

During the late spring, when their ordinary food would be more accessible, they appear to kill less sheep, and do not become very much of a nuisance again until about the middle of summer.

The reason why the keas find this season a good time for their depredations, is uncertain, but may be accounted for as follows:—

Firstly. Owing to the snow having melted, the sheep are able to roam in the kea's domain.

Secondly. The sheep have favourite places for sleeping, and if anywhere near, they make for them, night after night. These spots are called "Camps," and no doubt the kea are always sure of finding a good supply of sheep in the camps, whenever they intend to attack.

Thirdly. At shearing time, the sheep are confined to small paddocks, and so have less chance of getting away from the kea.

They do not, however, confine their attacks to these seasons only, but have been known to kill sheep all the year round, though autumn seems the time when they attack least, whether it is due to the quantity of their ordinary food, that would be plentiful at this season, or not, is hard to decide.

The time of the day when they attack sheep, is also uncertain, and speaking generally, they have been known to attack at all hours, but the evening, night, and early morning appear to be their favourite times.

Why night time should be their favourite time, may be accounted for in several ways:—

First. The sheep are said to make for the same sleeping grounds or camp for several consecutive nights, and the birds would be sure of finding plenty of sheep together during the hours of darkness.

Second. Being partly nocturnal in their habits, they have an advantage

over the sheep, and at night there is less chance of their being seen or disturbed.

If attacking in daylight, they seem to choose dull or foggy days, but this is not always the case, as I have heard of several instances of attacks being made in bright sunshine. However, in these cases, there has always been snow on the ground, and the helplessness of the sheep or the lack of food, may have made them more daring.

NUMBER OF SHEEP KILLED.

It is impossible to work out anything like a correct estimate of the damage done to the flocks of sheep by the keas, owing to the uncertainty of the results sent in.

For instance, where every sheep that is missing is put down as the work of these birds, the damage is exaggerated, and in cases where sheep are killed by the keas, and their remains are never seen, there will be an under-estimation of the loss.

Again, if we take the number of birds killed in a certain time, we go wrong, because the birds seem to kill at irregular intervals, and when percentages are given, we have to find out whether it is made out on one flock, one station, or one district.

Often when a percentage is given on a week's or a month's damage, unless it is very clearly stated, it is sometimes taken for the annual loss, and in this way, very erroneous results have been published.

Some people quote the damage to stations at 30 and 40 per cent., but I think that this is very wide of the mark. A rough idea of the number killed, even in a short time, can be seen by the following accounts:—

Mr J. Morgan writes as follows:—"In spring, 1894, Mesopotamia Station, Rangitata Gorge, we found a lot of strong wethers dead, and on skinning some, we found a small puncture through the skin above the loins, and the flesh torn about under the skin. On going over a block, we found a mile long and a quarter wide, we found close on 300 dead sheep. The next night a man went out and shot a few birds; in all, during two days, he shot 63 keas, and we lost no more sheep on this spot."

On another occasion, when taking hogsheads out in the spring, we put them through a gate at dark. When we went in the morning, we found seven of the sheep dead, about their camp. The following night we shot eight keas at this place, and although we took out several mobs of sheep the same way afterwards, no more were killed."

Mr P. E. Challis states that he has seen 19 sheep attacked in one evening.

Mr A. Watherston reports that one evening he found some keas attacking the sheep, and eight of them were killed. On going out at daybreak next morning, he found that during the night 38 had been killed, and the keas were still attacking them.

The carcasses of the sheep were, in most cases, still warm, and out of about 1600 sheep, about 300 were killed. This loss works out to about 18 per cent. for the winter.

Mr W. N. Ford says that around Lake Wanaka the losses in the year are about 26 per cent. of the sheep, and about half of these are put down to the keas.

If the birds always kill on an average 20 or 30 a night, the loss would be tremendous, but it seems that they make special raids, and then are quiet for some time. Many of the keas must either kill for the love of killing, or else to have a number of dead sheep on which to feed for some time. Many are killed and left almost untouched. However, from evidence it seems that they come back afterwards and feed on them until the carcasses are devoured.

In most of the kea-infested country the annual damage is, I should say, well under 5 per cent. A few stations may lose as much as 10 per cent., and I doubt if any station loses as high as 20 per cent.

ATTACKING OTHER ANIMALS.

Though the sheep are the favourite animals for the keas to attack, they do not seem to confine themselves to them alone, for I have instances sent to me where they have attacked horses, dogs, and rabbits.

Mr Guthrie gives the following account of an attack on a horse:—"The pack horse was tethered on a piece of flat ground about ten chains from the camp. After we had tea, I strolled over to where there was a large flock of keas on a little knoll above the pack-horse. This would be about an hour before dusk. One or two flew down on to the horse's back. He was an old, stiff-built cobby horse of very sluggish nature. He took no notice of the keas when they flew on and off his back for some time, giving him an occasional peck. At last an old fellow perched on his back and started operations in a most serious manner. He soon had the old horse showing more life than he had ever done before; in fact, before he got the kea dislodged, he was almost mad. When I got down to him, he was in a heavy sweat, and the blood was trickling slightly over his loins. On examination, I found a nasty wound that took a long time to heal, as it became very dirty. Ever after, the horse would go almost frantic when there were any keas about."

Two of my correspondents record cases where the keas have settled on dogs, and also cases of where rabbits have been killed by these birds.

NESTING HABITS.

As well as the evidence that I have received, there have been several notes about the kea's nesting habits, which I think are worth while putting on record.

Their breeding season has been recorded as beginning in August, but this seems to be too late in the year.

Mr J. McIntosh says:—"They nest at all times from May onwards. I have seen eggs from May on to September."

Mr Turton states that he has seen them early in July, and Messrs Huddleston and Ford in August.

The late Mr Potts says:—"It breeds in the deep crevices and fissures, which cleave and seam the sheer facing of almost perpendicular cliffs, that in places bound, as with massive ramparts, the higher mountain spurs.

Sometimes, but rarely, the agile munterer, clambering amongst these rocky fastnesses, has found the entrance to the 'run' used by the breeding pair, and has peered with curious glance, tracing the worn track till its course has been lost in the dimness of the obscure recesses beyond the climber's reach. In those retreats the home or nesting-place generally remains inviolate, as its natural defences of intervening rocks defy the efforts of human hands unless aided by the use of heavy iron implements that no mountaineer would be likely to employ."

From the above account, it would appear as if the kea's nest was inviolate unless one used force to get at it. Several of my correspondents have obtained eggs and young birds, and none of them say that the nests are always so inaccessible, though they often communicate with the exterior by a long run, and are usually built in places that are very difficult to reach.

As far as I can ascertain, Mr Potts never saw a kea's nest, and it seems as if the poetry of his description has obscured some of the facts.

The nests have been found in other places besides fissures and crevices in the rocks, namely, under rocks, in rabbits' burrows, in banks, in cairns of stones, and even on the flat.

The nest seems to be just a small hollow, lined with a few straws. The young birds have been known to hatch in June, and, from all accounts, they stay in the nest for a long time.

Mr J. McIntosh found young ones in September, and took them out of the nests in December, and this seems to indicate that they remain in the nest until they are nearly as big as their parents.

It has been suggested that the taste for meat has now become hereditary to the young keas, for when they are given raw meat, they seem to eat it greedily.

For instance, Mr W. N. Ford found some kea chicks only a few days out

of the shell with their eyes still closed. He kept them for six weeks, feeding them on sop and raw meat, but they died one night, owing to them being left out in the cold.

This would appear, at first sight, as if the taste for meat was hereditary, but as pieces of meat have been found outside the nest, it is most likely that the old birds teach the young to be carnivorous.

Again, the fact that young birds will eat meat does not prove conclusively that they have inherited the taste. Other instances are known where animals have instantaneously taken to food which they could never have tasted before.

By the kindness of Dr. Cockayne and Mr E. Jennings, of the Dunedin Museum, I am able to publish the following interesting incident:—

While on a tour of the Southern Islands of New Zealand in the Government steamer Hinemoa in 1904, a specimen of the flightless duck of New Zealand (*Nesometta Aucklandia*) was captured, and brought alive to Dunedin. From the time of its capture it was fed solely on bread and milk, which it seemed to take to very readily. Now this duck is found only in the Auckland Islands, where it feeds on small crustaceans and other small animals, etc., which are found among the rocks of the sea shore and the kelp where this bird swims. These islands are uninhabited, and are practically never visited by any shipping except the Government steamer Hinemoa, which pays them an annual visit.

It can almost be taken for certain that this particular bird had never before seen bread, much less tasted it, and yet, when caught, it at once took to this strange food, which was so entirely different from its natural supply. This instance, I think, shows that even if birds take to new food readily, it does not prove that the taste is of necessity hereditary.

(To be continued.)

HABITAT.

That the kea is found in the mountainous country of Canterbury, Otago, and Westland is a well established fact, but whether it lives among the snow-capped peaks and the glaciers or lower down near the forest line, is a question that has never been satisfactorily settled. The generally accepted opinion is that the bird's stronghold is far up among the snow-capped peaks, and a recent book states that the kea lives "Up in the mighty mountains where the snow never melts and men seldom go. Sometimes it is driven from its stronghold, and is compelled to seek food at lower elevations."

The late Mr T. H. Potts describes the bird as living "Far above the dwarfed vegetation, in a region often shrouded with dense mist or driving sleet, etc."

It is quite true that the keas do sometimes live in these desolate regions, for they are common at Mount Cook near the large glaciers, where they may be seen soaring from peak to peak.

Sir Julius Von Haast saw two of them flying over the Godley Glacier, but though he saw keas several times while exploring the mountains of Canterbury, only once did he see them in the perpetual snow-clad regions and among the glaciers.

Again, nearly all the accounts of these birds attacking sheep have come from districts which are situated many miles from the regions described by many writers as the kea's home.

At the present day, however, the bird does not seem to be a dweller of the glacier regions only, and although it does sometimes frequent these heights, it is most commonly found about the forest limit.

Dr. L. Cockayne describes, in a communication to me, its habitat as follows:—"I have observed the kea in various parts of the Southern Alps, from the Humboldt Mountains in the South to Kelly's Hill in Westland. Although frequently met with on the

open alpine and sub-alpine hillside, I consider the bird essentially one of the forest limit, where it may be seen in numbers at the junction of the forest and sub-alpine meadows, and in the Nothofagus forests at lower levels where such are pierced by river-beds."

Mr Taylor White does not consider the bird one of the forest, for he says:—"I remember being astonished on reading of the kea living in the forest, for I never, even during the severest winters, saw it perched on trees."

However, in spite of this, as early as 1862, Haast saw one in a tree near Lake Wanaka, and since then they have been often seen perching in the forest.

I have, on several occasions, seen the kea both on the Birdwood Range and Mt. Torlesse, and each time the bird has been about the forest limit. Though I have often seen them at an altitude of 5000ft I have never seen them above that height.

Twice have I seen them perching in the Fagus Forest, once in July, 1903, in a bush behind the Glenthorn Homestead and while camping for several days, near the source of the Avoca river, we continually saw them flying in and out of the forest, about 500ft above us.

Seeing these birds so low down in summer rather upsets the statements of many writers who say that the keas only come from higher altitudes in severe weather, for both times when I saw the birds at low altitudes it was in midsummer, and the weather was warm and fine.

They come much lower than some people suppose. Potts says that they have been seen at Hororata, near the Malvern Hills, and Mr G. Rutherford states that nearly every year keas have been shot in the thirteen mile bush, which is situated near the foot of Porter's Pass.

At first I thought that perhaps the keas had learnt to live at lower altitudes so as to be near the sheep, but the fact that before the kea had learnt to kill sheep, namely between 1861 and 1867, Sir Julius Von Haast saw more keas below the snow line than above is against this suggestion.

I consider that in the future their habitat should be described as follows in the words of Dr. Cockayne:—"Although frequently met with on the open alpine and sub-alpine hillside, the kea is essentially a bird of the forest limit, where they may be seen in numbers at the junction of the forest and sub-alpine meadows, and in that Nothofagus forest at lower levels where such are pierced by river-beds."

DISTRIBUTION.

As I have not yet completed my investigations in this part of the subject, I will simply confine myself to the main facts.

The kea's area of distribution can be roughly stated as the mountainous country of the Middle Island of New Zealand; from Lake Te Anau in the south to Mount Robert in the Nelson province in the north, and I have just heard that it has been seen in the extreme north of this, on an island near Cape Farewell.

The western limit seems to touch the coast; for the birds have been seen near Hokitika and Bruce Bay in Westland. The eastern boundary seems to follow the eastern limits of the mountainous country, but extends farthest east in Canterbury at Mount Peel and Mount Torlesse. Through the kindness of Mr T. E. Currie I hear that the keas are making their way into the Marlborough province, where they have been lately seen around the Hillersden and Taradale stations. The evidence seems to indicate that the birds are extending northward, and one wonders if Cook Strait will prove an impassable barrier, or whether they will cross over this narrow sheet of water and establish themselves in the North Island.

Though the habit of killing sheep has not reached as far north as the keas, it seems to be spreading in that direction, for in some places where keas have been seen for some time, it is only lately that they have been known to damage the flocks.

In spite of the numbers of keas that have been killed they still seem very plentiful, but in case all these interesting birds should be exterminated, I would suggest that a number of them should be placed on some island, off the coast of New Zealand, where they could live and flourish, without doing harm to the flocks. Such islands as the Auckland or Kapiti would do admirably for this purpose.

In concluding I should like to take this opportunity of thanking all those who have so willingly helped me in my investigations, especially those who have sent me in their actual experiences with the kea, for I know that without their co-operation this paper could never have been written.

ADDRESSES OF COMMUNICANTS OF INFORMATION ABOUT THE KEA.

- Bond, J. H. C., Templeton, Canterbury.
- Burnett, Andrew, Aorangi Station, Cave, Canterbury.
- Burnett, Donald, Sawdon Station, Burke's Pass, Canterbury.
- Cameron, Ewen, Pembroke, Lake Wanaka, Otago.
- Cameron, H. E., Longlip Station, North Otago.
- Challis, P. E., Parawa, Southland.
- Cockayne, L. Ph. D., Olivier's road, Christchurch, Canterbury.
- Daw, Fred., Miller's Flat, Otago.
- Dunbar, Peter, Waiatu Amuri, Marlborough.
- Faulks, J., Makarora Station, Lake Wanaka, Otago.
- Finlayson, Donald, Lochindorb Station, Papanui, Otago.
- Ford, W. N., Pembroke, Lake Wanaka, Otago.
- Foster, Reginald, Hasledon, Papanui, Christchurch, Canterbury.
- Gully, —, Acclimatisation Gardens, Nelson.
- Guthrie, Robt., Burke's Pass, Canterbury.
- Hassal, R. H., Benmore Station, Otago.
- Heckler, H. T., Stock Department, Lumsden, Southland.
- Hilgendorf, F. W., M.A., D.Sc., Agricultural College, Lincoln, Canterbury.
- Ironsides, John, Pembroke, Lake Wanaka, Otago.
- Jennings, E., Otago Museum, Dunedin.
- Kidson, Edward, Canterbury College, Christchurch, Canterbury.
- King, John H., Pembroke, Lake Wanaka, Otago.
- Lake, C. C., Olivier's road, Christchurch, Canterbury.
- Legg, W., Double Hill Station, Canterbury.
- McGregor, J., Burke's Pass, Canterbury.
- McIntosh, John, Burke's Pass, Canterbury.
- McKay, A. J., Geraldine, Canterbury.
- McKenzie, Hugh, Etowale Station, Nightcaps, Southland.
- McKenzie, Rodk., Blackmount, Southland.
- Morgan, Jno., Lake Coleridge Station, Canterbury.
- Rides, C. V., Acclimatisation Gardens, Christchurch, Canterbury.
- Rutherford, Geo., Dalethorpe, Russell's Flat, Canterbury.
- Scott, John, Bannockburn, via Cromwell, Otago.
- Smith, A. S., Fairlie, Canterbury.
- Sutherland, J., Benmore Station, Otago.
- Symons, C. W., Christchurch, Canterbury.
- Toms, Thomas, Richmond Station, Lake Tekapo, Canterbury.
- Hodkinson, H. E., Pukeuri Junction, Oamaru, Otago.
- Turton, J. G., Peel Forest, Canterbury.
- Urquhart, R., Algidus Station, Canterbury.
- Watherston, A., Rees Valley Station, Glenorchy Lake, Wakatipu, Otago.
- Wilson, A., Pembroke, Lake Wanaka, Otago.
- Wilson, Thomas, Alford Forest, Canterbury.

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(Concluded.)