

Mr J. Sutherland writes:—"In 1887 I was keeping a boundary where keas were numerous, and on several occasions I saw them attack sheep. I saw a sheep running down the hill with a kea hanging on. I followed after it, and found the sheep lying in the gully, with the kea tearing away at it. I drove it off. The sheep was not dead, but the wool and the skin was torn and a hole was made in the sheep's back, just above the kidneys, a wound from which it would have died; however, I killed it to put it out of pain."

Mr H. E. Cameron writes:—"One day while mustering in the summer time of 1895, I saw a kea on a sheep's back, clinging to the wool, and digging his beak into its back, and a number of others flying about. I went down to the sheep with some other men. Some entrails had been pulled through a hole in its back, and we had to kill the sheep."

"I was camped at the foot of Davies Saddle (Longslip Station) one foggy day, and at three o'clock heard a great screaming of keas, so I went out to see what they were at. On going down the creek a short distance, I saw a sheep coming down the face of the hill as fast as it could, with a kea on the hips, and twelve more birds following and screaming. The sheep when it got to the foot of the hill ran under a bank and went down on its knees, the kea picking away at its back and the others watching as if waiting for a feed."

"I went up to the sheep after throwing stones at the birds. When I got up to the sheep it had two holes in its back, the kidney fat had been eaten, but the kidneys were lying bare in the sheep. The entrails were pulled out through the hole in the back. The sheep was not dead, but had to be killed."

Mr J. H. Bond gives his experience while on the Mount Algidus Station:—"I saw a kea settle on a sheep and begin to tear away at its back, while I was within a few chains. The sheep bolted downhill into a gully and stood up to its belly in the snow at the bottom. From three or four chains off it looked to me as if the kea then drove its beak deep into the flesh; the sheep gave a big jump and stood still. When I went to examine the sheep, it had a bad wound just over the kidney, quite fresh in appearance."

Mr Hugh McKenzie writes:—"In 1884 on Lorne Peak Station, Wakatipu, in the month of July, there came a heavy fall of snow. One morning early, myself and two other men went out to look up the sheep; at 10 a.m. we sighted a mob."

"As we got within about a quarter of a mile of them, we could make out a number of keas flying about the sheep, making a great noise screeching. We at once hastened on to the sheep, which were stuck on a point of a spur about 3,000ft in altitude. At a distance of three to four hundred yards, we saw two sheep floundering in the snow with a kea perched on the rump of each sheep, and at work on the loins. These sheep would be distant from the mob about eighty yards, and fully twenty yards from each other. As we sighted them, however, notwithstanding our singing out, and hurrying up to the sheep, neither kea quit his position until we were within twenty yards of them. They, however, did not damage these sheep enough to cause death, as we came just in time."

Mr J. Morgan writes:—"In Mesopotamia Station, in July, 1905, one afternoon at 2 p.m., the kea settled on the snow alongside the sheep, and then hopped on to the sheep's back. The kea then started to pull a tuft of wool out above the ribs and then another, etc. Then it inserted its beak at this the sheep ran into the mob, and the kea just flew off, and when the sheep was quiet again, it once more got on to its back and started to use its beak again. At this the sheep plunged downhill into the snow. The kea went through the same performance again. All this occurred in-

side of five minutes. Of course we did not let the kea kill the sheep."

Mr A. S. Smith, of Fairlie, writes:—"The first occasion on which I actually saw a sheep killed, was one time while mustering. I noticed two sheep that had been passed some little distance, and while in the act of hunting a dog for the sheep, a kea flew down to the back of a sheep, which made headlong down the hill with the bird all the while on its back. After running some little distance, the beast stumbled and fell. Then the bird rose to its wings until the sheep got up, and continued its race downhill, evidently much terrified. The bird then flew on to the sheep's back again while it ran. This occurred, I should say, three or four times before the bottom of the gully was reached. When I went to investigate, I found the sheep not quite dead, but beating with evident pain, it would appear on account of a hole in its back, close up to the shoulder."

Mr A. Wilson, Pembroke, writes:—"I have seen them attack a sheep at midday, when it was quietly feeding, and it would rush away as fast as it could go, until it either tripped itself or fell down exhausted, when the kea that followed it would start picking the wool off the loins. I have followed sheep under these circumstances and found the keas picking them until I drove them away and set the sheep on to its feet again. I have also found sheep actually able to walk a little, even though they had portions of their intestines pulled out through the hole in the loins and hanging down their sides. These, of course, we killed."

Mr H. Heckler, of Lumsden, writes:—"I was keeping boundary up the Gladstone Gorge, after snow muster, and was gathering stragglers off the high country, when I ran across about twenty keas. Two of them were on a sheep's back. The balance were flying round him (a stray wether) making a terrible noise. The sheep was going at full speed down the spur. I watched him where he ran to, and followed him down for about three miles. When I got down, the sheep was dead, with two holes (one on each side of the backbone) in him, and most of the mob of keas were picking out the kidney fat. I crawled to the rock where the poor sheep was lying, and the keas were so busy at work, that I killed three with my stick."

Mr Andrew Waterston writes of his experience in 1904, as follows:—"I was looking out a mob of wethers, and found that the keas had been killing them, and there were eight dead. As it came on a dense fog, I had to return to my hut. Early on the following morning I went out to the wethers again. Arriving where the sheep were camped, some time before sunrise, I could hear the keas calling, and following up the sound, I got to where there were about forty of them."

"They had about three or four hundred wethers rounded up. The sheep were huddled close together, and the keas were flying over them and alighting on their backs. When the keas started to pick the back of the sheep, it would start to run round and round the mob; the kea would rise, but as soon as the sheep stopped, the bird was on its back again. This continued for a little time; the sheep apparently getting sulky, lay down with its neck stretched out and its lower jaw resting flat on the ground, when it showed no further resistance, but allowed the kea to pick away at its back. I never knew a sheep, after it once sulked, to show any further resistance. I shot nineteen keas and left the mob, but, on looking round, I found that they had killed thirty-eight wethers, most of them being quite warm and in splendid condition."

Many more such instances could be cited, but enough has been said to show the method and the results of the kea's attack on sheep.

(To be continued.)

#### THE KIDNEY THEORY.

It has always been supposed that the kea attacked the sheep for the sake of the kidneys, and the first man to dispute this, as far as I know, was Mr F. F. C. Huddleston. Dr. Alfred Russell Wallace, in his book entitled "Darwinism," after describing the method of the kea's attack, says:—"Since then it is stated that the bird actually burrows into the living sheep, eating its way down to the kidney, which form its special delicacy."

From the evidence of men who have seen many sheep killed and wounded by keas, this statement appears to be erroneous, and of the many correspondents that have communicated with me, only one states that the bird eats the kidneys, and later on the same writer says, "I have shot many keas by the dead sheep, and they vomited up fat."

It appears as if, even in this instance, the birds eat the fat rather than kidneys.

Mr T. Toms says: "I have not examined many sheep that have been killed by keas, but in the ones that I have examined, I have always found the same result; the fat has been torn away, and the kidneys left. Of course the kidneys have been found mangled, but they were not sufficiently torn to give the impression that the keas had been eating them."

In three other accounts, namely those of Messrs Donald Finlayson, H. E. Cameron, and C. W. Symonds, the fat was also eaten and the kidneys left exposed and untouched; now, if the kidney itself was a special delicacy, as Mr Wallace's book states, the keas, I think, would have eaten the kidneys as soon as they were exposed. Mr McKay, of Geraldine, had a Kea which would not touch sheep's kidneys. He says "I repeatedly tried him (the kea) with kidney fat and the kidneys themselves, but he would scarcely deign to put his beak into them."

One reason why people suppose the kea to be fond of kidneys, is that the keas nearly always attack the sheep on the loin just near these organs, and as they eat their way through the flesh and fat, people have jumped to the conclusion that they must be after the kidneys.

In looking through the authentic accounts of about fifty eye-witnesses, I cannot find any evidence to support the kidney theory.

The reason for the keas always tearing open the sheep above the kidneys, can be explained, I think, by the way the animal attacks sheep.

All my correspondents, with three exceptions, say that from what they have seen, the kea always settles on the rump.

Mr R. Guthrie (15) thinks that they only settle on the shoulders when the sheep is stuck in the snow, but I have an instance where the shoulders were eaten, and the sheep was not caught in the snow.

The reason for the keas always settling on the hindquarters are as follows:—

Firstly, the rump of the sheep is its widest part, and so it makes a firm platform for the kea to settle on and to get a firm hold.

Several witnesses say that it is almost impossible for the kea to keep on the sheep's back unless he perches on this part.

Mr Guthrie (15) says:—"It is almost impossible for a kea to stick on a sheep's back, while pecking it, in any other position than behind the kidneys facing the head. I have seen them trying to hang on to a sheep's back, but unless they were in the position described, they could not stick on for ten yards."

Secondly, When flying after a sheep, the rump is the nearest and handiest part to settle on, and as the birds often have to alight on the sheep while it is running, it is no wonder that the rump is that part chosen. Though keas seem fond of mutton fat, I do not consider that this is the only reason why they make for the loin.

It naturally follows that when perched on the sheep's hindquarters, the bird will commence to pick the sheep's back at the handiest part, this without doubt, will be the part that is under the kea's nose, namely the loin.

Again, the loin is very easy to tear open, owing to the absence of ribs, and this again would commend itself to the bird.

To me it seems that the preceding reasons do more to influence the kea when attacking than the presence of the kidney fat. Even the first recorded accounts of sheep-killing mention that the bird attacked the loin, and the only way to explain this, is that the kea found the loin the easiest and handiest part of attack. I can hardly believe, as some people do, that by some kind of instinct, the kea knew where the kidney fat was to be found in the live sheep. This latter idea is somewhat upset by the fact that cases have been seen where the flesh around the backbone has been eaten, and the kidney and the kidney fat left almost untouched.

The kea appears to eat whatever part of the sheep that comes first; first the skin and flesh, then on to the kidney fat. In some cases they do not even eat all the kidney fat, but begin to pull out the intestines, and several sheep have been found alive with these organs protruding.

Mr A. Wilson (11) says:—"One day I came suddenly upon two or three keas busy picking at the loin of what I supposed to be a dead sheep. There was a hole right through the sheep's back, and the birds were putting their heads right through to the inside of the sheep and pulling out portions of the intestine, but I cannot say if they eat them or not. I then went over, and to my surprise, I found that the sheep was not dead, so I killed it to put it out of pain."

It is evident that these birds do not mind what part they attack as long as they get something to eat, and when a sheep is buried in the snow, they go for the handiest part.

Mr E. Cameron (4) says:—"A snow-slip carried some sheep with it. I found the sheep stuck in the snow, where it landed, still alive, with its leg eaten to the bone and half a dozen keas tearing away at him."

I think that the theory about the bird killing the sheep for the kidney alone, is entirely wrong, and I doubt very much if the kidneys are in any way the source of attraction. The birds certainly do not leave the sheep to die a lingering death while their hunger is unappeased, unless they are disturbed.

As to the kidney fat theory, though this has some evidence to support it, I think that it is mostly because these parts are easiest to get at. The very fact that the keas eat all parts of a carcass, except the wool and bones, rather weakens this theory.

#### HOW THE HABIT WAS ACQUIRED.

We now come to the interesting question as to how the kea acquired the habit of killing sheep and eating the carcasses.

This can never be completely answered, but there are several theories, which are well worth considering, as they throw a certain amount of light on the reasons for the bird's change of diet.

1. The "Vegetable Sheep" Theory, is certainly the most popular, though it has very little to recommend it. The supporters of this theory suppose that the kea had been in the habit of tearing open the "Vegetable sheep," *Haastia pulvinaris* and *Raoulia eximia*, in search of grubs which are supposed to

live in these peculiar plants. They are found especially in the northern half of the middle island at an altitude of from 4600 to 6000ft, and in external appearance they somewhat resemble a sheep, growing as they do, in the form of cushions often as large as sofas, and the whole surface having a woolly appearance. It is supposed that when the sheep first wandered into the kea's domains, the birds mistook them for the woolly-like plants, and with the idea of digging out the grubs, they began to tear open the skin of the sheep. In this way the keas are supposed to have acquired the method of killing the sheep and eating the flesh.

This all sounds very feasible, but on further investigation, it is found that the true facts do not support the theory.

Firstly, Where the keas were first known to attack sheep, namely around Lake Wanaka, the "Vegetable sheep" do not, according to Dr Cockayne, grow to such a size that they might be mistaken for sheep; in fact, *Raoulia eximia* does not occur there at all, and many mosses, etc., are often as conspicuous as the Otago species of *Raoulia*. The true "Vegetable sheep" *Haastia pulvinaris*, does not even come as far south as Canterbury, and *Raoulia eximia* does not go further south than Mt. Ida in Central Otago, its only known Otago habitat. Therefore it appears, that where the kea first acquired the habit of killing sheep, the

"Vegetable sheep" is practically unknown.

Secondly, I have never found any grubs in the "Vegetable sheep," though I have pulled many up, and I have read and heard of no one who has seen grubs in these plants, of such a size or numerous though, to attract the kea.

The only supposed reference that I can find is in an article by the Hon. Dr. Menzies, M.L.C., in 1878. He says:—"They suppose that these birds (keas), formerly fed chiefly on berries and the large white grubs abounding in the mossy vegetation on the hills."

Whether Dr. Menzies or the shepherds from whom he received his information, mistook the "Vegetable sheep" for a lichen or moss, as many people do, I cannot say.

Thirdly, When the keas first attacked sheep, and up to the present day, they seemed to confine their attacks to the shoulder or rump, the latter in preference. Now if the keas were in the first instance looking for grubs, then they would almost be sure to work right along the length of the back, but in the accounts that I have seen, this is certainly not the case.

Fourthly, If the keas feed on these grubs that are supposed to live in the "Vegetable sheep," one would expect to hear of the plant being found in a partly torn up condition. However, I can find no instance of the plants being seen in this condition, and though I have been upon the ranges where the keas and "Vegetable sheep" are both numerous, I have always found the plants intact.

It seems to me that unless further evidence is forthcoming to support this theory, it must be left out of consideration.

2. The Curiosity Theory. Some writers think that it is nothing but the kea's insatiable curiosity and destructiveness that has got the bird into the habit of sheep killing.

Taking into account the bird's love of investigating anything that is at all strange, it is suggested that when the sheep first appeared in the bird's domains, they became at once the centre of attraction. The keas, would, no doubt, walk round the sheep and inspect it, and finally hop on to the animal's back. When the sheep commenced to run, the bird would most likely fall off, but by repeated attempts, it would at last find the way to hold on. Once on the sheep's back, the kea most naturally would begin to pull out the wool, and finally find his way down to the flesh.

In this way, he would soon find out how to get food from a living sheep.

Again, if a number of sheep were half buried in the snow, their position would be quite strange enough to attract the keas, and with their natural love of tearing, they would soon find their way to the animal's flesh.

It seems to me, that this theory has very much in its favour, and may account, to some extent, for the bird's change of diet.

3. The Hunger Theory. The supporters of this theory, suggest that it was the lack of ordinary food that caused the kea to attack sheep.

They say that when the ground was covered with snow and frozen hard, the birds would have a difficulty in finding sufficient food.

Being pressed by hunger, they would visit the meat gullies at the homesteads and feed on meat, skins, offal, etc., and in this way, they would soon acquire a liking for meat. Having once acquired the taste, they would next take to eating dead sheep or dead sheep caught in the snow, and finally take to tackling the live animals.

4. The Maggot Theory. This is a slight modification of the hunger theory, and was first suggested by Dr. Menzies in 1878. He says:—"They suppose that these birds formerly fed chiefly on berries and the large white grubs abounding in mossy vegetation on the hills, and after the country was stocked, they first, by feeding on maggots and insects on dead sheep, and afterwards on dead animals, acquired, not only the taste for meat, but also a discrimination of the choice parts. By and by, they attacked living sheep, and their upper mandible enabled them quickly to tear open the skin."

Reischek, in 1885, supports this theory, and says:—"My opinion is that these birds became carnivorous through being numerous when sheep were introduced, and feeding on maggots which soon appear on carcasses of sheep dying on the runs, and have thus probably acquired such a liking for the fatty matter, that it has emboldened them to attack live sheep."

This theory seems to have much in favour of it, especially when we remember that the kea is naturally insectivorous. Again, the very fact that the birds seem fond of dead carcasses rather supports this theory.

It is of course impossible to say which theory is nearest the truth, but I think that there is no doubt that the main factors that caused the keas to change their diet and become birds of prey are expressed in the last three theories.

#### THE TIME OF ATTACK.

It would be unwise to say in what month of the year the keas are most destructive to the flocks, because all the sheep that are killed, are not found, and naturally when musters are out on the ranges, they will see more results of the kea's work than when they remain on the homestead.

From the records that I have received, they seem to attack mostly in the winter and the spring, and frequently at mid-summer. There are several reasons which may account for their attacking in winter.

Firstly, When the ground is covered with snow, or frozen hard, the birds will have much difficulty in finding sufficient food, and hunger, no doubt, would make them ferocious.

Secondly, The sheep are made an easier prey owing to the depth of the snow, and often they are buried in it, so as to be almost unable to move, and so would give the birds very little trouble.

In early spring the climatic conditions, are, if anything, intensified, and the ordinary food is scarcer still. Besides it is the kea's nesting time, and the extra work of sitting, and the feeding of the young birds, would make the parents more hungry and daring.