Dendrocygna viduata.
Duck, knob-billed	Sarcidiornis melanonotus.
Duck, white-backed	Thalassornis leuconotus.
Duck, Maccoa	Erismatura maccoa.
Duck, black	Anas sparsa.
Teal, red-billed	Anas erythrorhyncha.
Teal, yellow-billed	Anas undulata.
Teal, Hottentot	Anas punctata.
Teal, Cape	Anas capensis.
Goose, spur-winged	Plectropterus gambensis.
Goose, Egyptian	Chenalopex aegyptiacus.
Goose, African dwarf	Nettopus auritus.
Hare, Cape	Lepus capensus.
Hare, rock	Lepus saxatilis.
Hare, red	Lepus crassicaudatus.
Blesbuck	Damaliscus albifrons.
Bushbuck	Tragelaphus sylvaticus.

English Common Nomenclature.	*Scientific Nomenclature.*
Duiker	Cephalophus grimmi.
Duiker, red	Cephalophus natalensis.
Klipspringer	Oreotragus saltator.
Oribi	Ourebia scoparia.
Pallah or rooibuck	Aepyceros melampus.
Reedbuck	Cervicapra arundinum.
Rhebuck, rooi	Cervicapra fulvorufula.
Rhebuck, vaal	Pelea capreola.
Sharpe's Steenbuck	Rhaphicerus melanotis.
Springbuck	Antidorcas euchore.
Steenbuck	Rhaphicerus campestris.
Waterbuck	Cobus ellipsiprymnus.
Warthog	Phacochoerus aethiopicus.

All imported varieties of game animals and birds.

Part II. Big Game.

English Common Nomenclature.	*Scientific Nomenclature.*
Crane, crested	Chrysopelargus balearica.
Ostrich	Struthio australis.
Antelope, roan	Hippotragus equinus.
Antelope, sable	Hippotragus niger.
Buffalo	Buffelus caffer.
Eland	Taurotragus oryx.
Elephant	Elephas africanus.
Gemsbok	Oryx gazella.
Giraffe	Giraffa capensis.
Hartebeest, red	Bubalus caama.
Hartebeest, Lichenstein	Bubalus lichtensteini.
Hippo	Hippopotamus amphibius.
Kudu	Strepsiceros kudu.
Rhinoceros	Rhinoceros bicornis.
Sassaby	Damaliscus lunatus.
Wildebeest, blue	Connochoetus taurinus.
Wildebeest, black	Connochoetus gnu.
Zebra	Equus burchelli.

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11. * No. 67 (Administrator's), 1915.]

PROCLAMATION

By the Hon. the Administrator of the Province of Transvaal.

UNDER and by virtue of the powers vested in me and the Executive Committee by sub-section (*f*) of section *three* of the Game Preservation Ordinance 1905 as amended by the Game Preservation Further Amendment Act 1909 and section *eighty-one* of the South Africa Act 1909, I do hereby proclaim, declare and make known that the birds described in the Schedule hereto shall, on account of their general utility, be protected and not be hunted

or destroyed in all districts of the Transvaal Province as from the date hereof and shall be added to the list of general utility birds and locust destroyers prescribed by Proclamation (Administrator's) No. 20 of 1915.

God Save the King.

Given under my Hand at Pretoria this Twenty-second day of December One thousand Nine hundred and Fifteen.

JOHANN RISSIK,
Administrator of the Province of Transvaal.

SCHEDULE.

General Utility Birds.

English Common Nomenclature.	*Scientific Nomenclature.*
Bustard, bush	Otis ruficrista.
Bustard, Natal	Otis barrovi.
Bustard, blue	Otis caerulescens.
Bustard, vaal	Otis vigorsi.
Bustard, white-quilled or cackling	Otis afroides.
Bustard, black-bellied or silent	Otis melanogaster.
Bustard, Ludwig's	Otis ludvigi.
Bustard Stanley	Otis cafra.
Bustard kori	Otis kori.

XIII.—*Obituary.*

Major (Temporary Lieutenant-Colonel) Boyd Robert Horsbrugh, A.S.C., died on July 11 at Oxted, aged 44. He was the eldest son of the late Captain Charles Bell Horsbrugh, Central India Horse, and entered the Army in 1893, saw service in Sierra Leone in 1898–9 (medal with clasp), and for service in the South African War received the Queen's and the King's medals with five clasps. He had been promoted major in 1908, and was made temporary lieutenant-colonel in August, 1915, when he went to the front in command of a divisional train. He was present at the battle of Loos, and was mentioned in dispatches. Colonel Horsbrugh was a well-known ornithologist, a member of the British and South African Ornithologists' Unions, and a Fellow of the Zoological Society. He was the author of several papers on South African birds and

a book on the 'Game-Birds and Water-Fowl of South Africa,' which was illustrated by C. G. Davies of the C.M.R. While in South Africa, after the Boer War, he was stationed at Bloemfontein and at Potchefstroom, and was known to a number of local residents as a keen ornithologist and excellent sportsman. To the members of his family we extend our heart-felt sympathy.

XIV.—*Short Notices of Ornithological Publications.*

4. '*The Ibis*': *a Quarterly Journal of Ornithology.* April, July, and October, 1915.

The April number contains part 1 of a paper on the Ornithology of the Matopo District, S. Rhodesia, by L. Beresford Mouritz, which is of considerable interest. It gives us a list of the birds procured or observed, with excellent field-notes on their habits; and in many instances the Sindabele (native) name for the species is appended. The concluding portion (part 2) appears in the July number. Mr. C. H. B. Grant continues his paper on the collection of birds from British East Africa and Uganda presented to the British Museum by Capt. G. Cozens, with field-notes by the collector, Mr. Willoughby P. Lowe, part 2 being in the April number and part 3 in the July number—bringing the paper up to the end of the Woodpeckers, and making 212 species and subspecies in all. Eleven new subspecies are described in the July number, and text-figures are given of the short-crested and long-crested *Turacus* groups (i. e., *T. livingstonii* and *T. schalowii*). The specific name of the Diedric or Golden Cuckoo is changed from *cupreus* (this name being allocated to the Emerald Cuckoo) to *caprius*, on account of this being the spelling employed by Boddaert. What guarantee has the author of this change of name—that the name as spelled on d'Aubenton's plate is not a misprint, and should have read *cupreus* in any case? This everlasting changing of names on slender evidence, or (like the present

one) the alteration of one letter, is to our mind a wholly unnecessary proceeding.

In the April number there is also an interesting paper, entitled "Mixed Bird-parties," by our energetic Vice-President for Rhodesia, Mr. C. F. M. Swynnerton, in which he gives us his experiences where birds combine together to form "hunting-parties" for the better and easier obtaining of their prey.

The July number also contains a paper by D. A. Bannerman on the birds of the Cameroon Mountains, being the report on birds collected by the ill-fated Capt. Boyd Alexander; this is continued in the October number.

The October number also contains an obituary notice of R. B. Woosnam, whose name is fairly well known to South African naturalists by reason of his collections, made during, and subsequent to, the Boer War. He came to South Africa with the 2nd Worcester Regiment, and resigned his commission after the cessation of hostilities, to go on a collecting-tour with a brother officer, Mr. R. E. Dent, for the British Museum of Natural History. After his return to England in 1904 he went on several other tours to the Persian Gulf, Equatorial Africa, etc., and returned to South Africa in 1909 to explore the Kalahari Desert. In 1910 he was appointed Game Warden in British East Africa, which appointment he held until the outbreak of the present War, when he rejoined his old regiment at the Dardanelles, and fell on June 4th, 1915, while gallantly leading his men in the Gallipoli Peninsula. He was 36 years of age at the time of his death.

5. '*British Birds*,' Vol. ix. June 1915 to May 1916.

This little monthly magazine continues its interesting articles on English Bird-life, illustrated with the camera. Miss E. L. Turner, H.M.B.O.U., is to be congratulated on the photographs illustrating her article on "Wait and See Photography," many of which are works of art, apart from their interest ornithologically. The April (1916) number contains a record of a Swallow (*Hirundo rustica*) picked up

dead by Mr. S. Geo. Amm of Salem, near Grahamstown, on February 6th, 1916, bearing a ring with the number 82620 and Witherby, High Holborn, London. This Swallow was ringed as a nestling by Mr. F. W. Sherwood at Lytham, Lancashire, on July 3rd, 1915. This is the third Swallow ringed under the 'British Birds' scheme which has been recorded from South Africa, the other two having been previously reported in this journal.

XV.—*An Account of the Movement respecting the Amalgamation of the S.A. Ornithologists' Union and the Transvaal Biological Society.*

The attached circulars, which speak for themselves, were sent out to all members, the first one in the beginning of May, and not one dissentient reply was received. Forty members wrote agreeing to the proposal, and of these quite a large proportion supported the proposal with enthusiasm, giving reasons why they considered the step advantageous. The main reasons for this are—firstly, in such a thinly-populated country as South Africa, ornithology is too limited a science to expect more than what was being done at present; secondly, it was felt that, this being so, it would be better to convert ourselves into a larger society, with a much broader scope and a much better chance of publishing a regular journal; thirdly, that the larger society would appeal more strongly to the average amateur naturalist in South Africa, for whom no present society makes adequate provision at present.

A suggestion was then made that the Transvaal Biological Society, which has its headquarters in Pretoria and which has so far met regularly every month, should amalgamate with the S.A.O.U. to form the nucleus of a South African Natural History or Biological Society. To devise ways and means to this end a Committee was appointed to discuss the matter. This Committee drew up certain proposals, and called a meeting at Maritzburg at the time of the annual Science Congress in July. This Committee consists of

Sir A. Theiler (S.A.O.U. & T.B.S.), Chairman, Messrs. T. B. Pole-Evans, Dr. Ethel Doidge, A. J. T. Janse, and C. K. Brain representing the Biological Society; and Messrs. Ivan Ayres, C. E. Gyde, A. K. Haagner, and Austin Roberts representing the S.A.O.U.

Printed circulars containing the proposed rules of the new society have now been posted to all our members, and we hope that they will give the new venture their hearty support.

South African Ornithologists' Union.

Sir,—

At the July meeting of the Science Congress in Pretoria a proposal was made to found an Entomological Society for South Africa, which I strongly discountenanced, saying that what was wanted was not multiplication of societies but rather amalgamation. A Committee was thereupon elected to go into the pros and cons of the matter, and an idea was formulated that the South African Ornithologists' Union should broaden its scope and change its name; then all the mammalogists, herpetologists, and entomologists in the country could join us, and we would have a strong society, which would be able to publish a regular quarterly journal devoted to the Zoology of South Africa. Most of the members of the South African Ornithologists' Union are interested in the science but who are not actually active workers, so that it seems as if the subject could be worked up. Please let me have your opinion on the matter, and say whether you agree or not. It is the intention of the Sub-Committee appointed to meet again in the beginning of July, and to that end I would be obliged for an early reply to this circular. If I do not hear from you I will take it that you acquiesce in the suggested alteration of the Society's name and activities.

Yours faithfully,

A. K. Haagner,

Hon. Secretary.

Zoological Gardens, Pretoria.
May 19th, 1916.

DEAR SIR,—

I beg leave to notify you that at the Maritzburg Congress of the Science Association a meeting was held in the Town Hall, and the proposals regarding the formation of a South African Biological and Natural History Society, such as has already been communicated to you by circular, were ratified by a unanimous vote of the thirty odd persons present. The S.A.O.U. were represented by its President (Sir Arnold Theiler), its Secretary (Mr. A. K. Haagner), Mr. Kehoe, and the Rev. N. Roberts. A meeting was also held in Durban in the Museum, with our Vice-President for Natal (Mr. E. C. Chubb), in the chair, and there again the scheme was heartily endorsed. Your Secretary was also present at this meeting. It was decided to give the Sub-Committee appointed at Pretoria — consisting of four members of the Transvaal Biological Society and four of the S.A.O.U., with Sir A. Theiler as Chairman—power to act, subject to their recommendations being circularized throughout South Africa to all members of the S.A.O.U. and Biological Society for final approval or otherwise. This circular will follow in due course. To enable us, however, to wind up the affairs of the S.A.O.U., I would deem it a great favour if you would be good enough to send along your remittance as per account enclosed, and to let me know what Journals you are short of—if any—so that your series may be complete.

It is the intention of the new Society to issue a quarterly Journal of Natural History, commencing probably in January next ; and to that end I would be glad to receive any papers, photographs of special interest, or short notes from our members on any subject of natural history—ornithology in particular. We trust that our members will continue to give the new Society all the support they have accorded the old, and more so. It can become a strong Society with some influence in South Africa, and there is much work for it to do.

Thanking you for the confidence placed in us, we subscribe ourselves, Yours very faithfully,

A. THEILER, *President.*
A. K. HAAGNER, *Secretary.*

Pretoria.
August 12th, 1916.

NAME INDEX.

C.

G.

N.

O.

P.

Q.

U.

V.

W.

Y.

Z.

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OF THE

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EDITED BY

A. K. HAAGNER, F.Z.S.,

Col. Member British Ornithologists' Union;
Hon. Mem. Royal Hungarian Bureau of Ornithology,

AND

B. C. R. LANGFORD.

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Box 754, Pretoria,
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