A NEW SPECIES OF KIWI (AVES, APTERYGIFORMES) FROM OKARITO, NEW ZEALAND

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Abstract. The distinctiveness of the brown kiwi population at Okarito, West Coast, South Island, has been documented by morphological, parasitological, field, and genetic data in this and other studies. We formally describe and name this taxon as *Apteryx rowi*. This action aims to forestall use and repetition of recently-published *nomina nuda*, and also provides a valid scientific name for a critically endangered population.

KEYWORDS: *Apteryx rowi*; Apterygiformes; kiwi; Okarito; New Zealand; new species.

INTRODUCTION

At present, all brown kiwi populations from the South Island of New Zealand are taxonomically regarded as belonging either to one subspecies (*Apteryx australis australis* Shaw & Nodder, 1813, originally described from Dusky Sound, Fiordland) of the brown kiwi found throughout New Zealand (see Ornithological Society of New Zealand 1990: 8, Marchant & Higgins 1990: 71), or to a species (*Apteryx australis*) separate from North Island birds (*Apteryx mantelli* Bartlett, 1852) (see Holdaway *et al.* 2001: 125). However, the taxonomic status of the brown kiwi population living in the Okarito Forest – a small area of the West Coast of the South Island – has been a subject of debate for decades. Brian Reid and the late Colin Roderick (both of the former New Zealand Wildlife Service) claimed that the Okarito brown kiwi – known to them from the 1950s – was different from brown kiwi living in Fiordland (see O'Donnell & Dilks 1986: 26, Peat 1990: 100, Reid *et al.* 1995). The presence of a "special" kiwi was partly responsible for South Okarito forest being preserved in the 1970s and later added to the Westland National Park (Peat 1990: 100, Reid *et al.* 1995).

Preliminary genetic studies in the 1980s by David Fountain (Massey University, Palmerston North), and Charles Daugherty (Victoria University, Wellington), indicated that the Okarito brown kiwi was most closely related to the North Island brown kiwi (Powlesland 1988: 6–8, Peat 1990: 78, Butler & McLennan 1991: 20). Since about 1991, when the Kiwi Recovery Programme was formally established (Butler & McLennan 1991), the Okarito brown kiwi has been widely accepted as a separate taxon. For example, a painting of the taxon by Pauline Morse was included on *Bank of New Zealand* cheque books; it has been included as a separate taxon in lists of threatened plants and animals by the New Zealand Department of Conservation (Tisdall 1994, Hitchmough 2002); and, in 2000, it appeared in a New Zealand postage stamp issue of threatened birds painted by Paul Martinson (Anon. 2000). The identification of a species of

louse of the genus *Apterygon* Clay, 1960 (Insecta: Phthiraptera), exclusively parasitising Okarito brown kiwi, was another indication of the kiwi's uniqueness (Palma & Price, in press).

Recent molecular work has confirmed that the Okarito brown kiwi is different from its South Island congeners, and more closely related to North Island brown kiwi populations. Baker *et al.* (1995) published detailed data on the phylogenetic relationships of all kiwi taxa, including the Okarito brown kiwi, based on their analysis of allozymes and mitochondrial DNA sequences extracted from blood, as well as a summary of morphological and feather lice differences between all kiwi. Burbidge *et al.* (2003) presented similar results from an updated and more thorough analysis of mitochondrial DNA from brown kiwi.

Since the early 1990s Okarito brown kiwi have been referred to as "*Apteryx mantelli* subspecies", "*Apteryx mantelli* Okarito brown kiwi", "*Apteryx mantelli* Okarito", "*Apteryx mantelli 'Okarito'*", "*Apteryx* Okarito brown", *Apteryx* "Okarito", "Okarito brown kiwi", or "rowi" in various reports and popular accounts (e.g. Tisdall 1994, Anon. 2000, Blaikie 2000, Hitchmough 2002), and in Internet pages (e.g. *A Field Guide to the Birds on the Web* – September 2003 [http://fieldguide.tripod.com/struthio.html]).

The early vernacular names for brown kiwi at Okarito have a confused history. In 1867, Charles Douglas called the South Island brown kiwi (including those at Okarito and Haast) the "roa" (Pascoe 1957: 225, Langton 2000: 220). Although Langton (2000: 218) suggested that Douglas used "kiwi" to refer to the South Island brown kiwi, we agree with Pascoe's (1957: 225) conclusion that Douglas used the name "kiwi" for the little spotted kiwi (*Apteryx owenii* Gould, 1847). We believe that Hackett, in 1867, called the Okarito brown kiwi "rohi", despite Fleming's (1986) conclusion that "rohi" referred to the great spotted kiwi (*Apteryx haastii* Potts, 1872). Again, in our opinion, Hackett's "kiwi" was the little spotted kiwi, as opposed to Fleming's suggestion that it was the brown kiwi. Potts (1873) called the South Island brown kiwi the "rowi" and the little spotted kiwi the "kiwi". Potts's main informant and collector was Docherty. Docherty had killed about 2,200 "kiwi" and "rowi" by the end of 1871 and Potts had seen "hundreds of skins" of the rowi. Although Canterbury Museum once contained a "very great" number of skins and skeletons of the "rowi" (Potts 1873: 188), not one brown kiwi labelled as coming from Okarito in Potts's time, remains in its collection today (P. Scofield, *pers. comm.* 2003). Apparently, Potts (1873) was not certain that the brown kiwi occurred in the South Island outside the Okarito area. He was told that a "black kiwi" occurred further south, which he thought might be the "toko-weka" of Bruce Bay, and he immediately erected the taxon *Apteryx fusca* for it (Potts, 1873: 196), which we regard as a *nomen nudum*.

To summarise, the brown kiwi at Okarito have been called several different common names: "roa" by Douglas, "rohi" by Hackett, and "rowi" by Potts. Douglas's "roa" also referred to brown kiwi in other parts of the South Island. Potts's "rowi" referred to the South Island brown kiwi, except for the "black kiwi" at Bruce Bay. Additionally, Hamilton (1879) used "kiwi" and "rowi" as general names to encompass the kiwi species in the Okarito region, making particular reference to their occurrence in the alpine area, which is outside the current range of the Okarito brown kiwi.

Burbidge *et al.* (2003) used the scientific name "*A. rowii*", and Marsh (2003) used "*Apteryx rowii*", for the Okarito brown kiwi, thus inadvertently creating *nomina nuda*. Their articles lack two essential requirements for the proper naming of a new species under the rules of the International Commission on Zoological Nomenclature (1999): the explicit intention of establishing a new nominal taxon (*Code* Article 16.1) and the unequivocal designation of a holotype (*Code* Article 72.3.). The *nomen nudum* "*Apteryx rowii*" was also included in the Internet pages of *Bank of New Zealand Kiwi Recovery* [http://www.kiwirecovery.org.nz – September 2003].

Despite the uniqueness of the Okarito brown kiwi population and its ranking by the Department of Conservation as belonging to a "nationally critical" threatened species with the highest priority for conservation (Tisdall 1994: 26, Hitchmough 2002: 20), there is yet no formal published description naming it according to the rules of the International Commission on Zoological Nomenclature (1999). Therefore, considering the urgent need for a properly established scientific name for the Okarito brown kiwi, we herewith name and describe the new species. Another motivation for this taxonomic action is to forestall use and repetition of the *nomina nuda* mentioned above.

SYSTEMATICS

Order Apterygiformes
Family Apterygidae
Apteryx Shaw & Nodder, 1813

Apteryx rowi new species (Fig. 1)

A. rowii Burbidge *et al.*, 2003 [April]: 172, 176. *Nomen nudum.*
Apteryx rowii Marsh, 2003 [July]: 29. *Nomen nudum.*
VERNACULAR NAMES: Rowi, Okarito brown kiwi.
TYPE LOCALITY: South Okarito Forest, West Coast, South Island, New Zealand.

HOLOTYPE: Canterbury Museum AV38269, immature female mount (Fig. 1), trunk skeleton (dried), and internal organs (in 70% ethanol). Hatched shortly before 9 February 1999 in South Okarito Forest, banded (R-55376) as a juvenile on 21 September 1999, sexed using DNA, and named "Jammit". Never bred and was still living with her parents about a month before she was accidentally killed on Forks-Okarito Road, Okarito (43°15′S 173°13′E). Collected by the New Zealand Department of Conservation on 20 August 2002.

Her dried colours (Smithe 1974, 1975, 1981 numbers) are as follows. Body plumage: feather bases – centre of feathers black (82) with fuscous (21) edges; remainder of feather buff (24) centre with tawny (38) tip, edges black (82). Head plumage: centre of feathers fuscous (21) with buff (24) edges tipped with black (82). Head with small white feather areas, two white feathers below ear, white chin and upper neck. Plumage "soft" when stroked backwards. Outer wing feathers barred pale and darker. Longest facial bristles: 10 mm from the bill base. Bill: cream (54) with salmon (6) striations across surface near tip. Legs and feet pale: scales salmon (6) with some scale edges buff (24), claws reddish (apparently due to post-mortem bleeding). Measurements are given in Table 1.

PARATYPES: Very few specimens of *A. rowi* have been preserved. The paratype series includes all six specimens that we know of (besides the holotype), none of which are complete skins or skeletons. Measurements are given in Table 1.

(1) Canterbury Museum AV800, ?adult, sex unknown, headless partial pelt and partial skeleton (dried), road-killed at Big Swamp, Okarito, collected before 6 Nov. 1944 by A. Barrett.

(2) Museum of New Zealand Te Papa Tongarewa MNZ27239, juvenile male with testes 7 x 5 mm, partial skeleton (dried) and one leg in 70% ethanol, captured in Okarito Forest as a young chick on 3 October 2000, banded (R-57618) as a juvenile on Motuara Island on 8 January 2002; returned to South Okarito Forest on 30 January 2002, where found dead, possibly drowned, on 15 February 2002. Collected by C. Rickard, Department of Conservation.

Fig. 1. Holotype of *Apteryx rowi* new species (Canterbury Museum AV38269, immature female).

(3) MNZ27240, immature female (from dissection), partial skeleton (dried) and one leg and headless partial pelt in 70% ethanol, unbanded, died at Okarito Forest c. 8 March 2002. Thought to have drowned at least eight days before being collected by S. Anderson, Department of Conservation.

(4) MNZ27241, adult female (sexed from measurements of the living bird), headless partial pelt with one leg and partial skeleton (dried), banded (R-57626) on 7 May 2002 in South Okarito Forest but pelvis broken, apparently during capture. Died in veterinary care on 20 May 2002. Collected by S. Anderson, Department of Conservation.

(5) MNZ27242, immature female sexed using DNA, headless partial pelt with one leg and partial skeleton (dried) and mandible and one leg in 70% ethanol, named "Beep", from an egg laid in South Okarito Forest, hatched on 10 September 1999, taken to Motuara Island (Marlborough Sounds) on 24 February 2000 and banded (R-55382) on her return to Okarito on 6 December 2000. She died 5 m from a road in South Okarito Forest apparently as the result of a fight with another kiwi and was collected on 16 June 2002 by C. Rickard, Department of Conservation.

(6) MNZ27243, adult male (sexed from measurements of the living bird), headless partial pelt and partial skeleton (dried) and partial pelt and one leg in 70% ethanol, banded (R-34152) in Okarito Forest, on 10 February 1991; died, possibly as a result of intra-specific fighting, at Okarito in late July 2002. Collected by S. Anderson, Department of Conservation.

Table 1. Measurements of type specimens of *Apteryx rowi*. "Scute count" refers to large scutes on the dorsal surface of the tarsometatarsus. We defined large dorsal scutes as all those wide scutes from the juncture with the middle toe up the tarsus in a line until the size changes to half that of the previous scute. Measurements (mm) were taken from dead birds as follows: Bill = chord of bill length from tip to front edge of cere. Tarsus = chord of tarsometatarsus length from heel to distal joint with middle toe. Mid toe = middle toe + claw length from claw tip to toe joint with tarsometatarsus. Bristle % = length of longest facial bristles (when stretched out) from the front of the cere at the base of the bill, as a percentage of the total bill length. – = specimen too damaged to measure.

Registration number & age/sex	Scute count Left	Right	Bill	Tarsus	Mid toe	Bristle %	Weight (g)
CM AV38269* imm. female	7	7	120.7	84.0	58.2	8	1880
CM AV800 ?ad.	–	–	–	–	–	–	–
MNZ27239 juv. male	6	7	c.96	92	78.6	–	1650
MNZ27240 imm. female	5	8	105.5	98	78.1	–	2070
MNZ27241 ad. female	6	2	–	92	73.7	–	1970
MNZ27242 imm. female	8	6	c.125	94	85.3	42**	1960
MNZ27243 ad. male	–	8	90.3	93.2	75.9	–	2145
Mean	6.40	6.33					
s.d.	1.14	2.25					

* Holotype
** This is a minimum percentage based on throat bristles because all forehead and lores feathers were missing

DIAGNOSIS: A small "brown" kiwi that differs from other "brown" kiwi by the following combination of characters. Dorsal feathers largely brown, streaked lengthways. Plumage soft when stroked backwards. The head, neck and belly feathers are noticeably grey. The outer wing feathers are transversely barred pale and darker, with short barbless regions (quills) at the base of the shafts. About 60% of birds examined in the field have some white feathering (ranging from a single feather to solid patches) on the head, especially around the sides of the face. Facial bristles short. In live birds, the bills are normally pink (n = 11), the legs and feet are pink or pale brown (n = 12), with an average of 6–7 large dorsal tarsal scutes, and the claws are largely whitish (n = 8). Measurements of live birds are given in Table 2.

DISTRIBUTION: Okarito Forest, West Coast, South Island, New Zealand. A total population of 150–250 birds is restricted to 10,000 ha of coastal podocarp-hardwood forest between the Okarito River to the north and Waiho River to the south (Miller *et al.* 2001, Rickard 2002). The pre-human range of South Island "brown" kiwi taxa is unknown. Kiwi fossils are found throughout the South Island, including from within the large geographic gap between living populations of *A. rowi* and *A. mantelli*, but the specific identity of many of these bones is still to be determined (e.g. Worthy & Holdaway 1993, 1994; Holdaway *et al.* 2001).

ETYMOLOGY: The specific name *rowi* is a noun in apposition derived from one of the vernacular names of the new species. This name was selected at the request of the Ngai Tahu iwi.

Table 2. Measurements of live adult *Apteryx rowi* caught in the field by Department of Conservation staff. For methods used see Table 1.

	Mean	s.d.	n	Range
Weight (g)				
males	1924	157	49	1575–2250
females	2650	316	51	1950–3570
Bill length (mm)				
males	94.8	4.3	48	83.5–104.2
females	125.5	5.9	51	109.9–140.3

DISCUSSION

There is a dichotomy in kiwi plumages, with "brown" kiwi taxa having feathers streaked brown, grey and/or black lengthways, whereas "spotted" kiwi taxa have feathers that are greyish, transversely barred pale and darker (Marchant & Higgins 1990).

Szabo (1993: 7, 9) appears to be the first author to have published the distinctive features of the Okarito brown kiwi in detail. He wrote: "Surprisingly, the genetic break occurs at Okarito . . . not between the two islands. The three populations of brown kiwi found south of Okarito . . . turn out to be genetically distinct from the Okarito and North Island brown kiwis." . . . "The Okarito population has a greyer plumage and white head markings around the eye and eyebrows, whereas the Haast birds . . . are of a reddish hue and the Fiordland population are brownish-grey. . . . Okarito birds share the physical characteristics of the southern species but are genetically closer to the North Island species . . .".

The plumage, bill, legs and claws of *A. rowi* are generally paler than in other "brown" kiwi taxa. However, the Okarito birds share most of their morphological and behavioural features with South Island brown kiwi (*A. a. australis*) and Stewart Island brown kiwi (*A. a. lawryi*), especially plumage softness, short facial bristles, shared incubation and living in family groups (Burbidge *et al.* 2003). The white feathering on the head of *A. rowi* is sometimes seen in other taxa of "brown" kiwi (authors' unpublished data), but the greyness of the head and neck plumage of *A. rowi* appears to distinguish it from the other taxa. The feathers of *A. rowi* are soft when stroked backwards, unlike those of *A. mantelli* which have a protruding rachis at the feather-tip (see Marchant & Higgins 1990). Barred outer wing feathers are found in *A. rowi* but not in other "brown" kiwi taxa. The short barbless regions at the wing feather bases are unlike the elongate ones in *A. mantelli* but similar to those of *A. australis* (see Bartlett 1852).

Bill colours of other "brown" kiwi are sometimes pinkish as in live *A. rowi*, but *A. mantelli* and *A. a. australis* often have pale cream- or horn-coloured bills and *A. a. lawryi* may have a slate-grey bill (Marchant & Higgins 1990). The bill of dried *A. rowi* specimens is sometimes cream-coloured. *Apteryx mantelli* and *A. a. australis* often have darker legs than the pink or pale brown legs of *A. rowi*, while *A. a. lawryi* has bluish grey legs (Marchant & Higgins 1990). The claws of other "brown" kiwi taxa are often much darker than the whitish claws of *A. rowi* (see Marchant & Higgins 1990).

Okarito brown kiwi have the shortest bills of any "brown" kiwi taxa. Bill lengths of *A. rowi* have a smaller mean and lower range than in *A. mantelli*, *A. a. australis* and *A. a. lawryi* (Tables 1, 2; Marchant & Higgins 1990: 79). Weights of "brown" kiwi are highly variable and *A. rowi* overlaps considerably with *A. mantelli* and *A. a. australis*. However, adult *A. rowi* are lighter than adult *A. a. lawryi* (see Tables 1, 2; Marchant & Higgins 1990: 79–80).

The count of large scutes on the dorsal surface of the tarsometatarsus of *A. rowi* is similar to that of *A. a. australis*, slightly less than that of *A. mantelli* and slightly more than that of *A. a. lawryi* (Tables 1, 3). Greater numbers of large scutes in "brown" kiwi taxa are not a result of a longer tarsus, as *A. rowi* and *A. mantelli* have shorter tarsi on average than *A. a. lawryi* (Table 1, Marchant & Higgins 1990). However, the number of scutes varies considerably within taxa, and even between left and right legs of the same individuals (see Table 1). The difference in scute pattern between taxa is not on the scale reported by some other researchers. Bartlett (1852) figured the tarsus scutes of *A. australis* and *A. mantelli* but neither illustration is typical of the specimens that we have examined. Using our criteria (see definition in Table 1), Bartlett's *A. australis* would have zero large scutes and his *A. mantelli* would have three scutes – both counts are below the normal number of large scutes that we found on these taxa (see Table 3). Baker *et al.* (1995) and Burbidge *et al.* (2003) reported that *A. mantelli* had 17 large tarsal scutes, a figure well above our range (4–12, Table 3), but their figures for scute counts of *A. rowi* (7) and *A. australis* (4–6) are similar to ours (see Tables 1 & 3).

Bartlett (1852) pointed out that *A. mantelli* had longer facial bristles than *A. australis* and this is borne out by our measurements, which also suggest that *A. a. lawryi* may have shorter

Table 3. Scute counts and measurements of facial bristle length (mm) in kiwi specimens held by Museum of New Zealand Te Papa Tongarewa (MONZ) – *Apteryx mantelli* (dried skins, 5 ad. male, 5 ad. female: MONZ 13550, 15376, 15382, 15647, 15775, 15777, 15778, 15820, 15821, 18168); *A. australis australis* (dried skins, all adult-sized birds: MONZ 2067, 2068, 18736, 11871, 22089, 27238); *A. australis lawryi* (dried skins/mounts, all adult-sized birds: MONZ 16610, 17105, 20994, 23718). For methods used see Table 1. Scute counts were taken from one leg of each specimen.

	Mean	s.d.	n	Range
Apteryx mantelli				
Scute count	9.0	2.5	10	4–12
Bristle length (sexes combined)	60	14	10	33–72
Bristle length (males)	66	9.9	5	49–72
Bristle length (females)	55	16.2	5	33–72
Apteryx australis australis				
Scute count	5.8	2.3	6	2–8
Bristle length	32	8	5	21–42
Apteryx australis lawryi				
Scute count	4.5	1.3	4	3–6
Bristle length	20	4.8	4	14–25

bristles than *A. a. australis* (see Table 3). Baker *et al.* (1995) and Burbidge *et al.* (2003) considered *A. rowi* to have "short" facial bristles. Our two facial bristle length measurements for *A. rowi* (8% and at least 42% of bill length, Table 1) suggest that this taxon has variable bristle lengths but that generally these may be shorter than the bristles of *A. mantelli*. The preliminary inter-taxa differences detected here are worth more detailed study.

According to studies of mitochondrial DNA and allozymes, *A. rowi* is the sister taxon of *A. mantelli* (Baker et al. 1995, Burbidge et al. 2003). This closer relationship to *A. mantelli* than to *A. australis* is also supported by evidence from the lice recorded from these kiwi species, in particular the species of the genus *Apterygon* Clay, 1960 (Palma & Price, in press).

In conclusion we recognise the following brown kiwi taxa:
Apteryx australis australis Shaw and Nodder, 1813: South-west South Island.
Apteryx australis lawryi Rothschild, 1893: Stewart Island.
Apteryx mantelli Bartlett, 1852: North Island.
Apteryx rowi new species: Okarito, South Island.

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