

Geographical variation in the bone length of Laughing Owls (*Sceloglaux albifacies*)

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ABSTRACT

Measurements of the lengths of fossil bones show that North Island Laughing Owls were appreciably smaller than South Island ones. Humeri and tarsometatarsi from the North Island were on average significantly shorter than those from the South Island. The regressions of humerus length and tarsometatarsus length on latitude were significant, and length and latitude were positively correlated. The North Island samples were too small to establish whether variation was clinal, and in the meantime the continued recognition of North and South Island subspecies seems warranted.

KEYWORDS: Laughing Owl, *Sceloglaux*, fossil bones, geographical variation, subspecies.

INTRODUCTION

In the middle years of last century, Laughing Owls *Sceloglaux albifacies* (Strigidae) were fairly abundant in eastern areas of the South Island but extremely rare in the North Island (see Oliver 1955). The type specimen of Gray's *albifacies* was a South Island bird, from Waikouaiti near Dunedin. Buller (1904) described a new species, *Sceloglaux rufifacies*, on the basis of an adult female that had been received freshly killed by the Colonial Museum in the summer of 1868-9 from a settler in the Wairarapa district about 50 miles from Wellington (Buller 1905: 67). It was "appreciably smaller" than the South Island species and had more rufous colouring on the facial disc and upperparts generally. The North and South Island populations are currently considered to be separate subspecies (Turbott 1990).

The specimen that became the holotype of Buller's *rufifacies* was skinned and sexed on receipt by the Colonial Museum and two years later was taken by Buller to London to be mounted by a taxidermist (Buller 1905: 67). According to Buller (1905: 66), the Colonial Museum subsequently disposed of the specimen by exchange to a private collector. Its whereabouts is now unknown. It was a controversial specimen. W. Rothschild examined it and discovered that during its preparation, the London taxidermist had replaced its tail, presumably because it was defective, with that of an Australian species (Buller 1905: 66). "... also some feathers on the neck are foreign" (Rothschild 1907: 77). Rothschild, E. Hartert, C.E. Hellmayr and H. Gadow thought it not fully adult, and showing "unmistakable signs of immaturity" (Rothschild 1907: 77) with the implication that it needed to be compared with juveniles of the South Island population. A. Newton and R.B. Sharpe thought the specimen to be older (Buller 1905: 66). Sharpe agreed that it was a new species but Newton was concerned that it might merely be a rufous form of the previously described species, which was known to vary in colour.

TABLE 1 - Length measurements (mm) of four elements of the Laughing Owl skeleton from the North and South Islands.

Bone & location	Mean	S.D.	N	Range
Humerus				
North Island	71.46	2.74	5	68.3-75.8
South Island	76.77	2.53	18	68.6-80.0
Femur				
North Island	51.35	2.19	2	49.8-52.9
South Island	62.23	2.45	15	59.4-66.2
Tibiotarsus				
North Island	89.43	5.69	3	86.0-96.0
South Island	101.85	4.77	14	94.7-111.1
Tarsometatarsus				
North Island	61.19	3.34	7	58.0-66.3
South Island	67.41	2.53	15	62.9-71.8

Fuller (1987) suggested that Buller himself was the private collector to whom the Colonial Museum exchanged the North Island owl, and that Buller described it as a new species to increase its value before offering it for sale to Rothschild. It was certainly offered to Rothschild, but "... for such a high price that I did not feel justified in buying it ..." (Rothschild 1907: 77).

The only other North Island Laughing Owl known to have been collected was shot by the taxidermist Martin in 1856 (or soon after) in forest on the slopes of Mt Egmont (Buller 1905: 67). He was making a collection for Captain King, but its whereabouts was not known to Buller, and has not been discovered since.

One specimen lacking a tail is a poor basis for erecting a subspecies, and the validity of the North Island race is therefore in doubt. The purpose of this study was to see whether measurements of the lengths of fossil bones of Laughing Owls from throughout New Zealand cast any light on the status of the North Island race. The type of *rufifacies* was smaller than South Island specimens (Buller 1904) but R.J. Scarlett (quoted in Williams & Harrison 1972) stated that fossil Laughing Owl bones from the North Island "are often as long as any from the South".

Scarlett (1972) gave ranges of lengths of Laughing Owl bones including 10 femora, six tibiotarsi, eight tarsometatarsi and 19 humeri, presumably from throughout the country. These data fall within the range of measurements amassed for this study (Table 1) with one exception: Scarlett recorded a minimum humerus length of 65 mm, whereas the smallest I encountered was 68.3 mm.

MATERIAL AND METHODS

I obtained measurements of the total length of all available Laughing Owl humeri, femora, tibiotarsi and tarsometatarsi held by the following institutions: Auckland Institute and Museum (AIM); Auckland University Geology Department (AU); Canterbury Museum, Christchurch (CMC); Museum of New Zealand, Wellington (NMNZ); Otago Museum, Dunedin (OM); and Waitomo Museum of Caves (WO). I measured the bones myself except for those from CMC, and some in the care of T. Worthy, which were measured for me (see Acknowledgements).

Measurements were recorded to the nearest 0.1 mm. Any bones with badly damaged ends were disregarded. The lengths of three bones registered as CMC AV20876 were taken from Scarlett (1967). They had been identified as Barn Owl (*Tyto alba*) by Scarlett, but were re-identified as Laughing Owl by Millener (1983). The intact length of tarsometatarsus CMC AV21795 was estimated at 59.5 mm from Fig. 4 of Millener (1983) using the scale in the photograph.

I used the simple measurement of total length for several reasons. The bones were fossils and I could include a relatively large number intact in their total length even if other details were damaged. Some of the bones were measured by others whose time I could not prevail upon unduly. In this study I sought a preliminary indication of geographical size variation. Further study of a greater range of characters can proceed when more North Island fossils come to light.

The following bones were measured:

Humerus (N = 23): AU4055 (Tom Bowling Bay); NMNZ S23334 (Cape Reinga); AU4834 (Tokerau Beach); CMC AV28371 (2, Waitomo); NMNZ S30165 (Takaka); CMC AV16685, AV21338 (3, Takaka); NMNZ S22701, S23041 (Honeycomb Hill); CMC AV11809, AV12864, AV13117, AV13134, AV13195, AV14004 (Grassmere); CMC AV14453 (Pyramid Valley); NMNZ S23393 (Ngapara); CMC AV23053, AV25293 (S. Canterbury); NMNZ S23306 (Castle Rock); CMC AV36069 (False Island, Otago).

Femur (N = 17): AU4834 (Tokerau Beach); CMC AV16685, NMNZ S30165 (Takaka); NMNZ S23041, S23832 (5, Honeycomb Hill); NMNZ S24673 (Martinborough); CMC AV13163 (Grassmere); CMC AV15045 (2, Pyramid Valley); NMNZ S23393 (2, Ngapara); CMC AV36069 (2, False Island, Otago); NMNZ S23306 (Castle Rock).

Tibiotarsus (N = 17): CMC AV20876 (Tom Bowling Bay); AU4834 (Tokerau Beach); WO1.9 (Waitomo); CMC AV21338, CMC AV16685, NMNZ S30165 (4, Takaka); NMNZ S23041, S23832 (Honeycomb Hill); CMC AV11630, AV13191, AV13192, AV13380 (Grassmere); AIM B6980 (Motunau Beach); NMNZ S34100 (Timaru); OM AV6232 (Forest Hill); CMC AV36069 (False Island, Otago).

Tarsometatarsus (N = 22): CMC AV20876, AV21795 (3, Tom Bowling Bay); AU4834 (Tokerau Beach); CMC AV28371 (2, Waitomo); CMC AV18447 (Napier); CMC AV16685, AV21338 (Takaka); CMC AV11633, AV11862, AV12124, AV12156, AV12582, AV12785, AV13623 (Grassmere); CMC AV14453, AV15045, AV15055 (Pyramid Valley); NMNZ S33795 (Timaru); CMC AV5093, AV11821 (Earnscliffe).

RESULTS

Laughing Owl bones from the North Island were generally much shorter than those from the South Island (Table 1). Bone length tended to increase with latitude (Figs. 1 & 2). Unfortunately, the sample sizes for the North Island were small, and statistical analysis seemed warranted only for humerus and tarsometatarsus, where the North Island sample was five or greater.

Humerus (Fig. 1). The difference between the means for the two islands was highly significant ($t = 4.09$, d.f. = 21, $P < 0.001$). The regression of length on latitude ($y = 0.54x + 53.45$, $r = 0.54$) was significant ($t = 2.96$, d.f. = 21, $P < 0.01$). For the South Island data points alone, the correlation coefficient was low ($r = 0.17$) and the regression not significant ($t = 0.67$, d.f. = 16, $P > 0.1$).

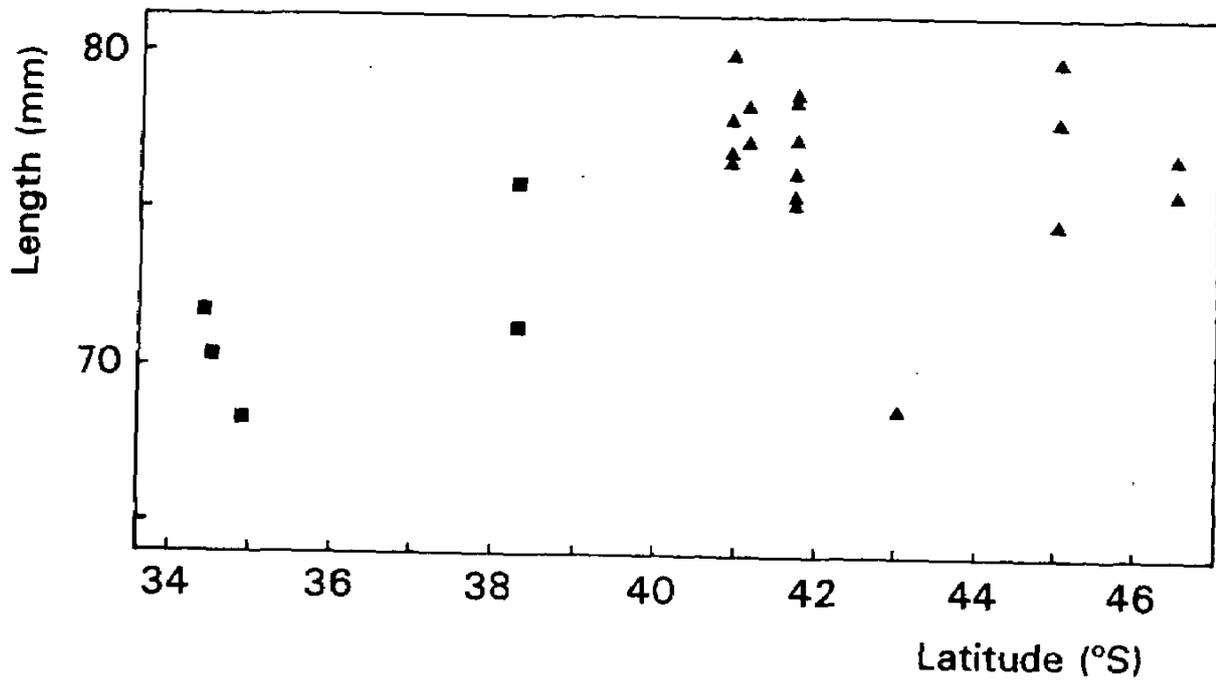


FIGURE 1 - A plot of length (mm) against latitude for Laughing Owl humeri (N=23) from the North Island (squares) and South Island (triangles).

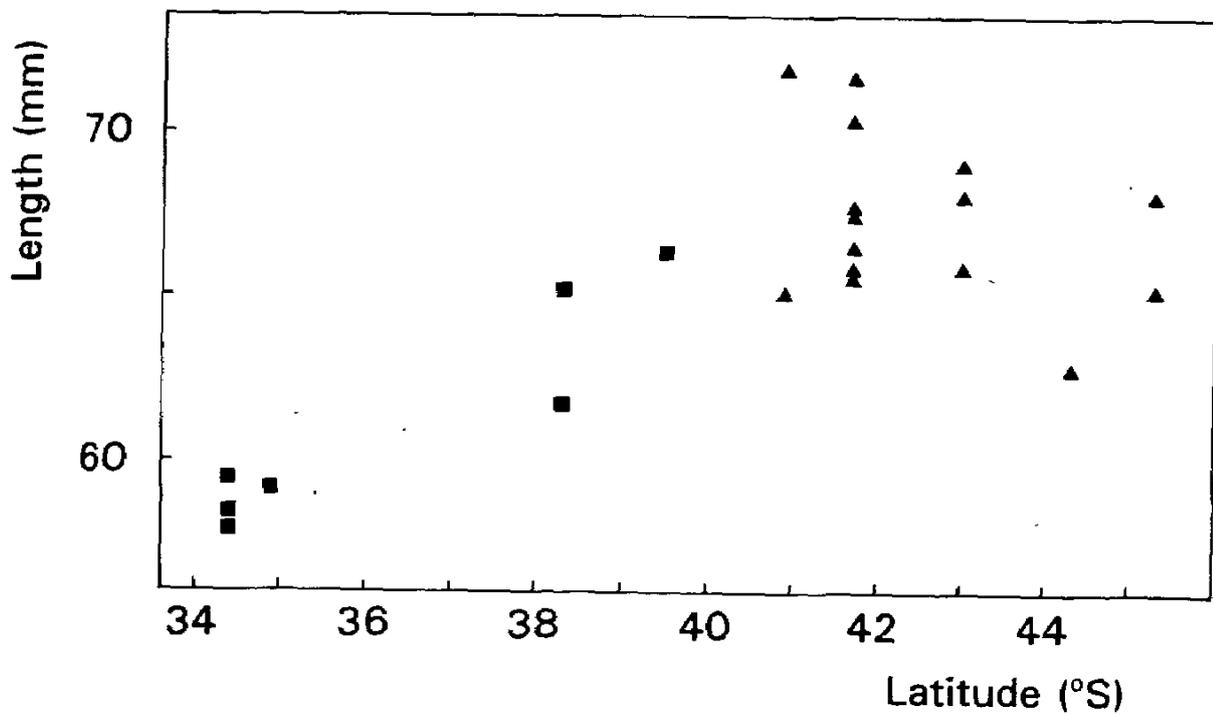


FIGURE 2 - A plot of length (mm) against latitude for Laughing Owl tarsometatarsi (N=22) from the North Island (squares) and South Island (triangles).

Tarsometatarsus (Fig. 2). The difference between the means for North and South Islands was highly significant ($t = 4.86$, d.f. = 20, $P < 0.001$). The regression of length on latitude ($y = 0.86x + 30.67$, $r = 0.72$) was also highly significant ($t = 4.69$, d.f. = 20, $P < 0.001$). For South Island measurements alone, the correlation co-efficient was low ($r = 0.35$) and the regression not significant ($t = 1.35$, d.f. = 13, $P > 0.1$).

DISCUSSION

The fossil bones show clearly that North Island Laughing Owls were on average significantly smaller than South Island birds, as was the indication from the 1868-9 Wairarapa skin. However, the small samples from the North Island are currently inadequate for a proper analysis of whether there is an abrupt discontinuity in the size of the owls between the islands, or whether size varies clinally between northern and southern ends of the country. If the latter were the case then subspecies would not be warranted. However, in the meantime, treating the two populations as subspecifically distinct seems justified, the evidence of the fossil bones supporting what was an inadequate original justification based on one imperfect skin.

Several New Zealand birds tend to be smaller in the North Island than in the South Island (Bull & Whitaker 1975), conforming to Bergmann's Rule. For example, this tendency is noted in the following species: the moa *Euryapteryx geranoides* within the North Island (Worthy 1992), the *Dinornis* moas (Worthy 1988), the extinct geese *Cnemiornis* spp. (Scarlett 1972), the adzebills *Aptornis* spp. (Oliver 1955), the owl-nightjar *Megaegotheles novaezealandiae* (Rich & Scarlett 1977), the Kaka *Nestor meridionalis* (Holdaway & Worthy 1993) and the extinct wrens *Pachyptichas* spp. (Millener 1988). However, Bergmann's Rule is not universal and there is evidence in the following species of smaller individuals towards the south: Holocene populations of the South Island moa *Megalapteryx didinus* (Worthy 1988), the Takahe *Notornis mantelli* (Williams 1960, Scarlett 1972) and Stewart Island Wekas *Gallirallus australis* versus the nominate race from western areas of the South Island (Marchant & Higgins 1993). The full extent and significance of geographical size variation in New Zealand birds awaits detailed analysis.

Further study is also needed on whether there is temporal variation in the size of Laughing Owls. Some New Zealand birds changed in average size between the Otiran (80,000-10,000 years ago) and the Holocene (10,000 years ago or younger). For example, *Pachyornis mappini* became smaller (Worthy 1987). Most of the Laughing Owl bones in this study can be safely assumed to be of Holocene age. Of the remainder, those from Honeycomb Hill (north-west Nelson) and Waitomo are probably Otiran, and those from Castle Rock and Forest Hill (Southland), and Takaka, are of uncertain age.

In Fig. 2, there is a suggestion of a reverse trend whereby tarsometatarsus length may decrease slightly with latitude within the South Island. This trend is not statistically significant and may be an artefact of the small sample of bones from the far south. It is not the result of the uneven inclusion of large Otiran-aged bones. In Fig. 2 there are no known Otiran bones among the South Island data-points; the line of seven measurements close to latitude 42°S, for example, represents Holocene bones from Grassmere, Marlborough.

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