

A new species of *Rallicola* (Insecta: Phthiraptera : Philopteridae) from the North Island brown kiwi

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Rallicola (*Aptericola*) *rodericki* new species is described and illustrated from specimens collected on North Island brown kiwis (*Apteryx australis mantelli* Bartlett, 1850) from Little Barrier Island, New Zealand. The published host-lice association between *A. a. mantelli* and *Rallicola* (*Aptericola*) *gadowi* Harrison, 1915 is discussed and deduced to be erroneous. Evidence is also presented supporting the opinion of some 19th century ornithologists that *A. a. mantelli* was established on Little Barrier Island before the introduction of further birds of the same subspecies at the beginning of the 20th century.

Keywords: lice, new species, *Rallicola*, *Aptericola*, kiwis, *Apteryx*, wrong records, historical records, island distribution of kiwis, biological tags

INTRODUCTION

The genus *Rallicola* Johnston & Harrison, 1911 includes many species of lice found on a wide range of birds belonging to several taxonomic groups (Clay, 1953).

Three species of *Rallicola* parasitic on kiwis (*Apteryx* spp.) were first reported and described by Harrison (1915), who also grouped them under the new subgenus *Aptericola* Harrison, 1915. Clay (1972) described one further new species, and synonymised one of Harrison's species, but did not recognise *Aptericola* as a separate entity.

Harrison (1915: 91) and Clay (1972: 73) identified as *Rallicola* (*A.*) *gadowi* Harrison, 1915 specimens listed as collected from North Island brown kiwis (*Apteryx australis mantelli* Bartlett, 1850). I have made a great collecting effort, described herein, in an attempt to confirm that host-lice association, but have failed to produce any further specimen of *R. (A.) gadowi*. Instead, many specimens of a hitherto undescribed species of *Rallicola* (*Aptericola*) were found on several North Island brown kiwis. All these kiwis, with one exception, originated from Little Barrier Island, a wildlife sanctuary (2,817 hectares) situated at the mouth of the Hauraki Gulf, 70 kilometres north-east of the city of Auckland, New Zealand (see Cometti, 1986).

In this paper, I (a) describe the new species of *Rallicola* mentioned above, (b) discuss the host status for the published records of *R. (A.) gadowi* from *A. a. mantelli*, and (c) present evidence supporting the view of some 19th century ornithologists (e.g. Buller and Reischek) that *A. a. mantelli* was already present on Little Barrier Island when additional birds of that subspecies were transferred from the mainland to that island at the beginning of the 20th century.

Abbreviations used for institutions

AMNZ, Auckland Institute and Museum, Auckland, New Zealand; BMNH, British Museum (Natural History), London, England; BPBM, Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A.; MAMU, Macleay Museum, University of Sydney, Sydney, Australia; NHMV, Naturhistorisches Museum, Wien, Austria; NMNZ, National Museum of New Zealand, Wellington, New Zealand; NZAC, New Zealand Arthropod Collection, D.S.I.R., Auckland, New Zealand; USNM, National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.

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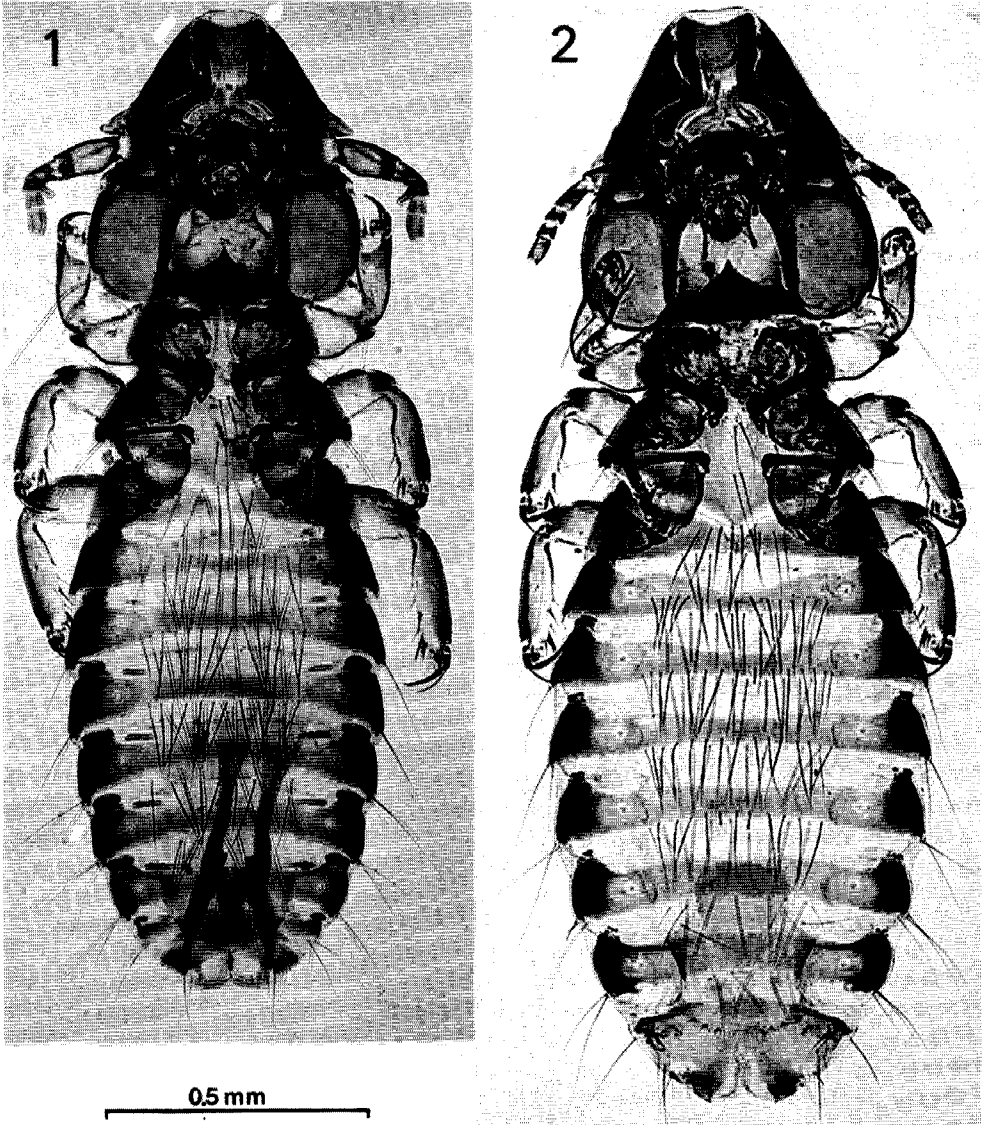


Fig. 1 – *Rallicola (Aptericola) rodericki*, holotype male.

Fig. 2 – *Rallicola (Aptericola) rodericki*, paratype female.

SYSTEMATICS

Family **Phloptoridae** Burmeister, 1838

Rallicola (Aptericola) rodericki new species (Figs 1- 4)

Type host: *Apteryx australis mantelli* Bartlett, 1850.

Type locality: Little Barrier Island, New Zealand.

Holotype: A in NMNZ.

Rallicola (Aptericola) sp.; Pilgrim & Palma, 1982: 3, 29. Listed and annotated only.

Etymology: The new species is named after the late Colin Roderick (1942-1984) of the former New Zealand Wildlife Service, who collected many kiwi lice and encouraged me to study them.

Male as in Fig. 1. Marginal temporal setae 4 reach the level of the lateroposterior angle of

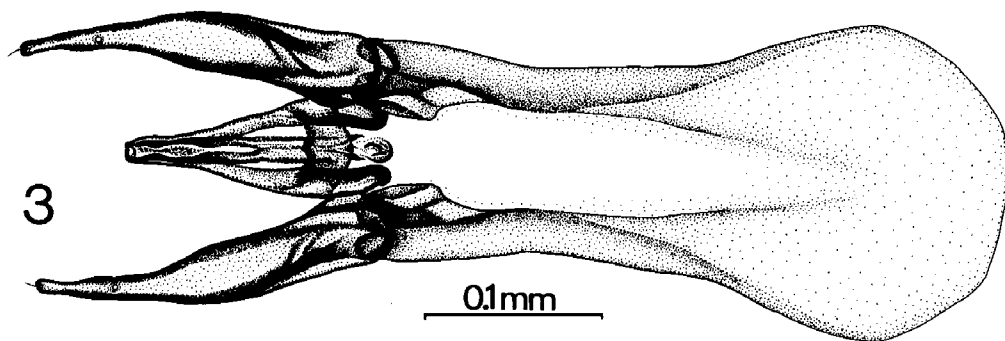


Fig. 3 – *Rallicola (Apterocola) rodericki*, male genitalia.

the pterothorax. Pterothorax with 2 anterior and 2 posterior long central setae on its ventral side. Genitalia as in Fig. 3, with an elongated mesosome (length: width ratio greater than 2.3) reaching well beyond the midpoint of the parameres.

Chaetotaxy of abdomen (30 specimens. Ordinal numbering refers to *visible* segments). Tergocentral setae: 1st, 6-11 (mean 7.9); 2nd, 10-14 (11.7); 3rd, 8-14 (10.6); 4th, 7-11 (9.4); 5th, 7-9 (8.1); 6th, 5-8 (6.5); 7th, 4-6 (4.6). Sternal setae: 1st, 6-11 (8.1); 2nd, 12-17 (14.7); 3rd, 11-17 (14.6); 4th, 10-14 (12.4); 5th, 8-12 (10); 6th, 2-3 (2.3); 7th, all 2. The last segment (8th) has one very long seta plus 2-3 shorter setae on each side of its tergum, and one very long seta plus 3-6 shorter setae on each side of its sternum. Pleural setae are, on each side, from 1st to 8th segment: 1,2,2,2,3,3,3,4.

Measurements (in mm; from 30 slide-mounted specimens). Head width, taken at temples: 0.48-0.52 (mean 0.50); head length, including hyaline margin: 0.53-0.56 (0.55); total length: 1.73-1.88 (1.83). Holotype: head width 0.50; head length 0.55; total length 1.83.

Female as in Fig. 2. Diagnostic chaetotaxy of head and thorax as in the male. Ventral view of last 2 abdominal segments as in Fig. 4; vulval margin rounded; opening of the spermathecal duct without a sclerotised ring.

Chaetotaxy of abdomen (30 specimens. Ordinal numbering refers to *visible* segments). Tergocentral setae: 1st, 6-11 (mean 8.4); 2nd, 11-16 (13.1); 3rd, 10-15 (12.6); 4th, 9-13 (11); 5th, 8-12 (9.3); 6th, 6-9 (7.4); 7th, 4-7 (5.5). The last segment (8th) has 2 very long and one very short tergal setae on each side. Sternal setae: 1st, 6-12 (8.7); 2nd, 12-18 (15.5); 3rd, 13-19 (16.3); 4th, 12-17 (14); 5th, 9-15 (12.2); 6th, 5-7 (5.9). Vulval margin with a proximal row of 11-16 (12.8) spiniform setae divided by a median gap in 2 groups of 5-9 (6.4) setae each; and a distal row of 29-34 (31.9) short thin setae (Fig. 4). Lateral tubercles (60) of last sternum each with 1-2 (1.8) stout setae on their anterior inner margin; on their posterior margin one very long seta among a double (irregular) row of 6-14 (10.9) shorter setae (Fig.4). Pleural setae are, on each side, from 1st to 8th segment: 1,2,2,2,3,3,3,2 (in some specimens, from the 2nd to the 5th segments, there is one fewer seta on one side of one or two segments).

Measurements (in mm; from 30 slide-mounted specimens). Head width, taken at temples: 0.52-0.57 (mean 0.54); head length, including hyaline margin: 0.57-0.60 (0.59); total length: 1.92-2.06 (2.00).

Material examined (all ex *Apteryx australis mantelli* Bartlett)

Type specimens: Holotype A, Shag Track, Little Barrier Island, New Zealand, 9 June 1980, C.R. Veitch (NMNZ). Paratypes: 24 A A and 25 B B from same bird as holotype (NMNZ, AMNZ, BMNH, BPBM, MAMU, NZAC, USNM); 9 A A and 9 B B, Hauturu Island (= Little Barrier I.), N.Z., September 1882, A. Reischek (NMNZ, NHMV); 24 A A and 24 B B, Little Barrier I., N.Z., June 1980, C.R. Veitch [ex 2 birds] (NMNZ).

Other specimens, not types: 52 A A and 51 B B, Auckland Zoological Park, Auckland, N.Z., 7 March 1978, G.W. Meadows (This sample was collected during the post-mortem

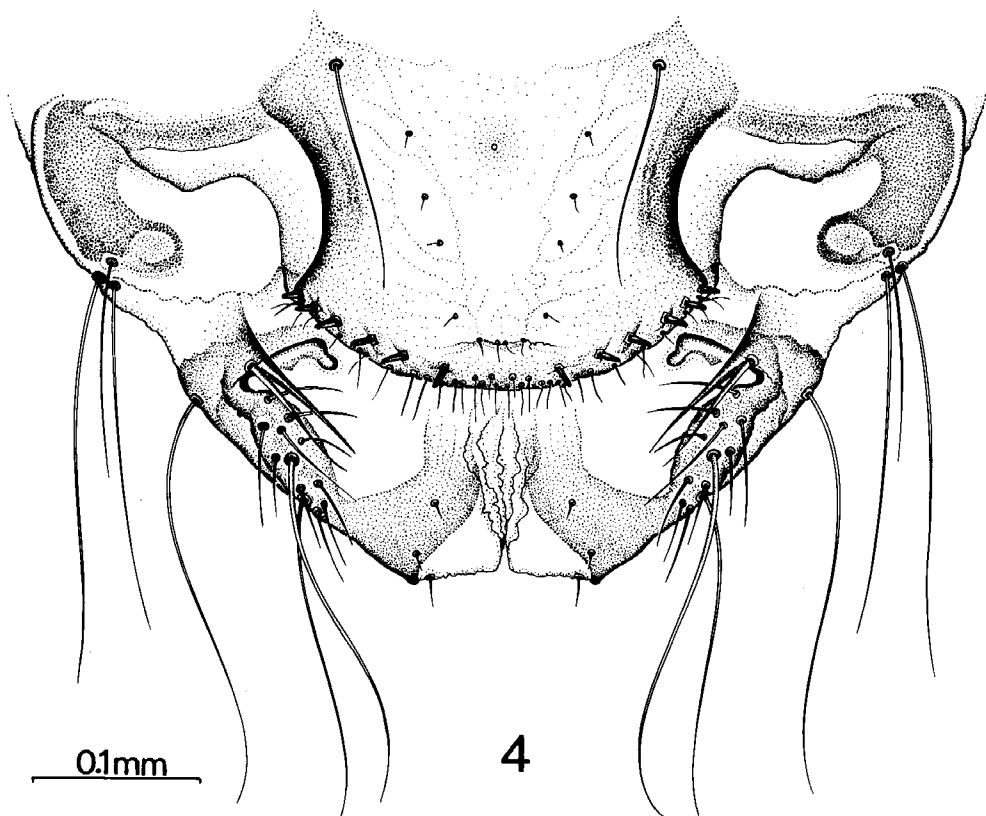


Fig. 4 – *Rallicola (Aptericola) rodericki*, ventral view of female last abdominal segments.

examination of a kiwi which had hatched and had lived only in the Park. This bird had been caged with other North Island brown kiwis, some of them collected in the wild from several localities within the North Island).

DISCUSSION

The male genitalia of *R. (A.) rodericki* are the most distinctive among the species of the subgenus *Aptericola*, especially in the shape and proportions of the mesosome (compare Fig.3 with figs 13-15 in Clay, 1972). The female of *R. (A.) rodericki* can be distinguished from the other known species of *Aptericola* by the shape of the vulval margin and by the chaetotaxy of the ventral terminal segments, especially that of the vulva (compare Fig. 4 with figs 7-9 in Clay, 1972). In the key to females published by Clay (1972: 75), *R. (A.) rodericki* would key out to *R. (A.) gadowi* in couplet (1) having the opening of the spermathecal duct without a sclerotised ring, but *R. (A.) rodericki* has no more than 2 stout setae on the anterior inner margin of each lateral tubercle, and it can be further separated from *R. (A.) gadowi* because it has many fewer spiniform and short thin setae on the vulval margin. Also, the number of short setae on the posterior margin of the lateral tubercles is smaller in *R. (A.) rodericki* than in all other species of *Aptericola*.

The geographical distribution of *R. (A.) rodericki* is so far restricted to Little Barrier Island, if we disregard the record from the Auckland Zoo Park which is obviously an artefact. Over 100 live and dead North Island brown kiwis from 35 localities, all in forested areas of the North Island mainland (*i.e.* Northland, Urewera, Bay of Plenty, East Cape, Taranaki and King Country) have been searched for lice during the last 30 years. This collecting effort has

produced about 40 samples of the louse *Apterygon mirum* Clay, 1961 (Phthiraptera : Menoponidae) which I have examined and identified. *A. mirum* has also been found on 3 of the 4 kiwis from Little Barrier Island, which were hosts to *R. (A.) rodericki*. However, not a single specimen of *Rallicola* was collected on the 100+ kiwis from the areas of the North Island mainland mentioned above.

From the number of specimens in each sample examined (listed above), it is apparent that *R. (A.) rodericki* is relatively abundant on Little Barrier Island kiwis. Therefore, if *R. (A.) rodericki* were a regular parasite on mainland North Island brown kiwis, it would be difficult to explain why it has not been found yet. It is tempting to claim that this louse species is absent from the North Island mainland; however, unless *all* existing kiwis are thoroughly searched for lice, obviously an impracticable task, the possibility of *R. (A.) rodericki* living on an isolated small population of birds cannot be ruled out. I have not yet been able to examine any louse from kiwis inhabiting either Coromandel Peninsula or forested areas in Hawke's Bay; samples from these localities, or any other, would be most welcome.

Erroneous host-lice association between *Apteryx australis mantelli* and *Rallicola (Aptericola) gadowi*

Wrong host-lice associations are the result of *either* the transferral of lice between different host taxa (naturally or by human agency) *or* the misidentification of taxa (host and/or louse). The detection and correction of those wrong associations which become published involve a great deal of further collecting from the reported host species (and the same individuals, if available) and from other host species, as well as obtaining authenticated identifications of all hosts and their lice.

Among the species of kiwi lice recorded in the literature, I believe there is one erroneous association: that between *Apteryx australis mantelli* and *Rallicola (A.) gadowi*. Harrison (1915: 91) assigned a single female louse he collected from a skin of a kiwi labelled "*Apteryx mantelli*" to his new species *R. (A.) gadowi*, but his description of this species was based on many specimens (males and females) from skins of *Apteryx australis australis* Shaw & Nodder, 1813. In the same paper, Harrison also described the new species *R. (A.) novaezealandiae* from many specimens he collected from skins of *Apteryx australis lawryi* Rothschild, 1893. All the kiwi skins examined by Harrison were in the collection of the Cambridge University Museum, United Kingdom.

Clay (1972), in her revision of the species of *Rallicola* parasitic on kiwis, examined some of the material published by Harrison (1915), as well as several additional samples. In that paper, Clay (1972: 71) synonymised *R. (A.) novaezealandiae* with *R. (A.) gadowi* and, on page 73, also listed three samples under the latter species as follows: "MATERIAL EXAMINED from *Apteryx australis mantelli*, NEW ZEALAND: 2 A, 6 B, Manawatu, 7. iv. 1965 (G. Singh); 18 A, 10 B, skins (R. Meinertzhagen); 1 A, 5 B, skins (L. Harrison)." After a detailed study and comparison of all the specimens from the three brown kiwis (treated as subspecies of *australis*), Clay concluded that although "the populations on *australis* and *lawryi* show some divergence, with specimens from *mantelli* being more similar to those from *australis* ..., it seems more satisfactory to include all the populations from the three subspecies of *australis* under the name *gadowi*". My study of 48 further samples of *Rallicola (Aptericola)* (held in the NMNZ collection) from *Apteryx australis australis* and *A. a. lawryi* shows that the morphological variability between and within samples, irrespective of host subspecies, is even higher than that recorded by Clay (1972).

However, the total absence of further records of *R. (A.) gadowi* from *A. a. mantelli* (see above) made me suspect the authenticity of the data given for the three samples quoted above from Clay (1972: 73). Furthermore, of the three samples the only one with a locality reads "Manawatu"; but there has not been any record of a wild North Island brown kiwi in that area since the arrival of Europeans in New Zealand (Fleming, 1982: 33; Bull *et al.*, 1985: 31). The collector of the "Manawatu" sample obtained the lice from a dead kiwi kept in a freezer of the then New Zealand Wildlife Service and had it identified by an officer of that Service. The published date, 7 April 1965, refers merely to the day when the lice were removed from the

carcass, not the day when the kiwi was collected (G. Singh, pers. comm., 1979). Kiwis which accumulated in the Wildlife Service's freezers were regularly given to the NMNZ to be preserved and kept in the museum's collection, but a search through the NMNZ ornithological register failed to reveal any kiwi specimen from "Manawatu". However, in the record book of the Wildlife Service there is an entry for a South Island brown kiwi (*A. a. australis*) from "Manapouri" received on 23 February 1965 and transferred to the NMNZ at the end of April 1965 (Colin Roderick, pers. comm., 1979); this bird is now an NMNZ study skin (No. 11871), from which I removed 9 specimens of *R. (A.) gadowi*. From the above dates, it can be seen that the date on which Mr Singh removed the lice falls within the period during which the Wildlife Service's freezer contained the South Island brown kiwi from Manapouri. This, together with the similarity between "Manawatu" and "Manapouri", combined with the inadvisable habit of identifying biological specimens from their localities rather than from their features, explains what I consider to be an unfortunate confusion resulting in a wrong host-lice association.

Confirmatory evidence supporting my conclusion that the host of the "Manawatu" sample of *R. (A.) gadowi* is not *A. a. mantelli* can be found in Tandan (1972) who was uncertain about the species identity of 2 males *Apterygon* collected by Mr G. Singh from the same "Manawatu" kiwi. Tandan (1972: 68) wrote: "Of the three known species of *Apterygon* these males resemble *dumosum* most closely;" but he had doubts that they actually were *Apterygon dumosum* Tandan, 1972. I have now examined over 40 specimens (3 samples) of *Apterygon* collected from *Apteryx australis australis* in Fiordland, which fall within the variability range of *A. dumosum* taken from its type host (*Apteryx australis lawryi*). Tandan (1972: 68), realizing that there was something unusual about the two "Manawatu" males, concluded: "As *A. australis mantelli* is the type host of *mirum*, it seems that either this kiwi harbours two sympatric species of *Apterygon* or the host record of the two males [my italics] or of *mirum* is wrong."

Because there are no localities given for the remaining two samples of *R. (A.) gadowi* from *A. a. mantelli* quoted above, the obvious first step in assessing the validity of those records was to check the identity of the original skins (assuming that Clay's identifications were correct). Dr T. Clay (pers. comm., 1978) informed me that R. Meinertzhagen had collected the 28 lice listed, from skins in the Cambridge University Museum (presumably the same skins from which Harrison had obtained the specimens for his 1915 publication). Dr Clay also said that the 6 lice listed as collected by L. Harrison were labelled "Macleay Museum". Two old skins (MAMU B4080 and B4081) labelled "*Apteryx mantelli*, Loc.: New Zealand" were borrowed from the Macleay Museum and examined by the NMNZ ornithologist, Mr J.A. Bartle, and by several Wildlife officers. Their identification was not conclusive, mainly because there was no independent information on how much the feathers might have faded in storage. Measurements and other features were not diagnostic either. It was concluded that the skins were either *A. a. australis* or *A. a. mantelli* depending upon the amount, if any, of pigmentation lost by the feathers. However, I was able to remove 28 male and female specimens of *R. (A.) gadowi* from the two skins.

Mr Bartle also examined all the kiwi skins held in the Cambridge University Museum during a visit he made there in 1980. He found two skins and one mounted specimen labelled *A. a. mantelli*, but without any indication of localities. In his report, Mr Bartle wrote: "... the two supposed *mantelli* ... are actually *australis*." and referring to the mounted specimen: "This bird is very faded and could equally be *australis* or *mantelli*." Finally, he concluded: "There is nothing to suggest that any one of these three birds is really *mantelli* except the name given on the labels."

In summary, I conclude from (1) the evidence outlined in the preceding paragraphs, (2) the total absence of authenticated *R. (A.) gadowi* records from North Island brown kiwis, and (3) the presence of a new, clearly distinct species (*R. (A.) rodericki*) parasitising North Island brown kiwis (albeit from so far one locality only), that the claimed association of the host *A. a. mantelli* with the louse *R. (A.) gadowi* (e.g. Clay 1972: 73; Reid and Williams, 1975: 324) is almost certainly wrong.

Evidence supporting the presence of North Island brown kiwis on Little Barrier Island before 20th century introductions

The origin of the North Island brown kiwi population living on Little Barrier Island has been the subject of some controversy. Records published between 1843 and 1887 of kiwis on that island (Turbott, 1961: 138, 141) have not previously been confirmed by tangible evidence, but kiwis were introduced “sometime before 1903” (Oliver, 1922) and again in 1919 (Turbott, 1961).

Ernest Dieffenbach’s report (1843: 230, 233) is perhaps the first published record of kiwis on Little Barrier Island but, because it is not the result of his own observations, it has been largely ignored by 20th century authors. Similarly, no credibility has been given to Hochstetter’s observations (Sclater and Hochstetter, 1861: 506; Hochstetter, 1867: 177) which, ironically, record Little Barrier Island as a locality where *A. a. mantelli* “... is said to be still tolerably common”, while he refers to the possibility of kiwis being extinct in the northern districts of the North Island and “... nearly exterminated by men, dogs, and wild cats,” in the inhabited areas of the southern districts. In Gray’s (1862: 233) list of New Zealand birds, “Houtourou or Little Barrier Island” is included as one of the three localities for “*Apteryx mantelli*”; here Gray was probably following the 1861 Sclater and Hochstetter’s record quoted above.

Layard (1863: 244) visited Little Barrier Island in 1862, and later wrote: “It is said that the Kiwi exists in large numbers on this lonely island, but we did not see any tracks.” Hutton (1868: 106), after having spent four days on the eastern side of the island, decided against including *A. a. mantelli* in his list of birds found on Little Barrier because “... notwithstanding current reports, I am inclined to think that it is either very rare or else does not exist on the island ... we neither heard nor saw a Kiwi during the whole time we were on the island.” Despite this first-hand evidence, Hutton (1871: 23) still listed Little Barrier Island as a locality for “*Apteryx mantelli*” in his *Catalogue of the Birds of New Zealand*.

Buller (1868: 226) referred to *A. a. mantelli* on Little Barrier Island as “... still comparatively numerous although it no longer exists on the neighbouring mainland ...”, but it is doubtful that this statement was based on his own observations. However, in his first edition of *Birds of New Zealand*, Buller (1873: 360) acknowledged the controversy on the presence of kiwis on Little Barrier Island, adding that “... the matter has been placed beyond all dispute by Mr T. Kirk, who lately obtained several himself on the Little Barrier.” Unfortunately, despite the efforts of several colleagues, it has not yet been possible to locate any of the kiwis collected by T. Kirk.

An important record of *A. a. mantelli* from Little Barrier Island, published *before* the introduction by Europeans of additional kiwis from the mainland, was by Reischek (1887: 183), who visited the island five times, spending a total of about ten months on it. Andreas Reischek was an Austrian naturalist who collected over 2,000 birds in New Zealand, including many from Little Barrier (Cometti, 1986: 17); many of his specimens are now in the bird collection of the NHMV. Through the courtesy of their curator of birds, I have been able to borrow a specimen of *A. a. mantelli* (study skin No. 48109, male; Fig. 5), collected by Reischek on “Hauturu” (=Little Barrier) Island in September 1882 (Fig. 6), which he identified as “*Apteryx Bulleri* varietas” a name now regarded as a junior synonym of *A. a. mantelli* (Mathews and Iredale, 1913: 204). The specimen is in an excellent state of preservation, and from its feathers I removed 18 adults and 13 nymphs of *Rallicola* (*A. rodericki* (see ‘*Material examined*’ above).

The Little Barrier Island kiwi collected by A. Reischek in 1882 is definite evidence in support of the view that the North Island brown kiwi was living on that island before the first recorded introductions of kiwis sometime before 1903 and in 1919. Also, the 1882 kiwi is the missing evidence needed to give credibility to Reischek’s 1887 record after the latter’s dismissal by Turbott (1961: 141) on the grounds that it “... would appear to be based upon the earlier statements of Layard and Buller”, notwithstanding Reischek’s convincing statement in his last paragraph: “The above is written from my personal observations and facts” (Reischek, 1887: 184). Turbott (1961: 138) also dismissed Buller’s record (1873: 360) as “... ”



Fig. 5 – Study skin (lateral view) of *Apterix australis mantelli* collected by A. Reischek on Little Barrier Island in 1882 (in Bird Collection of NHMV, No. 48109).
 Fig. 6 – Original label of kiwi specimen No. 48109 shown in Fig. 5.

a fairly strong case for the belief that Buller was wrongly informed of the source of the specimens he mentioned and that the kiwi was not an indigenous species on Little Barrier.” Turbott’s conclusion was based on the unavailability of early specimens and the lack of kiwi records during the 13 years (1897-1910) that a caretaker lived on the island. As shown above, at least one early specimen has been rediscovered, and the ‘negative evidence’ of kiwis during relatively long periods has proved to be extremely unreliable as a measure of ‘kiwi-presence/absence’ in a given locality. Two recent examples support that statement: Dr J. McLennan (pers. comm., 1990) recorded at least 24 North Island brown kiwis during his research in Waitere, an area of regenerating bush in Hawke’s Bay; yet, when he first arrived there, local people living in the area for 10 years had never heard or seen a kiwi before. Dr McLennan and his colleagues found five kiwis within the first two nights searching for them. The second example refers to the history of the South Island brown kiwis introduced on to Kapiti Island about 50 years ago. Mr J. Jolly (pers. comm., 1990) informed me that the fate of those kiwis was uncertain until 1980, when the presence of a small population (about 50 birds) was confirmed. In the 8 years from 1972, when there was an unconfirmed report of brown kiwi calls, not a single kiwi of that species was seen or heard despite the continuous presence of wildlife rangers, and a Kiwi Survey of 600 hectares of the island carried out by Wildlife Service personnel in 1978 with the stated purpose of seeking South Island brown kiwis! The little spotted kiwi (*Apterix owenii* Gould, 1847) is common and well documented on Kapiti Island (Jolly, 1989).

The long held belief that “Flightless birds do not occur on any of the offshore islands round the New Zealand coast except Stewart Island, ...” (Turbott, 1961: 138) unless introduced

by humans, is no longer sustainable. Since the publication of that paper, little spotted kiwis were confirmed to occur naturally on D'Urville Island (Jolly, 1980: 5), hence this island was 'promoted' from the category of "offshore" to that of "mainland" island (Williams, 1981: 455). East and Williams (1984: 31) went as far as to give "... three possible explanations for the complete absence of the brown kiwi from offshore islands". Considering the present evidence I believe that both ornithologists and ecologists should critically review their points of view on the distribution of flightless birds on New Zealand offshore islands.

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