

L. varium, they were lax and pendulous and long-drawn-out, and the fertile regions of the stem were as little differentiated as is the case in the plant *L. Billardieri* var. *gracile*. It was only the fact that *L. varium* was abundant over the whole locality and that *L. Billardieri* and the variety *gracile* were altogether absent which indicated that this particular clump of plants belonged to the former species, for in habit of growth they showed the *Billardieri* form and in the nature of the strobilus that of *gracile*. It would seem to follow from this that these three species are best to be distinguished from one another by the particular stations that they normally adopt, rather than by their habit of growth or nature of the fertile region, for the latter characters are very variable. It must be added, however, that the strobilus seems to be more fixed in form in *L. Billardieri* than in the other two species. This particular clump of *L. varium* was further noteworthy by reason of the fact that nearly all the pendulous fertile branches showed rejuvenation at their tips. These new shoots were precisely similar in appearance to young normally-developed plantlets, and presented a marked and sudden contrast to the fertile branches from which they arose. Moreover, close to the base of the new shoots one or more roots were borne, which, in the case of those branches which reached to the ground, had begun to ramify in the soil. It is possible that the large clumps of this ground-growing species owe their spread a great deal to this mode of vegetative propagation.

I have found, also, *L. ramulosum* on the summit of Mount Greenland, at a height of about 3,000 ft., associated in damp peaty places with *Cladium teretifolium*, very stunted *Leptospermum scoparium*, and cushions of *Phyllachne clavigera*. The *Lycopodium* was here densely matted, and of a very short, creeping, and much-branched form, the numerous cones being about $\frac{1}{2}$ in. long, and borne on stiffly erect branchlets $\frac{1}{4}$ in. to $\frac{1}{2}$ in. high. In sheltered spots in this locality the plants were, on the contrary, of a more lax and drawn-out form, and bore very few or no cones. (See Cockayne, 10, p. 17.)

ART. XXI.—Notes on the Birds of South-western Otago.

By ALFRED PHILPOTT.

[Read before the Otago Institute, 10th December, 1918; received by Editor, 27th December, 1918; issued separately, 20th June, 1919.]

WHILE engaged in entomological field-work I have had frequent opportunities of observing the habits of our birds, and a series of notes taken during the last six years forms the foundation of the present article. While it is indisputable that many of the native birds are doomed to extinction, it is also true that others are adapting themselves to the changed conditions brought about by the settlement of the country and the introduction of other forms of life. Such species as the bell-bird, the grey warbler, and the fantail may be seen daily in plantations within a few minutes' walk of the centre of the town of Invercargill, and it is not unlikely that as time goes on these birds will become quite independent of the native forest.

In nomenclature I have followed that adopted by Mathews and Iredale in their "Reference List of the Birds of New Zealand," as summarized by Benham in the *Transactions of the New Zealand Institute*, vol. 46, p. 188.

BOWDLERIIDAE.

SOUTH ISLAND FERN-BIRD (*Bowdleria punctata punctata* Quoy and Gaimard).

This species is becoming very rare in Southland; I have not met with it for six or seven years. In the summer of 1913-14, in company with Mr. R. Gibb, I visited Stewart Island, and among the manuka scrub on the Rakiahua Flat we found the bird abundant.

MUSCICAPIDAE.

SOUTH ISLAND TIT (*Myiomoira macrocephala macrocephala* Gmelin).

Observations on the habits of the South Island tit point to the conclusion that it mates for life. During the winter a male and female are often to be seen in company, and I have seen the male giving food to the female as early as the first week in August. In the spring much fighting goes on between the cock birds, but the quarrelling is not confined to that season; on several occasions a pair of males were observed fighting in the presence of a female in the late autumn and winter. The tit is certainly holding its own wherever the native forest is still standing. It is equally common in the *Nothofagus* forest at 3,000 ft. and the mixed forest at sea-level.

SOUTH ISLAND ROBIN (*Miro australis australis* Sparman).

In considering the problem of the diminution in numbers of New Zealand birds the case of the South Island robin offers some peculiar features. While the bird has disappeared from large areas remote from settlement, it is still to be found in several districts in close proximity to farming, mining, and timber-working activities. Though the coastal forest from beyond the Waiau to Preservation Inlet—many hundreds of thousands of acres—does not now apparently contain a single robin, the bird still holds out in certain localities comparatively close to towns. If the stoat and weasel were alone responsible for the scarcity of the robin we should expect to find outlying districts more favourable to its safety; certainly the writer's experience is that the stoat is much more common in the neighbourhood of cultivation. From 1914 to 1917 I visited the Hunter Mountains each year in January, ascending through the Titiroa Forest from Monowai Flat. In 1914 the robin was common in the lower bush; in the following year only a few were about; on the third trip only a single bird was heard; and in 1917 there was no sign of the species at all. I am unable to suggest a reason for such rapid disappearance. On the Monowai Flat rabbits are very plentiful, and cats and stoats are probably not uncommon. The part of the Titiroa Forest in question is attached to Sunnyside Station, and the owner, Mr. H. Cuthbert, informs me that nearer the homestead the robin is still to be found. In Stewart Island in 1913 I found the bird plentiful on Rakiahua and Table Hill, but it is not in evidence near Half-moon Bay and other settled districts.

SOUTH ISLAND GREY WARBLER (*Maorigerygone igata igata* Quoy and Gaimard).

The grey warbler is a bird which I think will adapt itself to the new conditions attendant upon the settlement of the country. It frequents orchards and plantations, and several instances of its nesting in fruit-trees and macrocarpa hedges have come under my notice.

A point worth investigating is the variation in the song of this bird in different localities. The notes of the Longwoods bird vary a little from those of the Seaward Bush songster, but the song of the Titiroa Forest bird is altogether different. It consists mainly of a beautiful descending trill. Possibly, however, the Titiroa form belongs to the subspecies *sylvestris* Potts.

In the work of nest-building the female warbler does practically all the work. The male may be heard singing near at hand, and occasionally he may visit the site and bring with him a fragment of material, but the bulk of the work is left to his mate. The beautiful domed nest does not, as is popularly imagined, hang suspended from a twig, but is securely stayed in position, one or more stout sprays passing through the thick lower portion. Though occasionally conspicuous, it is usually well concealed, and is not infrequently hidden in quite dense growth. A thin framework of the nest is first put together, much cobweb being used to bind the materials. When this stage is completed the lining-material is thrust through the aperture, and at intervals the hen bird enters the structure and may be seen vigorously moving about, the walls of the nest being pushed out in all directions as she arranges and consolidates the inner layers. In Southland, if the weather is not unfavourable, nest-building commences early in September, and at least two broods are reared during the season.

SOUTH ISLAND FANTAIL (*Rhipidura flabellifera flabellifera* Gmelin).

On reference to my notes I find that more than a dozen instances of the crossing of pied and black fantails have come under my observation during the past ten years. Only a few instances in which both birds were pied, and but one case in which both parents were black, have been noticed during the same period. I entertain no doubt that we have here an interesting case of dimorphism, and that consequently the two forms should be placed under one species. An analysis of ten broods of mixed parentage gives the following results:—

Black.	Pied.	Total.
1	1	2
1	2	3
1	2	3
1	2	3
2	1	3
1	3	4
1	3	4
2	2	4
2	2	4
2	3	5
—	—	—
14	21	35

I was, unfortunately, unable to ascertain the particulars of the brood of which both parents were black, the birds having disappeared during my absence from the locality.

Both parents work industriously at the building of the nest, but I think that the female is the leading spirit. On one occasion I observed the male bring a flake of fuchsia-bark and deposit it in the nest, but on the hen bird's next visit she picked this out and carried it several yards away. In hot weather the nestlings suffer much from the heat, and lie with their

heads thrust over the edge of the nest and their beaks wide open. They are also often overrun with hundreds of minute acarids, and the parents seek to abate this annoyance by picking off all they can see on each visit with food. An instance of unusual vigour in nest-building may be worth recording. On the 3rd September, 1917, I found a pair—black and pied—commencing to build a nest. By the 9th they had ceased working at it, and it appeared to be completed, though from the situation I could not make sure of this. On the 16th the pair began another nest about 12 yards away from the first, but work on this was carried on for only about half a day, when another site was selected near it. This third nest was beautifully finished by the 23rd, but the birds never used it, choosing still another site, where they again built, hatching out their eggs on the 22nd October. The nestlings left the nest on the 3rd November, and on the 8th I found the black fan (the hen bird) at work on another nest. This was lower down than any fantail's nest that I have seen, being only about 4 ft. from the ground. Within a yard of it was another nest, nearly completed, and once the bird alighted on this and did a little work at it. The first egg was laid on the 11th, and one on each of the following days till four were deposited. The young birds left the nest on the 12th December, but previous to this the pied parent had disappeared. A young black bird, presumably one of the former brood, began to assist in feeding the brood, and by the 7th January this pair of blacks had built a nest and had young birds hatched out. As mentioned above, I was unable to keep any further watch on this pair.

PARIDAE.

BROWN CREEPER (*Finschia novaezeelandiae* Gmelin).

Though becoming rather rare in the smaller bush areas, the brown creeper is still common in the larger forests. In the upper portion of Titiroa Forest it is very abundant, and in the Longwood and west-coast blocks it is also plentiful.

YELLOWHEAD (*Mohoua ochrocephala* Gmelin).

The yellowhead disappeared from the neighbourhood of Invercargill about ten years ago. West of the Waiau River it is not uncommon in suitable portions of the coastal forest, and it is abundant in Titiroa. I have not met with it on the Longwoods.

MELIPHAGIDAE.

BELL-BIRD (*Anthornis melanura melanura* Sparrman).

It is gratifying to find that this charming songster, which at one time was thought to be in danger of extinction, is now one of the most common of the indigenous bush-birds. The smallest patch of forest usually supports one or two individuals, and orchards and gardens in the centre of the town are regularly visited. An instance of what appears to have been an individual variation in the song of this bird came under my notice in December, 1917. While camping, in company with Mr. C. C. Fenwick, at the Wairaurahiri River, a bird kept up an incessant short song, consisting of three bell-like notes in a descending scale. It was quite different from anything I had heard in any other locality. On returning to the same spot a year later exactly the same pleasing melody was heard nearly all day long; probably it was the same bird.

TUI (*Prosthemadera novaeseelandiae novaeseelandiae* Gmelin).

The tui is not uncommon in the large forest areas, but appears to favour the lowland mixed type; not many are to be met with in the *Nothofagus* mountain blocks.

ZOSTEROPIDAE.

WHITE-EYE (*Zosterops lateralis tasmanica* Mathews).

The white-eye appears to build about the end of October in this district. Apparently partial migration takes place in the winter, as the large flocks which may be seen in the late autumn are represented by only twos and threes in the spring. A great many, however, fall victims to the cat while they are searching the vegetables and small-fruit trees for insects.

MOTACILLIDAE.

SOUTH ISLAND PIPIT (*Anthus novaeseelandiae novaeseelandiae* Gmelin).

Not uncommon in the open country round Invercargill. It is strange that this bird, which nests and roosts on the ground, does not succumb to the stoat in a district where these animals are so plentiful. On the Hunter Mountains, at an elevation of 3,000 ft. to 4,000 ft., the pipit is common, and I am of opinion that these alpine birds are much lighter in colour than those found on the low country.

ACANTHISITTIDAE.

RIFLEMAN (*Acanthisitta chloris chloris* Sparrman).

Plentiful in all forests, and extending to the bush-level on the mountains. I have never met with one in the open or seen one flying from forest to forest.

ALCEDINIDAE.

KINGFISHER (*Sauropatis sanctus forsteri* Mathews and Iredale).

About the middle of September a few kingfishers always visit the outskirts of the bush districts, and may be seen and heard among the scattered trees in the fields. During the winter they either migrate northwards or retire to the coastal areas.

CUCULIDAE.

SHINING CUCKOO (*Lamprococcyx lucidus* Gmelin).

The shining cuckoo and the long-tailed cuckoo (*Urodynamis taitensis* Sparrman) are certainly not so common as formerly near settlement, but their rarity is simply the result of the clearing of the forest. In the untouched forest areas both species are abundant in their season. In the hill country the long-tailed species is common at all elevations, but I have not met with the shining cuckoo above 2,000 ft.

BUBONIDAE.

MOREPORK (*Spiloglaux novaeseelandiae novaeseelandiae* Gmelin).

Throughout the winter months for the past four years a morepork has lived in a small piece of bush within the Invercargill boundary. During the day he could almost always be found perched under some tree-fern fronds. Frequently several kinds of small birds would gather round

and mob him, but he took very little notice of them. In the spring and summer the bird was never to be found on the usual perch, which seems to indicate that the morepork pairs for the nesting season only. It is popularly supposed that this owl shelters by day in a hole in a tree, but I have on many occasions surprised the bird by day, and always found it perched under tree-fern fronds or in similarly shaded situations.

Wherever any forest is still standing the morepork is not uncommon. A few years ago I had the good fortune to come upon a brood of young birds which had just left the nest. They were perched on a dead limb, and both parents were busy catching moths and other insects for them. I think it very probable that the old birds largely supplement their own diet with such large insects as they can catch.

NESTORIDAE.

KEA (*Nestor notabilis* Gould).

The kea is common on the Hunter Mountains, where its numbers seem to be on the increase. Contrary to the experience of flock-owners in other localities, Mr. H. Cuthbert, who utilizes Mount Burns and Cleughearn, informs me that the birds have never to his knowledge interfered with his sheep. During several visits to the Hunters in January of each year I paid special attention to the food of the kea. In January, 1917, the mountain-flax (*Phormium Cookianum*) was in flower, and little flocks of keas might daily be found sucking the nectar from the blossoms. On more than one occasion keas were observed breaking off and splitting up the flower-stalks of the celmisias. The soft central portion of the stalk seemed to be the part desired, for, though I examined the refuse in order to ascertain if it was caterpillars or some other form of insect-life that the bird was after, I could find no trace of such. The gizzards, however, of a few which were captured showed that insects formed a large proportion of their food, remains of the larvae of Cicadae being plentiful. Though the kea may often be seen stripping off the lichen and moss from the branches of trees, the bird does not seem to bore into and break up decayed wood as its congener the kaka does; probably *Nothofagus* logs do not contain sufficient insect-life to make it worth while.

During the greater part of the day the keas frequented the open hills, but in the mornings and evenings they were to be found about the upper edge of the forest, and they passed the night in the trees. On sunny days, generally about four in the afternoon, they took what appeared to be pleasure flights. They would circle about in companies, breaking up and re-forming again, swooping down towards the ground and soaring up again, and crossing and recrossing each other's paths with excited cries. The kaka has the same pleasing habit.

Though I have found the kea very inquisitive and given to the investigation of every strange object, I have not met with any instances of that extreme playfulness recorded by some observers.

KAKA (*Nestor meridionalis meridionalis* Gmelin).

Abundant in the coastal forest beyond the Waiau River; it ascends as high as the bush-line, but is most common in the mixed forest near the sea. In the Titiroa Forest it is not plentiful, even in the lower areas. In Stewart Island the back country still yields a refuge, but near the settled areas the bird is scarce. The smaller forests are now practically forsaken

by this interesting parrot. In 1913 a very handsome variety was shot in Stewart Island. The specimen, which is now in the Southland Museum, has the forehead dull leaden grey; the crown and nape are scarlet, each feather being tipped with olive-brown; the feathers of the neck and pectoral band are broadly margined with yellow; the back and scapulars are scarlet, with crescentic olive-brown marks; the wings are scarlet mixed with olive, the primaries being olive-grey; the rump and upper tail-coverts are scarlet; the tail-feathers are dark olive, basal half pale scarlet, tips olive-grey; the ear-coverts are faintly yellow; the lores, cheeks, and throat are dark olive, the cheek-feathers being centred with pink; the breast is scarlet mixed with olive, the flanks, abdomen, and under tail-coverts being almost wholly scarlet.

CACATUIDAE.

PARRAKEETS (*Cyanorhamphus*).

The three species of *Cyanorhamphus* which were once so common in Otago are now seldom seen or heard in any of the smaller forests. *Cyanorhamphus malherbi* Souancé, which was never so abundant as the other two, is in all probability extinct, but the red-fronted and yellow-fronted species still occur far back in the great timbered areas. It is very noticeable that these remaining birds are much more timid than the parrakeets of the early days. They seem to frequent the tall trees only, and are much more often heard than seen. Between thirty and forty years ago the parrakeet fed freely on the low berry-bearing shrubs, and frequently hunted about on the ground for fallen seeds. They were so tame that a boy with a "shanghai" could soon make a fair bag; but now it would be difficult to get within gun range. Possibly this acquired timidity will prove the salvation of the species. Two specimens of *C. malherbi* are in the collection of the Southland Museum, and the yellow varieties of *C. novaezealandiae novaezealandiae* and *C. auriceps auriceps* referred to by Sir Walter Buller (*Trans. N.Z. Inst.*, vol. 29, p. 188) are also still in good condition.

TRERONIDAE.

WOOD-PIGEON (*Hemiphaga novaeseelandiae novaeseelandiae* Gmelin).

The pigeon is still plentiful except near settlement. Orchards near the Titiroa Forest are visited when the cherries are ripe, and such large birds exact a heavy toll upon the owners of the trees. In the open glades on the Hunter Mountains above 3,000 ft. I found this beautiful bird feeding on the berries of *Coprosma rugosa*. In fine weather they appear to feed in the morning and evening, and to rest in the shade during the hottest part of the day.

RALLIDAE.

BLACK WEKA (*Gallirallus brachypterus* Lafresnaye).

It is pleasant to be able to record the fact that the black weka is undoubtedly becoming more plentiful in the Fiord County forest. While gold-mining operations were being carried on at Preservation Inlet, with the attendant traffic along the Orepuki-Preservation track, the weka naturally became scarce in that locality. Many were killed for food, and many more were destroyed needlessly by the miners' dogs. In 1911, by

which time there was little activity at the inlet, I found that the black weka had recovered to a great extent from its persecution, and was to be found in fair numbers from the coast to the western bank of the Wairaurahiri River. On the east side of the river only a few were to be met with. In the summer of 1916-17, the bird was found to be abundant to the west of the Wairaurahiri, and common on the eastern side, occurring, though in diminishing numbers, almost to Bluecliff. By the summer of 1917-18 they were common at Bluecliff and beyond, one or two being heard within a few miles of the settlement of Papatotara. Even at the top of the forest on the Hump Ridge a pair were present—the first seen there by the writer, though the spot had been visited five or six times since 1911.

During the last spring and summer a plague of mice has occupied this western forest. While an odd mouse or two might always be found about the huts on the track, there has never been, in my experience, anything approaching the number present on this occasion. They were everywhere—on the sea-beach and the hill-tops, in the huts, on the track, and in the dense bush. Very probably their numbers accounted in some degree for the spread of the weka; the birds were snapping them up on every opportunity, the victims being swallowed whole, head first. On the beach I saw the wekas picking up many small crustaceans (sand-hoppers); the large stag-beetles (*Lissotes*) also formed part of their diet.

STEWART ISLAND WEKA (*Gallirallus australis scotti* Grant).

In the back country of Stewart Island this species is still fairly common. My experience with this bird leads me to regard it as much less vigorous and enterprising than the black weka. I should imagine that the latter species, if introduced into the same region, would soon exterminate the former.

PUKEKO (*Porphyrio melanonotus stanleyi* Rowley).

The pukeko is one of our birds which is in danger of extinction. Few are to be found now, even in localities remote from settlement.

ARDEIDAE.

WHITE HERON (*Herodias alba maoriana* Mathews and Iredale).

Two very fine specimens, in spring plumage, are in the Southland Museum. These, I learn from Mr. James Hunter, were shot by Mr. J. Fox at Kew, near the mouth of Kingswell's Creek, in the year 1875. As showing that the bird was not then regarded as very rare, it may be mentioned that the museum authorities purchased the skins for 10s. each. In the early "eighties" the writer remembers seeing a white heron near the Waihopai River, where the buildings of Collingwood now stand.

WHITE-FRONTED HERON (*Notophox novaehollandiae* Latham).

The white-fronted heron is exceedingly rare, but a specimen was shot near Invercargill during the present spring.

BITTERN (*Botaurus poeciloptilus melanotus* Grey).

About ten or twelve years ago the bittern was not uncommon in swampy localities near Invercargill. The draining and reclamation of these areas has driven the bird farther back, and it is now rarely seen.

HAEMATOPODIDAE.

REDBILL (*Haematopus niger unicolor* Forster).

Along the coast, wherever masses of rock are to be found in conjunction with sandy shores, the redbill is not uncommon.

CHARADRIIDAE.

DOTTEREL (*Pluviorhynchus obscurus* Gmelin).

Seldom seen on the mainland. In Stewart Island it occurs in fair numbers, nesting on the dunes near the sea and visiting the bare tops of the high country.

RECURVIROSTRIDAE.

PIED STILT (*Himantopus leucocephalus alba* Ellman).

The pied stilt seems to be in no danger of extinction. A flock of about fifty was observed recently on the mud-flats of the New River Estuary, and pairs and small groups may frequently be met with in shingly riverbeds and other suitable situations.

SCOLOPACIDAE.

ORIENTAL WHIMBREL (*Numenius variegatus* Salvadori).

In the collection of the Southland Museum is an example of this species. It was shot on the New River Estuary in 1907, being in company with a flock of godwits.

LARIDAE.

WHITE-FRONTED TERN (*Sterna striata striata* Gmelin).

This very common tern breeds at several rocky stations along the coast. In the middle of December I found numerous eggs and a few young birds just hatched. No attempt at a nest is made, the egg being laid on the sandy grit in the hollows of the rocks. The parent bird will not allow any other species to approach the breeding-place; a pair of paradise ducks which were swimming in the sea near the rocks were set upon, and compelled to dive repeatedly in order to escape their tormentors, and on more than one occasion a harrier which had only come within several hundred yards of the nestery found itself vigorously attacked. It was surprising to see the hawk retreat, without the least show of defence, from a bird less than half its size.

ART. XXII.—*Descriptions of New Species of Lepidoptera.*

By ALFRED PHILPOTT.

[Read before the Otago Institute, 10th December, 1918; received by Editor, 27th December, 1918; issued separately, 20th June, 1919.]

PYRAUSTIDAE.

Scoparia illota n. sp.

♂ ♀. 18–20 mm. Head, palpi, and thorax fuscous-brown mixed with grey. Antennae fuscous, ciliations very short. Abdomen grey, anal tuft ochreous. Legs fuscous, posterior pair paler, apex of tarsal joints narrowly whitish. Forewings elongate, triangular, blackish-fuscous, densely irrorated with white: first line broad, curved, bluntly angled at middle, white: