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Rediscovery of the types of *Dinornis curtus* Owen and *Palapteryx geranoides* Owen, with a new synonymy (Aves: Dinornithiformes)

Trevor H. Worthy

Palaeofaunal Surveys, 2A Willow Park Drive, Masterton, New Zealand (twmoa@wise.net.nz)

ABSTRACT: A left tibiotarsus BMNH A5906, carrying the original Royal College of Surgeons number 2305 (later replaced by 2290 and then by 2292), located in the Natural History Museum, London, is identified as the lectotype (nominated by Lydekker in his 1891 catalogue) of *Dinornis curtus* Owen, 1846. BMNH 21687, the lectotypical cranium of *Palapteryx geranoides* Owen, 1848, was found to be conspecific with *Pachyornis mappini* Archey, 1941, which therefore becomes a junior synonym of *Palapteryx geranoides*, now known as *Pachyornis geranoides*, for which a new synonymy is given. The majority of moa bones from Waingongoro, Taranaki, New Zealand, whence the lectotypical cranium of *Pachyornis geranoides* originated, belong to this same species, as originally stated by Owen. Photographs of both lectotypes are presented. A lectotype for *Pachyornis septentrionalis* Oliver, 1949 is nominated, as the 'type' is a 'skeleton' that comprises two taxa.

KEYWORDS: Dinornithiformes, moa, *Dinornis curtus*, *Palapteryx geranoides*, *Pachyornis mappini*, lectotypes, new synonymy.

Introduction

Sir Richard Owen, the foremost osteologist of the nineteenth century, was the curator of the Hunterian Collection of the Royal College of Surgeons of England (RCS) from 1836 to 1856, and then he was appointed as Superintendent of the Natural History Department of the British Museum at Bloomsbury. Owen envisaged and actively promoted the concept of the Natural History Museum in South Kensington; he oversaw its completion by 1880, and it opened as the British Museum (Natural History) (BMNH) in 1886, with Owen as first Director (Rupke 1994). Many of the type specimens of species Owen described during the 20 years he was at the Royal College of Surgeons remained in the Hunterian Collection until World War II when, on the night of 10 May 1941, the College was seriously damaged by bombing. Over two-thirds of the collection was destroyed. Since World War II, the type material of most of the moa species described by Owen has been presumed lost (Oliver 1949). These types are critical to any revision of the taxa involved. In September 2003 and September 2004, I had the opportunity to examine the collections of the Natural History Museum (BMNH) in London, and located two moa types that had not been labelled and recognised as such.

Systematics

Dinornis curtus Owen, 1846

(Fig. 1)

Owen (1846a: 47) briefly described the small moa *Dinornis curtus*, which was described in more detail in Owen (1846b: 325), based on a tibiotarsus, a tarsometatarsus,

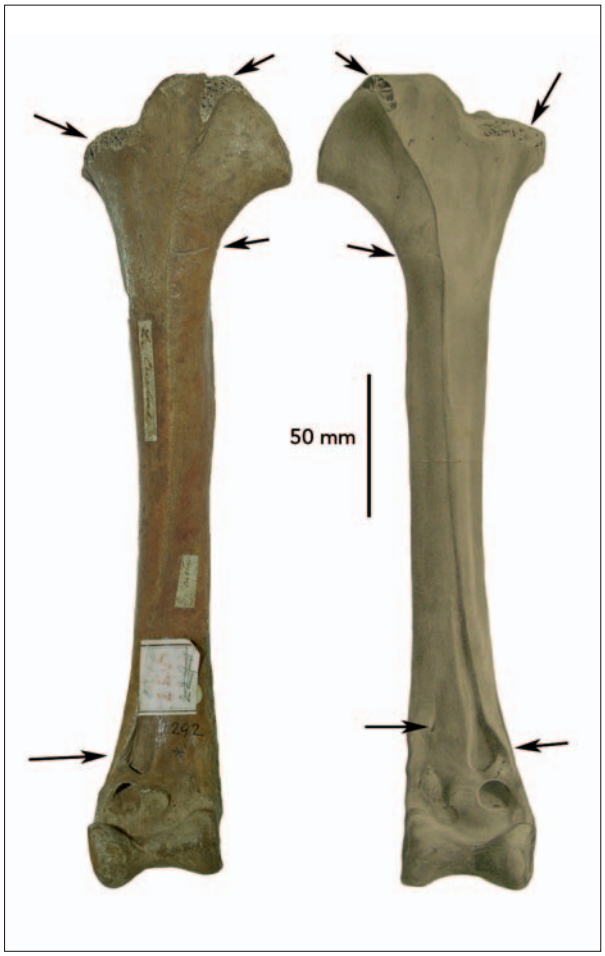

Fig. 1 The lectotypical left tibiotarsus of *Dinornis curtus* Owen, 1846. Left: actual specimen BMNH A5906. Right: a copy of the lithograph from Owen (1846b, Pl. 47, Fig 3), which depicts a mirror image of the bone. Arrows point to erosion features and other individual features that identify this bone with that shown in the original plate.

and a shaft of a femur, from the North Island. Lydekker (1891: 281) designated the tibiotarsus shown in Owen (1846b: Pl. 47, Figs 3, 4, 5) as the lectotype, but he did not state its whereabouts. Archey (1941) noted that the location of the 'type' was not known, and it had not been found until this study. Nevertheless, this species, now known as *Euryapteryx curtus* has continued to be recognised by subsequent workers (e.g. Archey 1941, Oliver 1949, Brodkorb 1963, Worthy & Holdaway 2002).

On 22 September 2004, I searched the moa collections in the BMNH for this lectotype, with particular attention to the fossils derived from the RCS collections that entered the collections of the BMNH in 1949, long after Lydekker wrote his catalogue. A left tibiotarsus labelled A5906 (RCS number 2292), matched the bone portrayed in reverse (as is normal for lithography) by Owen (1846b: Pl. 47) in all details of size and shape, especially in blood vessel markings and erosion features (Fig. 1). This bone is therefore the lectotype of *Dinornis curtus* designated by Lydekker (1891). It is labelled with old stuck-on labels reading '*D. curtus*' in two places anteriorly, and with another label (antero-distally) with RCS numbers '2292, 2305, 2290' (one above the other), as well as inked with a '2292' and a star below the latter label. The RCS label overlies a round paper stuck-on label whose content has not been determined. Posteriorly, near the proximal end, there is a small label with a '44' on it, the significance of which is unknown. A large white label with black ink writing identifies the bone as '*Anomalopteryx didiformis, Quaternary, RCS No. 2292, Presented by W.D. Napier*' with the new catalogue number 'A5906'. This number is also inked on a small yellow label stuck to the bone distally.

Sharpe (1891) recorded the following data for the above Royal College of Surgeons numbers (Simon Chaplin, pers. comm. 13 Dec 2004):

> 2290: [*Anomalopteryx didiformis*] Right tibio-tarsus. Presented by HA Lautour, Esq.
> 2292: [*Anomalopteryx didiformis*] Four left tibio-tarsi. Marked "*D. curtus*, *D. rheides*, and *D. didiformis*.". Presented by WD Napier Esq.
> 2305: [*Anomalopteryx curta*] Left femur. Marked "*D. curtus*". No History.

It therefore appears that unknown persons tried to match the bone with the Sharpe catalogue and decided first that it could not be RCS2305, as it was originally numbered (centre, red inked number) because the bone is a tibiotarsus, rather than a femur. They first chose 2290 (pencilled lower crossed-out number) but, presumably since the bone is a left tibiotarsus, then decided that this too was incorrect and so settled on 2292, for which there are four recorded specimens, and then wrote this in Indian ink on the bone below the paper label.

Records in the BMNH show that the specimens with the RCS number 2292 were identified as *Dinornis didiformis* Owen, and that they were presented by W.D. Napier MRCSE, on 1 March 1858 (Sandra Chapman, pers. comm. 29 Oct 2004). This information cannot pertain to the bone now catalogued as A5906, which also carries the original RCS number 2305, and which is figured herein

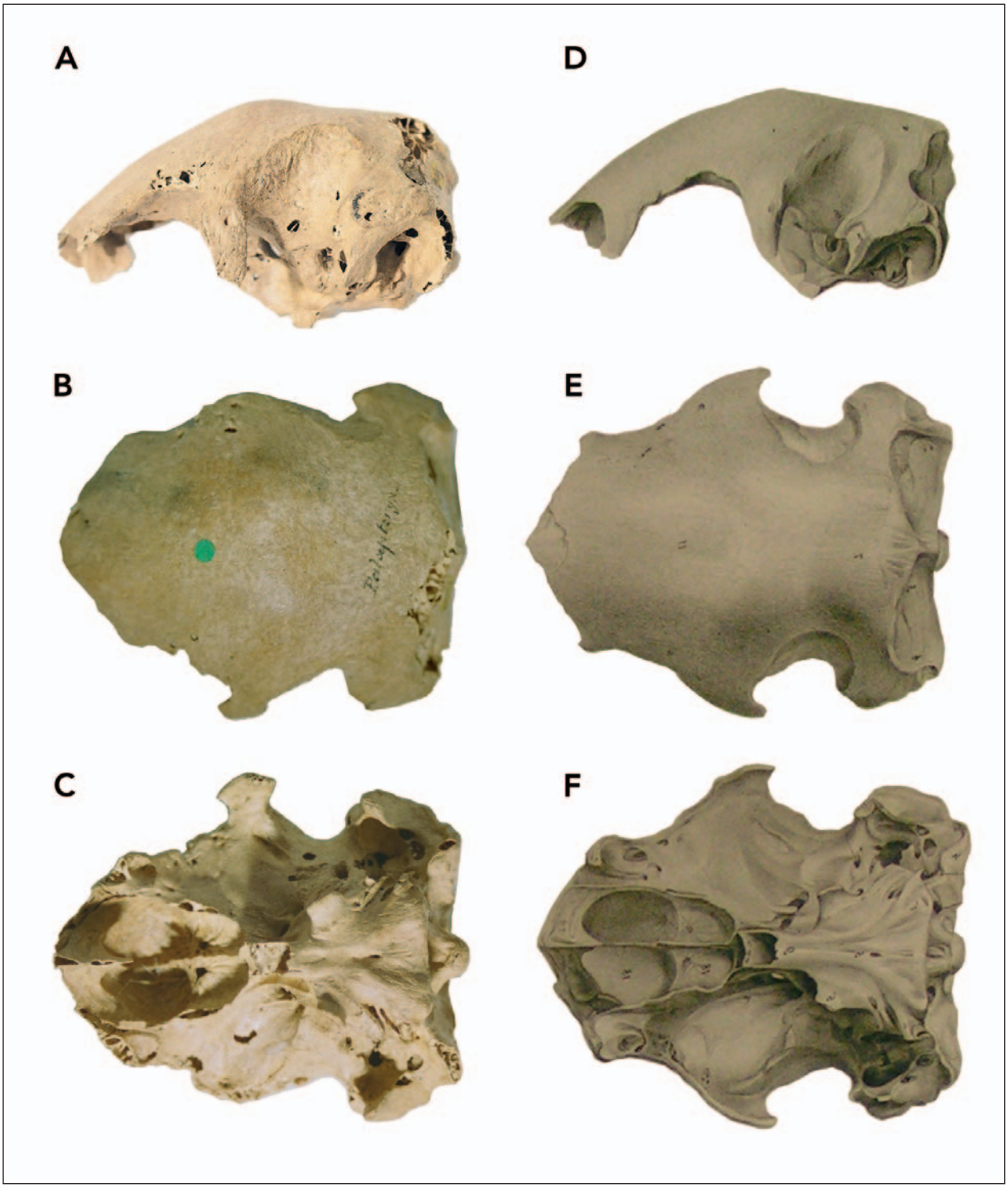

Fig. 2 The lectotypical cranium of *Palapteryx geranoides* Owen, 1848. Left column (A–C): actual specimen BMNH 21687. Right column (D–F): illustrations from (Owen, 1848b, Pl. 54) converted to a mirror image for ease of comparison. Left lateral (A, D), dorsal (B, E), and ventral (C, F) views. The fossil is quite fragile, a typical condition of dune material, and over the years has suffered considerable damage, with loss of the right postorbital area as well as damage to the left orbit, left paroccipital, and supraoccipital areas.

(Fig. 1), because Owen had it in the RCS in 1846, if not earlier, when he published the above noted lithographs of it on 28 December 1846 (Duncan 1937), calling it *Dinornis curtus*, which is the name recorded on the old stuck-on labels on the bone. There is at least one other tibiotarsus in the BMNH labelled A5906, that is *Anomalopteryx didiformis*, and which most likely does derive from the lot RCS 2292. It is stained dark brown and is clearly of peat-swamp derivation; thus it differs markedly from the lectotype. Specimen RCS 2290 is recorded as '*Anomalopteryx didiformis*, R tt. Quaternary New Zealand, presented by H.A. De Lautour, May 1881' (presented by RCS to BMNH in 1949), and now is registered as A5904 (Sandra Chapman, pers. comm. 16 Nov 2004). Therefore, it is probable that the original number RCS 2305 is correct, except that the bone was incorrectly entered in the Sharpe catalogue as a femur, when it is a tibiotarsus.

A further label tied onto the bone indicates that the specimen was sampled by Alan Cooper for DNA extraction. Amplification of genomic material has recently been possible and will be reported elsewhere (M. Bunce, pers. comm. 7 Dec 2004).

The bone depicted in Fig. 1 has the following measurements: length 282 mm, maximum proximal width 79 mm; proximal width from between the cnemial crests to the posterior margin of the articular surface 74 mm; mid-shaft width 25.8 mm; mid-shaft depth 18.4 mm; distal width 46.8 mm; medial condyle depth 45.2 mm; lateral condyle depth 41.1 mm; height (in anterior view) of medial condyle 25.5 mm; height (in anterior view) of lateral condyle 26.5 mm; fibular crest length 65 mm. The specimen exhibits the following features: proximal margin between the ectocnemial and procnemial crests is flat, not sloped proximally; the anterior facies between the fibular crest and the line extending from the procnemial crest is flat to slightly convex (not markedly convex); the nutrient foramen is slightly distad of the end of the fibular crest; posteriorly there is no groove between the condyles; in anterior view the medial profile slopes down to the medial condyle without a step. These features and the measurements of the bone, particularly as they relate to the low height and shallow depth of the distal condyles, are typical for bones currently referred to *Euryapteryx curtus* (*see* Worthy 1987, Worthy & Holdaway 2002). The rediscovery of the lectotype of *D. curtus* confirms that the current assignment of specimens to this taxon is correct.

Palapteryx geranoides Owen, 1848

(Figs 2–4)

The name *Palapteryx geranoides* was first used by Owen (1848a: 1, 7) without any data supporting the identification of the taxon and, therefore, those uses are *nomina nuda*. The name appears again as a *nomen nudum* in Owen (1848b: 346), in a table listing the numbers of moa bones in the Mantell Collection from Waingongoro, Taranaki, North Island, with the footnote 'This is an unpublished species defined from certain leg-bones sent home by the Rev. Mr. Cotton since the communication of my former Memoir, Part II.' Specifically, the following leg bones were listed from Waingongoro: ten right and five left femora, eight right and eight left tibiotarsi, nine right and four left fibulae, and seven right and six left tarsometatarsi. These numbers are greater than for any other listed taxon, clearly showing that Owen considered *P. geranoides* as the most common species in the collection.

The name *Palapteryx geranoides* became nomenclatorially available when it was applied to a specific bone fifteen pages later, where a cranium was described (Owen, 1848b: 361, Pl. 54, Figs 1–4, 7). Then, Owen (1848b: 363) described a partial mandible and a premaxilla, stating: 'accords in size with the cranium of *Palapteryx* above-described' (Owen 1848b: 365), effectively creating three syntypes. As Owen had not nominated a specific specimen as a type, Lydekker (1891: 288) designated the cranium (BMNH 21687) as the lectotype when he stated: 'The under-mentioned cranium, which must be taken as the type of *Palapteryx geranoides*…'.

The correctness of the ascription of the premaxilla and mandible to the cranium was questioned by Lydekker (1891) and by Oliver (1949), both of whom thought the mandible, at least, belonged to *Anomalopteryx*. The aforementioned table shows that Owen clearly associated the cranium with leg bones in the collection, of which he later illustrated so-named examples (Owen 1866: Pl. 55, Figs 5, 6 – left femur, now BMNH 21781; Pl. 57, Figs 5, 6 – right tarsometatarsus, now BMNH 21706). These leg bones have been recognised as belonging to *Pachyornis* since the description of *Pachyornis mappini* Archey, 1941 (e.g. Archey 1941, Worthy 1990). Moreover, Lydekker (1891: 288) recognised that these associated leg bones were similar to those of *Pachyornis*, being intermediate between those of *Pachyornis* [*elephantopus* (Owen, 1856)] and *Anomalopteryx*. He listed *Anomalopteryx* (?) *geranoides* within his

category 'C. Aberrant Group' defined as 'Distinguished from the preceding forms by the inflection of the distal extremity of the tibio-tarsus', which is now recognised as a characteristic feature of *Pachyornis* (e.g. Archey 1941).

Archey (1941) said of the lectotype of *Palapteryx geranoides*: 'It is, however, definitely of *Euryapteryx*' without further discussion. Later, Oliver (1949) stated that 'the cranium probably, and the premaxilla certainly, belong to *Euryapteryx*' and thus the binomial *Euryapteryx geranoides* (Owen, 1848) came to be first applied to larger forms of *Euryapteryx* from the North Island. However, it appears that neither Archey nor Oliver actually examined the bone, with both authors taking their data from Owen's and Lydekker's (1891) publications. Later, when the South Island species *Euryapteryx gravis* (Owen, 1870) was considered indistinguishable from southern North Island *Euryapteryx*, *E. geranoides* was applied to larger *Euryapteryx* specimens from both North and South Islands (Cracraft 1976a, Worthy 1988). Worthy (1992) accepted Owen's association of the mandible and premaxilla with the cranium and therefore regarded *E. geranoides* as emein, without considering *P. mappini* in his comparisons, and concluded that *E. geranoides* was distinct from *Euryapteryx curtus* and *Emeus*, but the same as *Euryapteryx gravis*.

However, in the knowledge that some of Owen's plates are not in fact accurate in detail, that isolated and damaged crania of North Island *Pachyornis* and *Euryapteryx* are superficially similar, and given the observation I had made in September 2003 that *Pachyornis mappini* was the dominant taxon amid the moa leg bones from the Mantell Collection at Waingongoro, a reassessment of the lectotype of *Palapteryx geranoides* was desirable.

I located BMNH 21687 in the Natural History Museum, London in September 2003. At that time, it was not identified as the lectotype of *Palapteryx geranoides* and it only had a small stuck-on label on the occipital area carrying its Lydekker number. In addition, it had '*Palapteryx*' written in ink on the dorsal surface. Comparison of BMNH 21687 with other moa taxa was made difficult, as there are no crania of either *Pachyornis mappini* or North Island *Euryapteryx* in the BMNH. I therefore re-examined and photographed Owen's specimen in September 2004 in London, then returned to New Zealand and compared it against a large series of crania of *Pachyornis mappini*, *Euryapteryx curtus* and *E. geranoides* in the Museum of New Zealand Te Papa Tongarewa (MNZ) (nomenclature sensu Worthy & Holdaway 2002).

Morphological analysis of cranium BMNH 21687

The catalogue number is written on a small yellow label on the left supraoccipital area and clearly identifies the specimen as that listed in Lydekker's catalogue (1891). Specimen BMNH 21687 appears to have suffered extensive damage since it was figured by Owen (1848b: Pl. 54), but essential similarities between the bone and Owen's plate still exist (*see* Fig. 2).

The specimen allows the following measurements to be taken: maximum width across zygomatic processes 60.5 mm; width at temporal fossae 43.8 mm; width between temporal ridges 38 mm; width between temporal and lambdoidal ridges 7.0 mm; estimated width across post-orbital processes 66 mm; olfactory chamber width 22 mm; length from paroccipital process to preorbital process 66.5 mm.

Among the many details Owen (1848b: 361–362) recorded were notably 'the major development of the mastoids [zygomatic processes] (8) and the olfactory chambers' and again 'the capacious olfactory chambers'. These features offer fundamental characters in the distinction of small members of the genus *Euryapteryx* from *Pachyornis* in the North Island. Specimen BMNH 21687 is clearly from a small moa belonging to a genus other than *Dinornis*, based on its smaller size and gross shape (Figs 2–4). It has relatively small temporal fossae that do not extend to the lambdoidal ridges and so differs markedly from *Anomalopteryx*, in which crania are also usually larger. In the North Island, there are presently three accepted taxa (Worthy & Holdaway 2002) that have crania of similar size to BMNH 21687: *Pachyornis*, with one species *P. mappini*, and *Euryapteryx* with two species, *E. curtus* and *E. geranoides*, that differ in size; however, it is bigger than any crania attributed to *E. curtus*. *Euryapteryx* and *Pachyornis* are very different in gross skull anatomy as, for example, the latter has a pointed bill, an inflated maxillary antrum, and a prominent descending nasal process, whereas the former has a blunt rounded bill, a collapsed maxillary antrum, and lacks a descending nasal process. However, the differences are subtler in isolated and damaged crania. Consistent differences between the genera include the following. *Pachyornis* has a relatively large olfactory chamber resulting in a broader prefrontal width, and *Euryapteryx* a relatively small chamber and narrower prefrontal width (Figs 2, 4). The enlarged olfactory

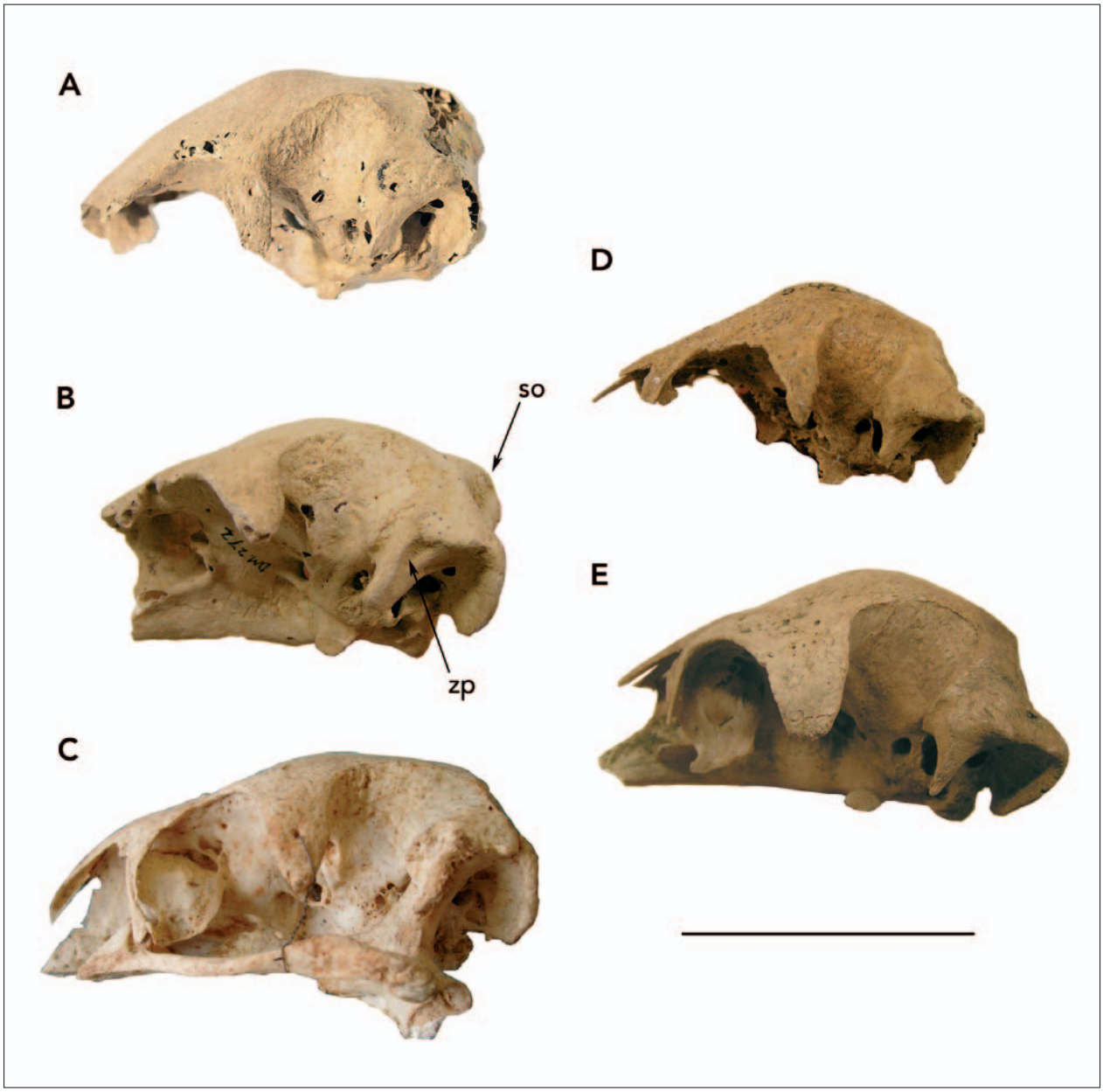

Fig. 3 Left lateral views of crania: (A) BMNH 21687; (B) *Pachyornis* '*mappini*' MNZ S272; (C) *P. mappini* Holotype AIM LB720, formerly Moa 124; (D) *Euryapteryx curtus* MNZ S42180; (E) *Euryapteryx gravis* MNZ S39016 (previously identified as *E. geranoides*). Abbreviations: so – supraoccipital prominence; zp – zygomatic process. Note the swollen supraoccipital prominence in *Pachyornis* (not visible in (C) because view is from slightly anterior of centred on lateral), lacking in *Euryapteryx*, and the much larger zygomatic processes whose bases extend to the dorsocaudal corner of the tympanic cavity in *Pachyornis*. Scale bar is 50 mm.

chamber causes the frontals in *Pachyornis* to extend further anterior of the postorbitals than in *Euryapteryx*. *Pachyornis* has a robust zygomatic process with a broad base whose caudal margin forms a straight line extending to the dorsocaudal point of the tympanic cavity, forming in lateral view a triangle with the ascending edge of the paroccipital flange (Fig. 3). In *Euryapteryx*, the zygomatic process is much smaller with the caudal margin reaching the dorsal part of the tympanic cavity well anterior of the caudal margin of that cavity. In lateral view, the postorbital process does not occlude any of the temporal fossa in *Pachyornis*, whereas it is directed farther caudally in *Euryapteryx* and so

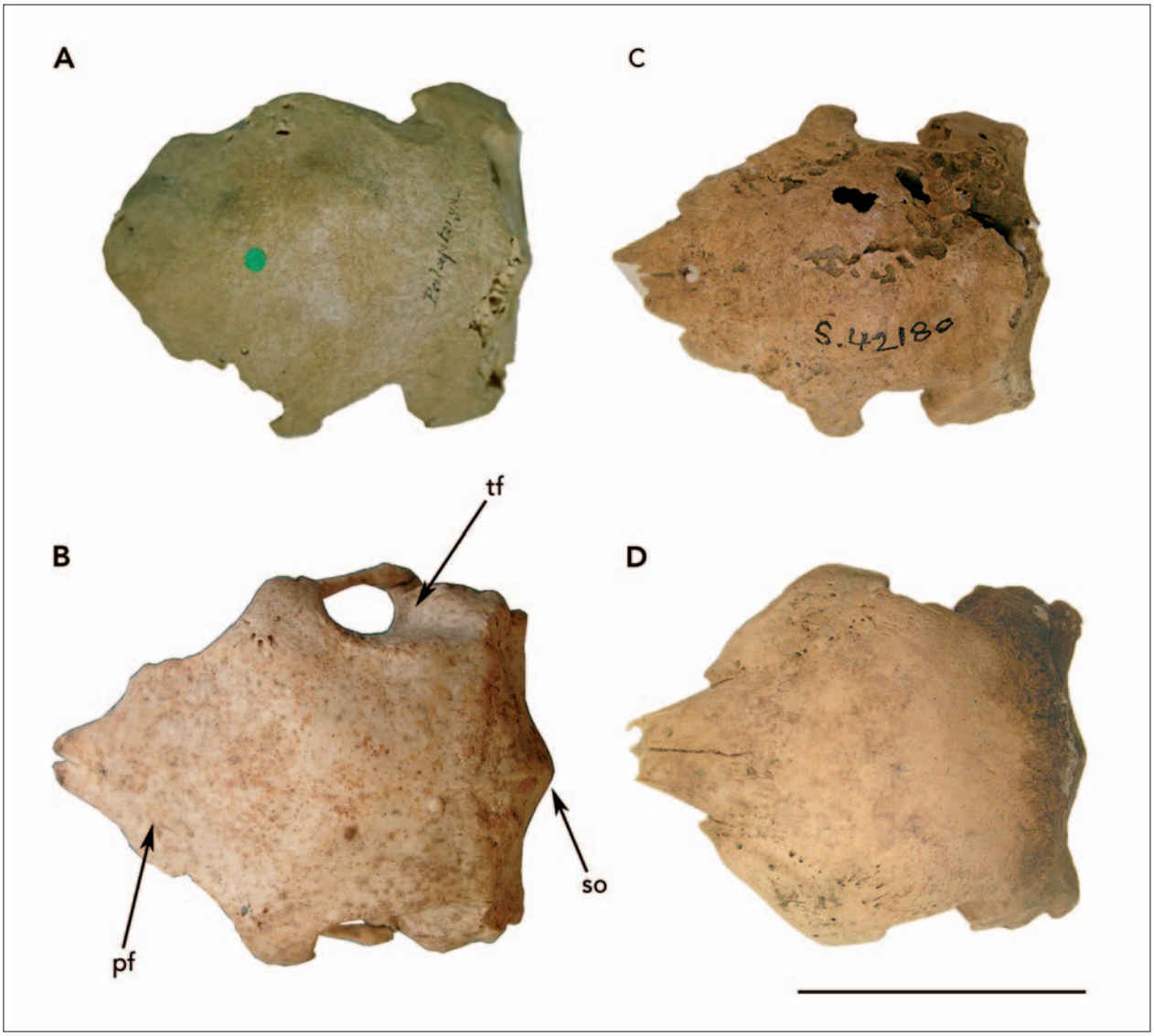

Fig. 4 Dorsal views of crania: (A) BMNH 21687; (B) *Pachyornis mappini* Holotype AIM LB720, formerly Moa 124; (C) *Euryapteryx curtus* MNZ S42180; (D) *Euryapteryx gravis* MNZ S39016. Abbreviations: pf – prefrontal region; so – supraoccipital prominence; tf – temporal fossa. Note especially the enlarged temporal fossae and relatively wider prefrontal region of *Pachyornis*. The prominence of the supraoccipital in (A) is obscured as the cranium is more tilted down anteriorly because of loss of the rostrum. Scale bar is 50 mm.

occludes part of the temporal fossa (Fig. 3). This has the effect that in dorsal view the temporal fossa forms a notch behind the postorbital process in *Euryapteryx*, but not in *Pachyornis*. *Pachyornis* crania have a characteristic inflated supraoccipital resulting in a swollen prominence that is much thickened on the dorsal margin of the occipital foramen. The supraoccipital is not thickened and so not as prominent in *Euryapteryx* (Figs 3, 4). In a larger series of skulls, I have found that the two features other than size used by Worthy (1992) to distinguish crania of *E. curtus* from *E. geranoides* both vary intraspecifically: *E. curtus* may have either poorly developed (usual condition) or prominent mamillar tuberosities (e.g. MNZ S25527) and the ridge forming the dorsal margin of the tympanic cavity sometimes continues over the zygomatic process in both small and large members of *Euryapteryx*, so creating a ridge in the profile of the zygomatic process. A secondary dorsal elevation to the crania appears to be related to small size and is not seen in crania with a postorbital width greater than 70 mm in either *Euryapteryx* or *Pachyornis*.

Cranium BMNH 21687 (Fig. 2) has a broad robust zygomatic process whose caudal margin extends to the dorsocaudal corner of the tympanic cavity, the postorbital process does not occlude any of the temporal fossa in lateral view, the olfactory chamber is large, and there is an inflated supraoccipital. This cranium matches in all features those of *Pachyornis mappini* (Fig. 3, 4), for example, the holotype of *Pachyornis mappini* held in the Auckland Museum (AIM LB720, formerly known as Moa 124), and specimens MNZ S272 and MNZ 36627. Therefore, I refer cranium BMNH 21687 to *Pachyornis mappini*. The only difference of potential significance between BMNH 21687 and AIM LB720 is that, in the latter, the temporal fossae extend caudally to abut the lambdoidal ridge, but they are separated in BMNH 21687. This feature is variable in *P. mappini*, where the temporal and lambdoidal ridges are usually well separated, but the temporal fossa rarely extend posteriorly to abut the lambdoidal, for example, as seen in MNZ S24408.7.

Considering that the lectotype of *Palapteryx geranoides* Owen, 1848 (BMNH 21687) is conspecific with the holotype of *Pachyornis mappini* Archey, 1941 (AIM LB720), the latter name becomes a junior synonym of the former, as indicated in the synonymy of the taxon *P. geranoides* given below. This new synonymy completes Owen's intention of applying the name *geranoides* to the form that was most abundant amid the moa leg bones from Waingongoro. As 'Mappin's moa' is no longer applicable as a vernacular name for this taxon, I suggest that *Pachyornis geranoides* be referred to as 'Mantell's moa' in recognition of the fact that Walter Mantell was first to collect it.

I did not find the part mandible and premaxilla (BMNH 21693–4) but, as figured by Owen (1848b: Pl. 54), they are clearly not referable to *Pachyornis* because they are not sharply pointed. Furthermore, as indicated by Lydekker (1891), they are too large to be associated with the cranium BMNH 21687. The mandible may well belong to *Anomalopteryx* but the premaxilla possibly does not. A reappraisal of these specimens is needed. Very small specimens of *Dinornis* (*D. struthoides* Owen, 1844, or male *D. novaezealandiae* Owen, 1843 sensu Bunce *et al.* 2003), *Anomalopteryx didiformis* (Owen, 1844), and *Euryapteryx curtus* are all present in the Waingongoro assemblage (Lydekker 1891, pers. obs.), and need to be considered in any such reappraisal.

The resultant effect of the above new synonymy is that all specimens currently referred to *Euryapteryx geranoides* (e.g. sensu Worthy & Holdaway 2002) need another name. *Euryapteryx gravis* is the next available name that will preserve the current separation of *Euryapteryx* into two taxa: *E. curtus*, a small exclusively North Island form, and *E. gravis*, a larger form found in both North and South Islands, known as the 'stout-legged moa'.

Designation of a lectotype for *Pachyornis* (*Mauiornis*) *septentrionalis* Oliver, 1949

Oliver (1949) based his description of *Pachyornis* (*Mauiornis*) *septentrionalis* on a portion of a skeleton (MNZ S129), from Te Pohue, Hawke's Bay. My examination of 'skeleton' MNZ S129 shows that it comprises parts of two individuals from two species. Both tibiotarsi in 'skeleton' MNZ S129 belong to *Anomalopteryx didiformis*, as was first determined by Alan Cooper from analysis of mitochondrial DNA on one of them (Cooper, pers. comm. June 1991). The tibiotarsi appear to be from a single individual and their identification as *A. didiformis* is supported by analysis of their morphology (pers. obs.). As Oliver (1949) did not designate any single element as the type, MNZ S129 includes several syntypes of *P.* (*M.*) *septentrionalis*, belonging to two taxa. As it is necessary to clarify the status of this taxon for my ongoing taxonomic analyses of moa, I hereby designate the sternum – which Oliver (1949: 61) stated was characteristic – as the **Lectotype** of *Pachyornis (Mauiornis) septentrionalis* Oliver, 1949.

History of the taxon and synonymy of *Pachyornis geranoides* (Owen, 1848)

In the following list, entries in bold are true synonyms, whereas the rest are different combinations of names or incorrect referrals of specimens of *Pachyornis geranoides* (Owen, 1848) to the listed taxon.

Palapteryx geranoides Owen, 1848 [April 13]: 1, 7. – *Nomina nuda.*

Palapteryx geranoides Owen, 1848 [April 22]: 346 – *Nomen nudum.*

***Palapteryx geranoides* Owen, 1848 [April 22]**: 361, Pl. 54, Figs 1–3. – **Lectotype**, designated by Lydekker

(1891): cranium, Te Rangatapu, Waingongoro, Taranaki.

Palapteryx; Mantell 1851: 118, Figs 28, 29.

Dinornis geranoides; Owen 1866: 395, 400, Pl. 65, Figs 5, 6 – left femur (now BMNH 21781).

Dinornis geranoides; Owen 1866: 402, Pl. 67, Figs 5, 6 – right tarsometatarsus (now BMNH 21706).

Dinornis curtus; Owen 1871: Pl. 44, Figs 7–10 – two right tarsometatarsi BMNH 46504 (Fig. 7), BMNH 21709b (Figs 8–10). **Not** *Dinornis curtus* Owen, 1846.

Palapteryx geranoides; Owen 1879: 183, Pl. 65, Figs 1–4 – cranium BMNH 21768.

Dinornis geranoides; Owen 1879: 243, 246, Pl. 68, Figs 5, 6 – left femur BMNH 21781.

Dinornis geranoides; Owen 1879: 245, 247, Pl. 70, Figs 5, 6 – right tarsometatarsus BMNH 21706.

Dinornis curtus; Owen 1879: 311, Pl. 87, Fig. 7 – right tarsometatarsus BMNH 46504, and Figs 8–10 – right tarsometatarsus BMNH 21709b. **Not** *Dinornis curtus* Owen, 1846.

Anomalopteryx (?) *geranoides* (Owen): Lydekker 1891: 288.

Anomalopteryx curta [sic]; Lydekker 1891: 281. In part, e.g. BMNH 21781.

Cela geranoides; Hutton 1891: 248. In part.

Cela geranoides; Hutton 1892: 126. In part.

Pachyornis pygmaeus (Hutton, 1891); Hutton 1895: 174, Pl. 9. **Not** *Euryapteryx pygmaeus* Hutton, 1891.

Pachyornis pygmaeus; Hutton 1897: 555. **Not** *Euryapteryx pygmaeus* Hutton, 1891.

Cela geranoides; Rothschild 1907: 206. In part.

Cela geranoides; Archey 1927: 151, Pls 18, 19.

Pachyornis pygmaeus; Archey 1927: 152 – right tarsometatarsus shown in Owen (1866: 402, Pl. 67, Figs 5, 6). **Not** *Euryapteryx pygmaeus* Hutton, 1891.

***Dinornis expunctus* Archey, 1927**:152. – Unnecessary *nomen novum* for *Palapteryx geranoides* Owen, 1848.

Pachyornis pygmaeus; Archey 1927: 156 – left and right femora, two left tibiotarsi. Karamu Cave, North Island. **Not** *Euryapteryx pygmaeus* Hutton, 1891.

Emeus exilis (Hutton, 1897); Oliver 1930: 49. In part.

Euryapteryx pygmaeus; Oliver 1930: 54. In part.

Emeus exilis; Lambrecht 1933: 148. In part.

***Pachyornis mappini* Archey, 1941**: 41; Pl. 4, Fig 4; Pl. 5, Fig 4; Pl. 7, Fig 3; Pl. 9, Fig 4; Pl. 10, Fig 4; Pl. 11, Fig 4; Pl. 12, Fig 5; Pl. 15, Fig 1. – **Type**: near complete skeleton, Mangaotaki, North Island. **New synonymy**

***Pachyornis* (*Mauiornis*) *septentrionalis* Oliver, 1949**: 61, Figs 29–37. – **Lectotype**: sternum, from MNZ S129, designated above. Te Pohue, Hawke's Bay. In part.

Pachyornis (Mauiornis) mappini; Oliver, 1949: 65, Figs 35, 37–40.

Pachyornis septentrionalis; Oliver 1955: 574.

Pachyornis mappini; Oliver 1955: 574.

Pachyornis mappini; Buist & Yaldwyn 1960: 79, Pls 1–5.

Pachyornis mappini; Brodkorb 1963: 211.

Pachyornis septentrionalis; Brodkorb 1963: 211.

Pachyornis mappini; Cracraft 1976a: 197.

Pachyornis mappini; Cracraft 1976b: 496.

Pachyornis septentrionalis; Yaldwyn 1979: 3. In part.

Pachyornis mappini; Millener 1982: 169. Fig 4.

Pachyornis mappini; Worthy 1987: 59, Figs 1–3.

Pachyornis mappini; Worthy 1988: 4, Figs 5, 14, 27.

Pachyornis mappini; Worthy 1989: 419.

Pachyornis mappini; Anderson 1989: 37.

Pachyornis mappini; Turbott 1990: 3.

Pachyornis mappini; Worthy 1990: 213.

Pachyornis mappini; Worthy 1991: 556.

Pachyornis mappini; Holdaway *et al.* 2001: 125.

Pachyornis mappini; Worthy & Holdaway 2002: 78, Figs 4.7, 4.14, A1–A5.

Pachyornis mappini; Huynen *et al.* 2003: 175.

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