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SHORT NOTES

Breeding of Great Spotted Kiwis in captivity

Before 1985, Great Spotted Kiwis (*Apteryx haastii*) had laid in captivity at the National Wildlife Centre, Mount Bruce, Wairarapa, and at the Otorohanga Zoological Society's aviary, but none of the eggs had hatched successfully. When I arrived in December 1984, the National Wildlife Centre had one pair of Great Spotted Kiwis. Both birds were from the Greymouth area, being of unknown age and victims of gin-trap injuries. The female arrived at the Centre in June 1974 suffering from an injured toe, which healed. The male arrived in 1983. He had two toes missing from his left foot, although this did not appear to handicap his movements.

These two birds were put together in June 1983 in a pen of about 200 m² of forest consisting of tawa (*Beilschmiedia tawa*), kamahi (*Weinmannia racemosa*) and tree-fern (*Cyathea dealbata* and *Dicksonia squarrosa*). The pen was on flat ground and included three artificial burrows. The kiwis were given a diet of 200 g per bird per night of a mixture of water-soaked rolled oats, wheatgerm, multivitamin/mineral supplements, and minced ox heart. In addition, they often ate natural food they found in the enclosure.

During each of the two subsequent breeding seasons they produced an egg but broke it. Their first egg was laid in November 1983, and the two birds were seen together during the day in the nest burrow before the

was broken after two weeks. The second egg was laid in October 1984, but it was punctured by a claw. I believe that these breakages occurred because the birds had been disturbed during the day to check the egg's progress. Similarly, a pair of North Island Brown Kiwis (*A. australis manuelli*) at the Centre broke their egg when disturbed.

From September 1985, the Great Spotted Kiwis were not disturbed by day; the contents of their burrows were checked only at night, and only when both birds were out. During November the kiwis prepared a nest in a previously unused burrow, in which I had put bits of *Dicksonia squarrosa* fronds, by forming a bowl in the soil and flattening the fern fronds. They also began eating more of the supplied food. Some time between 22 December and 4 January an egg (white with green gloss) was laid. The male incubated by day, but seemed to be out foraging alone at night. To distinguish between the two birds at night, by day I put reflective tape on the female's leg band. After this disturbance she spent each day in the nest burrow with the male. I could then confirm that, after an hour of darkness, the male was the bird out foraging.

To get more detailed information, I set up in front of the burrow entrance a video nest monitor with a passive infrared movement detector and date/time inset. Thus, whenever a kiwi moved near the burrow, it was recorded on tape for up to 1 minute. I found that the female left the nest at dusk and fed for an hour or two. She then returned to the nest, where there would be much snorting and grunting for 20-50 minutes, before the male left. These sounds were also heard throughout the breeding season whenever the pair came together while foraging, when they would also touch and rub each other with their bills.

Whenever the kiwis left the nest they tossed sticks back at the entrance, but without covering or camouflaging the entrance. The female was inside the nest burrow usually for 4 hours every night. I did not look into the burrow when a bird was inside and so do not know whether the female covered the egg with her body. When the female left the nest, the male usually returned to the nest within 10 minutes. The male then incubated for the rest of the night, and the female returned to the burrow at about dawn.

The egg was removed on 23 February because a nocturnal house was being built beside the kiwi pen and the kiwis would probably break or abandon the egg. The egg was put in a still-air incubator at 34.5 °C and 80-90% humidity. The egg was beginning to pip, but it progressed little for 8 days.

Then on 2 March the chick became very active, pecking the shell at a different site and pushing with its feet. However, the chick was oriented incorrectly. Its feet were positioned wrongly and so it hatched feet first, through the smaller end. The incubation period had been a minimum of 57 and a maximum of 71 days. The chick's legs were splayed, but this was remedied by tying them together and sitting the chick in a cradle for about 10 days. During this time it was hand fed and had its legs exercised every few hours. After this setback, the chick progressed well and became nocturnal at 6 weeks of age.

In August 1986, the pair was moved to an enclosure of about 2000 m², consisting of half tawa, kamahi and tree-fern forest and half grass, and containing two artificial burrows. The birds soon dug two burrows into a bank. They ate little of the supplied food, presumably finding enough naturally. By October, they had built a nest of dry grass in a roost box. On 20 October, I could hear grunting and snorting from the box all morning, and that evening a newly laid egg was present. The next night the egg was being incubated and I did not check it again until it was removed. The pair's nesting behaviour was the same as in the previous season, although the female roosted in a natural burrow by day.

The egg was removed on 30 December. Its shell was thin and had cracked on the bottom. Although extra calcium had been added to the supplied food, a thin-shelled egg was laid, presumably because the female preferred to eat natural food. The chick hatched within 24 hours of pipping on 1 January 1987, 73 days after the egg was laid. It was a healthy, normal chick.

I had not heard before of female kiwis helping to care for eggs during incubation. Unfortunately, I could not tell whether the female Great Spotted Kiwi actually *incubated* the egg or not. I could not catch her in 1985 to see whether she had a brood patch because she roosted in a very long burrow. In 1986, A. Sturmer and A. Grant (pers. comm.) saw a female Stewart Island Brown Kiwi (*A. australis lawryi*) in a nest in southern Stewart Island and M. Potter (pers. comm.) saw female North Island Brown Kiwis (*A. a. mantelli*) in nests at Tangiteroria, near Whangarei. These observations show that female kiwis may have some part in egg care. We still do not know, however, whether the female incubates the egg.

The incubation period of the Great Spotted Kiwi does not seem to differ much from that of the North Island Brown Kiwi. B. Rowe (pers. comm.) found that the incubation period of the North Island Brown Kiwi was on average 71 days but may be as long as 91 days.

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Female kiwis incubating

On 27 November 1986 at about 1700, we heard a male Stewart Island Brown Kiwi (*Apteryx australis lawryi*) calling in the podocarp-kamahahi forest along the banks of the Robertson River, southern Stewart Island (grid ref. 21136 53275). We watched it from about 10 metres away as it foraged among ferns, after which it disappeared into the base of an old stump. Under the stump we found a small burrow and, by torch light, saw two birds inside, one sitting on an egg. Neither bird seemed disturbed or distressed by the presence of the other or by our activity at the burrow entrance. On the basis of size, bill shape and bill length, we determined that they were male and female. The female, larger and with a longer and more curved bill, was sitting on the egg.