

men, inclining towards centre of wing as it nears dorsum. Edge of termen deeply scalloped. Cilia light-brown. Hindwings ochreous, with strong darker terminal suffusion. Cilia ochreous.

Apparently close to *M. rubescens*, which it resembles in the markings, but it is easily distinguished. Has occurred in Dunedin in December, and on blossom here in October. Mr. Philpott has three specimens taken at Wallacetown.

In the 1905 volume of the Transactions I described a new *Leucania* as "*Leucania obsoleta*." As this name proves to be preoccupied, I alter the name to "*L. innotata*."

Leucania innotata, n. sp.

About 37 mm. Antennæ ochreous, filiform. Legs and palpi greyish-ochreous. Legs fuscous beneath. Face and thorax dark-ochre. Thorax moderately crested. Abdomen dull-grey; anal segment paler. Forewings uniform light-ochre. Veins plainly outlined in grey. Orbicular and reniform obsolete. Very slight dark shading from base to half-way along wing-centre. Termen very slightly sinuate near apex. Hindwings uniform fuscous, with cilia light-ochreous as in forewings.

This moth appears to be close to *L. arotis*, but differs in coloration, in the absence of dots on the forewings, and in its pale-ochre cilia.

The first specimen was taken in Dunedin in December, but since then, when collecting with Messrs. Lee and Oliver, we have taken several more in October at Anderson's Bay, Dunedin.

ART. XLVIII.—*Additional Notes on the Kea.*

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[Read before the Philosophical Institute of Canterbury, 11th December, 1907.]

Plates XXXII-XXXIV.

IN order to verify some of the accounts that I had heard of the damage done to the sheep-farmers through the depredations of the kea, and, if possible, to obtain some photographs of the murdered sheep, in July, 1907, I made a week's excursion to Mount Algidus Station. This run is situated near the confluence of the Rakaia, Mathias, and Wilberforce Rivers, a few miles above the Rakaia Forks, where the birds have been very troublesome for some time. Though midwinter is the worst

time of the year to visit this kind of country, owing to frequent heavy storms of snow and rain, yet in order to catch the kea at work one must travel at this time of the year.

I was not fortunate enough to actually catch the bird in the act of killing sheep, yet I was able to follow closely in his tracks and obtain several photographs of dead sheep which had evidently been killed by him. Also, through the kindness of Mr. R. Urquhart, manager of the station, who did all in his power to aid me in my investigations, I was able to get some photographs of keas' nests. As I believe that these are the first photographs that have been taken of these interesting phases in the natural history of the kea, I thought that some of the pictures, accompanied by a detailed description, would be of sufficient interest to place on record.

SHEEP KILLED BY KEAS.

The first dead sheep was found at the foot of the Rolleston Range, about ten miles above the Rakaia Forks, on a broad expanse of river-flat, known at the homestead as the "Top Flat." The animal was a merino ram, in splendid condition, and, from the place in which it was found, it had apparently been chased by the bird or birds until it was cornered where two wire fences met, and there injured. The sheep was quite dead, and lying on its wounded side. On turning the beast over we found an ugly black-looking wound on the right loin at 11 in. from the tail. The hole was 5 in. long by 4 in. wide. The wool was all torn off, and the flesh was removed so that the transverse processes of lumbar vertebrae were visible. Though a deep hole had been made in the flesh, the birds had not reached the body-cavity, nor had they injured the kidneys, and from the appearance of the animal it seemed as if it had died from blood-poisoning. Further up the back there were several other places where the wool had been picked. We propped the sheep up in order to photograph it, and on returning next day we found that the keas had evidently been at it, as was shown by the wool which was scattered around the carcass.

On the same flat we noticed another merino ram which had apparently been picked, and on rounding up the mob and capturing the animal we found a V-shaped scar 6 in. by 4 in. on the right loin. The sheep was still running with the mob, but, as the wound was dirty and very much festered, there was all probability of the animal succumbing to its injuries.

On my return to the Lake Coleridge Station I found that during my short absence the keas had been at work, and a wounded sheep was found dead near the homestead. Through the kindness of Mr. J. Murchison, who kept it for me, I was

able to photograph it, and take notes. The animal was a four-toothed merino ewe, and apparently in good condition. Over the left loin was a round wound 4 in. by 3 in. in size, and, like those seen at the Mount Algidus Station, the flesh was black-looking and much lacerated. The birds had just made a small hole into the body-cavity, but on opening the sheep we found the kidneys and kidney-fat intact. On skinning the back we found the flesh for some distance blackish in appearance, as though blood-poisoning had been the cause of death. Though the wounds in the sheep seen in this excursion were horrible enough, often the whole side of the sheep is eaten out, and various internal organs pulled out.

However, from what I saw, it appears that the death of kea-picked sheep is not always due to the injuries to the internal organs, but that foreign matter getting into a small flesh-wound made by a kea causes blood-poisoning and death. It may be that the kea's beak itself is not quite clean, or perhaps that the cruel laceration of the flesh due to the kea's attacks is sufficient to poison the blood.

KEAS' NESTS.

The position of the kea's nest depends a good deal on the surrounding country. If the mountains have numerous long narrow tunnels running for some yards into solid rock the kea will make use of them; but otherwise a rabbit-burrow or a cairn of stones will suffice. When the birds build, as they usually do, in the face of almost inaccessible cliffs, their nests are invulnerable, for even if a mountaineer can manage, at the risk of his life, to reach the exit of the "run" he will have to use a crowbar to force an opening, and in many cases nothing but a charge of blasting-powder would make a hole large enough to effect an entrance. The nest that we visited was situated in a narrow tunnel at the top of a 900 ft. cliff, caused by the Chimera Creek cutting a deep narrow gorge through Jack's Hill. We had to leave our horses in the gorge, and climb along the top of the cliff for some distance, which, owing to the slippery nature of the ground, made our progress very slow. The nest was fairly easy of access, owing to it being situated near the bottom of a small ravine, about 10 ft. deep, which poured its waters over the top of the cliff.

In the spring of 1906 Mr. Urquhart, having discovered the nest, determined to plunder it, and so one night he, with several of his men, climbed along the top of the cliff, but owing to the darkness they were unable exactly to locate the nest. The difficulty was overcome, however, by one of the men imitating the call of a kea, to which the young birds responded. A large

stone was forced away from the opening with the aid of a crow-bar, thus enabling a man to crawl in and reach the nest. The female bird was killed, but the male escaped, and the four young birds were carried back to the station. Mr. Urquhart brought two of the young birds to Christchurch for me, thus enabling me to photograph them.

The nest of a kea is almost a misnomer, for the bird chooses some natural hole in the rocks which has a narrow opening just wide enough to allow the adult birds to pass in and out, and then, placing a few pieces of tussock-grass at the far end, she lays her eggs.

The first nest that I saw was situated at the end of a long narrow tunnel running some 6 ft. into solid rock. The opening, after the removal of a large stone, was in the shape of a triangle; the distance from the apex to the base was 14 in., and the length of the base 19 in. The tunnel, or "run," narrowed as it approached the end, and here, in the narrowest part, was the nest placed, which, when it was robbed some months before, contained four keas.

On the opposite side of the ravine the remains of another nest were found, which could not have been reached without blasting the rock. The opening was 30 in. deep and some 13 in. wide, and the tunnel ran back some 10 ft. into solid rock, and a more secure place for a nest could hardly be imagined.

With such inaccessible nesting-places there seems very little chance at present of these interesting but cruel birds being exterminated.

EXPLANATION OF PLATES XXXII-XXXIV.

PLATE XXXII.

- Fig. 1. A sheep killed by keas on Top Flat, Mount Algidus Station.
 Fig. 2. Close view of the wound seen in fig. 1, Plate XXXII.

PLATE XXXIII.

- Fig. 1. A sheep killed by keas on Lake Coleridge Station.
 Fig. 2. Close view of wound in fig. 1, Plate XXXIII.

PLATE XXXIV.

- Fig. 1. Opening into the "run" leading to the nest where four young keas were captured. A large stone has been removed from the entrance.
 Fig. 2. Opening into the "run" of another nest.