SHORT NOTE

Subfossil kakapo (*Strigops habroptilus*) remains from near Gibraltar Rock, Cromwell Gorge, Central Otago, New Zealand

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Subfossil bones show that, before the arrival of humans in New Zealand, kakapo *(Strigops habroptilus)* were common across North and South Islands, and were most common in high rainfall areas west of the main divide where rimu *(Dacrydium cupressinum)* and beech *(Nothofagus* sp.*)* dominated the forest canopies (Worthy & Holdaway 2002). However, there is a notable absence of kakapo remains from subfossil deposits in the dryland regions of Central Otago and the Canterbury Plains (Worthy & Holdaway 2002). This does not appear to be due to lack of subfossil sites, as, although there are few sites suitable for accumulation and preservation of bird bones on the Canterbury Plains, 32 bird species have been collected from numerous sites throughout Central Otago (Worthy 1998; Wood unpubl.). Nor does the absence appear to be a result of the type of subfossil sites present in these regions; the most diverse avifaunal assemblage from Central Otago consists of at least 18 species collected from Earnscleugh Cave, near Alexandra (Worthy 1998). Kakapo are not yet recognised in this assemblage, although their bones are abundant in other New Zealand cave deposits such as those from Waitomo (Millener 1981), Takaka Hill (Worthy & Holdaway 1994) and West Coast (Worthy & Holdaway 1993). This note describes the first verified kakapo remains recorded from the Central Otago region, and material associated with these remains.

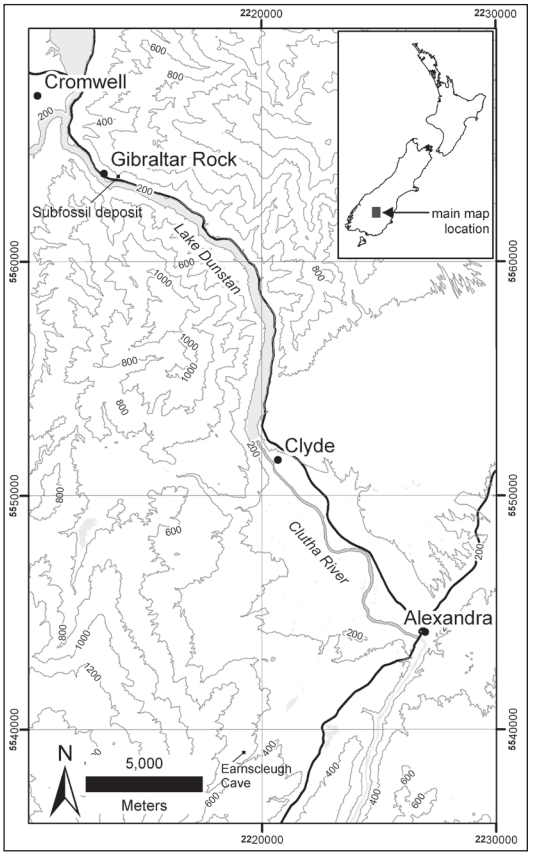

Figure 1 The location of the Gibraltar Rock subfossil deposit, Central Otago, New Zealand.

During the 1970s and 1980s, State Highway 6 linking Clyde and Cromwell was reconstructed at a higher elevation, before the old road was submerged by the filling of Lake Dunstan for the Clutha Valley hydroelectric scheme. Earthworks during road construction uncovered several deposits of subfossil bones. Two of the earlier discoveries, the first near Firewood Creek on 13 June 1979, and the second near the Cromwell railway station in February 1981, were described by Ritchie (1982). A third discovery was made in early 1987. While removing landslide debris from a slope 600m downstream from Gibraltar Rock (Fig. 1), a construction worker uncovered a deposit of plant material and bird remains. Jeff Bryant, an engineering geologist at Ministry of Works and Development, arranged for material to be collected from the site before earthworks proceeded. The discovery was reported in local newspapers (*Southland Times* 1987; *Otago Daily Times* 1987) and on radio news (J. Bryant pers. comm.). Newspaper reports indicate that remains of moa, tuatara (*Sphenodon punctatus*), kakapo and takahe (*Porphyrio mantelli*) were discovered at the site (*Southland Times* 1987). Unfortunately the current location of the collected faunal material remains a mystery. A dried foot of a kakapo, photographed by the *Southland Times* (1987), was collected from the site, but has since been lost (J. Bryant pers. comm.).

Geologist Roydon Thomson, who visited the site soon after its discovery, recorded the exact location of the deposit as 2214140 / 5563750 (NZMG coordinates) at an altitude of 240 m.a.s.l. (R. Thomson pers. comm.). The deposit is reported to have been 14m below the original ground

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surface (*Southland Times* 1987), probably in a small cave within the rocky landslide deposit, the entrance of which may have been covered by subsequent landslides.

In April 2005, I examined plant material labeled as a 'native eagle's nest, or moa nest', (ALEX 05.16.01), that had recently been gifted to the Alexandra Historical Museum from a private collection. Information associated with the plant material indicated that it had been collected from near Gibraltar Point *c.*1990. Feathers amongst the plant material were identified as kakapo, so it seems likely that this is a sample of material collected from the Gibraltar Rock deposit.

The sample was examined for faunal remains. The most common items present were kakapo feathers, including faded green and brown contour, wing and tail feathers (Fig. 2), and brown and white facial feathers. The only other feather in the sample was a red facial feather of a parakeet (*Cyanoramphus* sp.). Three small fragments of moa eggshell were identified, together with three fragments of thin white eggshell. The fine-granular texture of this thin eggshell is consistent with eggshell of kakapo (Higgins 1999). Two lizard dentaries, and two rabbit bones were also present in the sample. Takahe remains were reported to have been found in the Gibraltar Rock deposit (*Southland Times* 1987); this cannot be verified at present as no takahe remains were present in the sample analysed.

Kakapo coprolites found within the deposit contain primarily moss leaves and stems, with lesser amounts of grass and dicotyledonous (*cf. Muehlenbeckia*) leaf cuticle.

The plant material from the Gibraltar Rock deposit appears to have been deposited as a nest. Although no nest structure remains, the bulk of the material is finely chewed bark resembling that chewed by a Psittaciforme (Fig. 3). Kakapo typically nest in natural cavities at, or below, ground level (Higgins 1999). Items identified in the Alexandra Museum sample represent an open woodland habitat and include seeds of *Muehlenbeckia australis, Pittosporum tenuifolium, Coprosma* sp.*, Pseudopanax ferox, Myrsine* sp. *cf. nummularia, Carmichaelia* sp. *cf. nana, Rubus cissoides*, *Acaena sp., Centipeda* sp.; woody remains of *Muehlenbeckia* sp. and lacebark (*Hoheria* sp.), and fragments of moss.

An AMS age of 2482 ± 35 years B.P. (Wk17228) was obtained for one of the kakapo feathers. This contrasts with a previously reported age for the site of 9500 years (*Southland Times* 1987). No official records of this earlier age seem to exist, so the actual material which was dated cannot be determined. The late Holocene age is more consistent with ages obtained for other cave and rockshelter deposits in the Central Otago region (Worthy 1998; Wood unpubl.).

Two tentative subfossil records of kakapo from Central Otago await further examination. A small collection of bones labeled as originating from Earnscleugh Cave are present in the collections of the Natural History Museum, London.

Figure 2 Kakapo feathers found amongst nesting material near Gibraltar Rock, Cromwell Gorge (Alexandra Museum 05.16.01). Scale bar in cm.

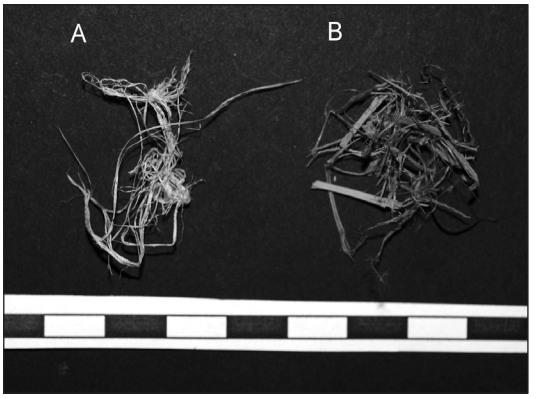

Figure 3 Comparison of A: modern bark from a lacebark *(Hoheria sp.)* after chewing by a Psittaciforme *(Cyanoramphus novaezelandiae)*; with B: inferred kakapo nest material from the Gibraltar Rock subfossil deposit, Cromwell Gorge (Alexandra Museum 05.16.01) (right). Scale bar in cm.

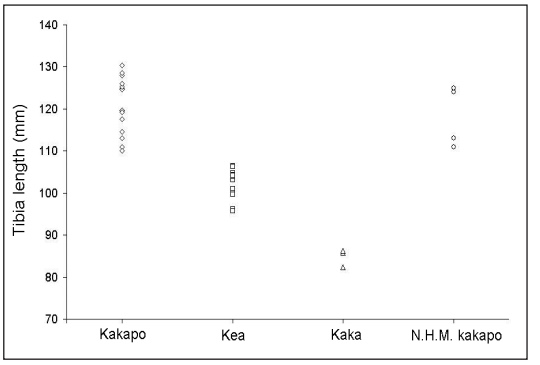

Figure 4 Tibiae lengths of kakapo (Otago Museum AV1523; AV1525; AV1561; AV1562; AV7152), kea (*Nestor notabilis*) (Otago Museum AV1634 - AV1638; AV893 - AV896) and kaka (*Nestor meridionalis*) (Otago Museum AV2231; AV2232) compared with kakapo tibiae labeled as originating from Earnscleugh Cave (Natural History Museum, London, R70-74).

However, four of the 10 species represented, including kakapo, have not been recorded in other collections from the cave (Worthy 1998). Analysis of photographs and measurements of the bones indicate they are correctly identified (Fig. 4), however closer examination of the bones is required to determine whether their origin is likely to have been Earnscleugh Cave, or if they have been mislabeled.

The only other record of kakapo from Central Otago is three coprolites from a cave on Old Man Range (Otago Museum, AV10436). However, the size and shape of these coprolites suggest they are likely to be from an upland moa (*Megalapteryx didinus*). Feathers and coprolites from this moa species are common in caves and rockshelters throughout the region.

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SHORT NOTE

Kakapo in Maori lore

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In Maori lore, there is an old story about the kakapo that has survived the test of time. Legend has it that toroa, the great ocean wandering albatross, was once a land bird but, because of its brilliant white plumage, it was conspicuous and vulnerable on land. So it swapped places with the kakapo, which was once a seabird, and soared out to sea, its markings blending beautifully with the foaming white crests of the southern ocean swells. Meanwhile, the kakapo vanished into the twilight forests of Aotearoa, its mossy green plumage perfect camouflage for its new home. Until the arrival of humans, it had few natural enemies. It was so safe in the depths of the bush, it eventually lost its ability to fly. Its greatest defence was its colour, nocturnal habits, and instinct to freeze rather than flee.

This survival strategy served it well until the arrival of the Polynesian kuri (dog) that relied on scent rather than sight to flush out game. Kakapo were sitting ducks, so to speak. And kuri grew fat on kakapo when an iwi settled in a new area.

The kakapo is one of a number of native New Zealand birds regarded as taonga (treasured) species to the Ngai Tahu iwi. It was hunted for its meat, skin and feathers.The meat was a great delicacy for tangata whenua, but it had a "strong and slightly stringent flavour", according to western tastes. The bird was plucked and skinned before eating. Some were preserved in their own fat in baskets made from the inner bark of totara trees or in poha (bags) made from kelp. Bundles of kakapo tail feathers were attached to these containers for decoration and to identify the contents.

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