

bed dry, exposing a number of trees, many of them being of large size. At various points, both in the dry bed of the lake, from which I send shells, and beyond its limits close to the hills, I have found Moa bones, the greater number in an advanced state of decomposition. At 4 and 5 were found parts of a foot with toe bones and a small tarsus, all of which I forward with this paper, and have marked them all with numbers to correspond with those which indicate on the map the places where they were found. So far as I have been able to discover, without making any very extended search, the Moa-hunters do not seem to have inhabited this part of the coast, or if they did, they were probably Maoris, such as now inhabit New Zealand, all the stone axes, etc., which I have found near their ovens and camping-places being similar to those in use amongst them up to the time when they became acquainted with the use of iron tools. No doubt there have been plenty of Moas about here at some time, but whether they lived here at the same time as the Maoris does not seem clear. I am, however, unable to agree with Mr. Booth and Dr. Haast in thinking that they have been extinct for thousands or even for hundreds of years; and I would direct particular attention to the state of preservation in which the tarsi, which accompany this paper, have been found. They were all obtained on the surface, exposed to wind and sun and rain, and would long ago have turned to dust had the date of the bird's extinction been so remote. I think Mr. Booth is right enough in saying that we know just three things about the Moa, namely, that it has lived in New Zealand, that it does not live in it now, and that it could not live in it now.

ART. V.—*Notes on Moa Caves, etc., in the Wakatipu District.*

By TAYLOR WHITE, ESQ. (communicated by Captain HUTTON).

[Read before the Otago Institute, 24th August, 1875.]

Cave near Mount Nicholas.

THIS cave is situated on the south side of Lake Wakatipu, two miles east of the Von River, in a small conical hill about a quarter-of-a-mile from the Lake. There is a tolerably steep rise, covered with long fern, to the entrance of the cave, which is in the overhanging face of a mica schist rock.

The entrance is about sixteen feet high, and ten feet broad, from which it narrows, both in height and width, to five feet. The top meeting the

bottom at the end of the cave. The estimated length of the cave is forty feet.

The floor consisted of a fine powdered rock, which was encrusted to a depth of two inches with rectangular crystals of a clear salt* resembling saltpetre. Some of this, or a similar substance, was found in pieces two inches long by one deep. The depth of the sand was nine inches.

Below this was a coarser formation of small flakes of schist, which extended to a depth of two feet six inches. The next stratum was composed of still coarser material, with broken blocks of schist through it. The depth of this was not tried.

The only trace of water was a slight drip on the left side near the entrance. In places the roof was encrusted with a thin covering of a white substance† which, probably, damp had caused to exude from the rock.‡

No traces of animal life were found lower than about six inches from the surface, except at the entrance end, where the material appeared to consist of animal and vegetable matter, which had drifted down from the other parts of the floor, which had a steep incline from the entrance inwards.

Thirty feet from the entrance, in the two-inch crust, a small quantity of double-shafted feathers, of a greyish-brown colour, and three inches long, were obtained. They were scattered separately through the sand. The height of the cave at this place was about three and a-half feet, and the width six feet.

Further in was a small collection of short sticks, fern, and broom, which might be the remains of a nest. Here the feathers were scarcer, and a *metatarsus* was found in good preservation which measured 8 inches in length, $6\frac{7}{8}$ girth at proximal end, $3\frac{7}{8}$ at thinnest part, and $8\frac{1}{4}$ girth at distal end;‡ also portions of egg-shell of a green colour, which appeared to be parts of a large egg, probably that of a large duck.

In both of these places feathers of different birds were found, the greater number belonging to the Paroquet (*Platycercus*). These appeared to be generally nearer to the surface than those first mentioned.

Close to the end of the cave were found a fibula, measuring $11\frac{1}{8}$ in length, and $4\frac{7}{8}$ girth at the proximal end, and several vertebræ, and a portion of an upper mandible. All of these belonged most likely to the same bird.

* Sulphate of soda, or Glauber's salt.—J. G. B.

† Gypsum.—J. G. B.

‡ *D. casuarinus*.—F. W. H.

There were also bones of other kinds of birds, some of which were very delicate, together with a considerable number of pieces of egg-shell. These were white, and might belong to a duck, but no feathers of this bird were found.

Excrement of a large bird was also found, which extended to a greater depth than the feathers. Some of this consisted of undigested fragments of what looked like the stalk of the fern.

Cave near Queenstown.

This cave is situated about a mile from Queenstown, in the range of hills on the south of the Gorge-road, and immediately above Jack's public-house.

The entrance is difficult of access, the hill being almost perpendicular below it. It is fourteen feet high, by five feet wide. The floor, for the first ten feet, is level, and consists of fine mica sand to a depth of two feet, below which come blocks of schist, intermixed with finer material. The floor then has a steep descent for about sixty feet, and consists of very large schist blocks, intermixed with smaller. The average height is from six to eight feet, and the average width six feet. The roof had in places a thin white incrustation, but the other no sign of water drip.

At the junction of the sand and schist blocks, at the commencement of the descent, a quantity of double-shafted feathers of a brown colour, and with light-coloured down near the tube, were found, together with quill feathers of small birds—Paroquet, Lark, etc. These were most plentiful at a depth of a foot below the surface, but were also found at a depth of four inches. Some were immediately under large schist blocks. They appeared to be chiefly in a layer of hard-trodden excrement.

Perfect droppings were also found in the sand, and a few specimens of a similar outward appearance, contained undigested vegetable fragments, some of which seemed to be branches and stalks of fern broken into short pieces of three-quarters of an inch in length. No bones were found with them.

To the left of the mouth of the cave, and slightly higher up the hill, at a distance of about 200 feet, was a crevice of an angular form, about five feet wide and fifteen deep, which had been made by a forward slip of a portion of the hill.

In this Mr. Russell, of the American Transit of Venus Expedition, found bones belonging to a very large bird,* also bones of several smaller varieties, and a portion of a large egg. The birds must have fallen or slipped in while examining its capabilities as a nesting place.

* *D. robustus*.—F. W. H.

Dimensions of Moa Bones from Drift at Owen's Punt, Kawaru River.

No. 1.

	Length.	Girth.			
		Proximal.	Middle.	Distal.	
Tibia	29 $\frac{3}{4}$	18 $\frac{3}{4}$	6	15 $\frac{3}{8}$ *	
Fibula	18	7 $\frac{7}{8}$	...	...	Originally larger.
Metatarsus	15 $\frac{7}{8}$	13 $\frac{3}{8}$	5 $\frac{3}{4}$	15 $\frac{7}{8}$ *	
Phalanx	3 $\frac{1}{2}$	6 $\frac{1}{2}$	3 $\frac{3}{8}$	5 $\frac{1}{8}$	

These were dug out of a perpendicular wall of sand, thirty feet high, and were eight feet from the surface. A corresponding Tibia and Metatarsus were found in the creek drift. Both Tibia were broken by a clean fracture in the centre length.

No. 2.

	Length.	Girth.			
		Proximal.	Middle.	Distal.	
Right femur .....	...	...	...	...
Left ,,	11 $\frac{3}{4}$	12 $\frac{1}{8}$	5 $\frac{3}{4}$	14 †	
Tibia.....	21 $\frac{3}{8}$	12 $\frac{3}{4}$	4 $\frac{3}{4}$	11 $\frac{3}{4}$ †	
Fibula	13 $\frac{1}{4}$	5 $\frac{7}{8}$	...	...	Originally larger.

Found ten feet below the surface, Tibia damaged at the proximal end.

No. 3.

	Length.	Girth.			
		Proximal.	Middle.	Distal.	
Left femur	12 $\frac{1}{2}$	12 $\frac{3}{4}$	5 $\frac{7}{8}$	14 $\frac{3}{4}$	
Right ,,	13	14	6 $\frac{1}{2}$	14	dmgd. at prox. end
Left Metatarsus ...	9 $\frac{1}{8}$	10 $\frac{1}{8}$	5 $\frac{3}{4}$	13 †	,, slightly.
,, ...	11 $\frac{3}{8}$	6 $\frac{1}{4}$	4 $\frac{1}{4}$	11 $\frac{1}{8}$ †	,, ,,

Found in the creek bed.

Singular places in which Moa Bones were found.

Above the saddle between Mount Rosa and the spur leading to the bluff on the Kawaru River is a slight hollow of an oval form, about 60 feet wide, and surrounded on all sides but that facing the hill by a wall of rock eight feet high, which had the appearance of being in blocks, a number of which had fallen inwards, causing several crevices to be formed between them and the rock. At the bottom of the largest of these, where the rock was slightly overhanging and the front block sloped steeply downwards towards the rock, making a wedge-formed bottom at a depth of six feet and a width at top of five feet, with a length of nine feet, the length at bottom being only five feet, a number of bones belonging to at least four Moas were found.

* *D. ingens.*

† *D. struthoides.*

‡ *D. elephantopus.*—F. W. H.

Also, at a distance of 100 yards from this place, where the rock cropped out in the form of a step, there was a hollow in the rock four feet deep, eight feet long, and four feet wide, slightly wider at the bottom, from the rock overhanging. In the centre of the bottom of this was a large block of stone on edge, heavier than a man could move in such a small space. Around this block, and apparently under it, were bones of a large Moa, the majority of which were not obtained on account of the narrowness of the space.

Dried Specimen of a supposed Maori Rat.

This was found in a hollow under an overhanging rock. Buried in the sand was a spherical nest of grass and plants, in which was a perfectly mummified rat, without the hair. The hair was lying by the side, and was of a yellowish-red colour.

Either the skull was lying separate from the body, or there was the skull of another in the nest; I think the latter must have been the case. I put the skull in a match-box and the skin in my pocket, out of which it unfortunately dropped.

In the nest, or in the sand covering, were several feathers of the Kiwi.

At another place of a similar description, in what appeared to have been a hawk's nest, I got some hair, which I thought similar to that first found, and which I had lost.

The body was two-thirds the size of the common rat, a dried specimen of which I happened to have found and examined a short time previously.

Notes by F. W. Hutton.

The green egg-shell, from the cave at Mount Nicholas, proves, on microscopical examination, to have the true *Dinornis* structure. It is of a rather pale sea-green colour, smooth, but not polished, and covered with irregularly placed shallow rounded pits. The thickness of the shell is 0.04-inch, and the diameter of the egg appears to have been about four inches. The white egg-shell obtained from the same cave also belongs to the Moa. The feathers from this cave are not very well preserved. Most of them are pale yellow-brown, margined with darker, while a few were dark brown. The largest is six and a-half inches. The feathers from the cave near Queenstown are in an excellent state of preservation, much better than any previously obtained, and many have both shafts quite complete. The after shaft is much more slender than the true shaft; but often nearly as long; the barbs gradually get more distant from one another towards the apex, and they are generally opposite on each side of the shaft. I saw no sign in any of the feathers of the barbs near the base being in groups of four or five as described by Mr. Dallas in the "Ann. Natural

History," 3rd series, c. 16, p. 66, in the feathers of *D. robustus*. There are no barbules on the barbs near the apex of the feather, and the shaft is not produced beyond the barbs. In colour these feathers are reddish-brown, with a central longitudinal dash of dark brown towards the apex of the shaft. The down is brownish white.

These two caves, therefore, have furnished two new kind of Moa feathers, making three distinct kinds that are now known. The green egg-shell is also quite a new type, approaching that of the Cassowary.

With regard to the Rat; the fur is exactly similar in colour to that of a specimen in the Otago Museum, locality unknown, which is certainly only a variety of *Mus decumanus*, but the skull obtained by Mr. White is much smaller than that of any rat that I have seen.

ART. VI.—*Extracts from a Letter from F. E. MANING, Esq., relative to the Extinction of the Moa.* [Communicated by T. KIRK, F.L.S.]

[Read before the Wellington Philosophical Society, 4th October, 1875.]

1. The Moas still existed in great numbers when the first Maori colonists arrived here.

2. They were called Moa because the Maoris were acquainted, either by experience or tradition, with other large birds, which they called by the same name.

3. There was little or no excitement in hunting the Moa, except such as a hungry man feels when hunting for a dinner.

4. They were most stupid and sluggish birds; and they were destroyed wholesale, by setting the grass and scrub on fire, and would quietly allow themselves to be roasted alive without moving. The natives killed in this way vast numbers more than they could use, or even could find, when the fire spread to great distances.

5. One unusually dry summer, a Maori hunter set fire to the scrub, and it caused such destruction amongst the Moas, that from that time forward they were so scarce as not to be worth the trouble of hunting, and soon became extinct.

6. The natives have a saying, "as inert (ngoikae) as a Moa."

7. Periodically (I suppose once a year) the Moas threw off their sluggishness, and fought with great fierceness, when the Maoris took advantage of their disabled condition.

8. When the Maoris first came into the northern part of the North Island, where the Moa was comparatively scarce, they soon found that,