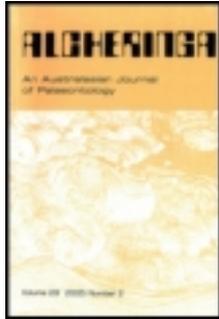


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Redescription of the Miocene penguin *Pseudaptenodytes macraei* Simpson (Aves: Sphenisciformes) and redefinition of the taxonomic status of *?Pseudaptenodytes minor* Simpson

TRAVIS PARK

PARK, T., 2014. Redescription of the Miocene penguin *Pseudaptenodytes macraei* Simpson (Aves: Sphenisciformes) and redefinition of the taxonomic status of *?Pseudaptenodytes minor* Simpson. *Alcheringa* 38, ISSN 0311-5518.

Pseudaptenodytes macraei is redescribed in detail using current avian anatomical terminology. The age of the species is constrained to the late Miocene, and two humeral autapomorphies are identified for the species: a flattened elliptical ventral portion of the fossa tricipitalis and a curved margo cranialis lacking a preaxial angle. *Pseudaptenodytes macraei* is a distinct taxon based on a diagnostic-type specimen, but it is recommended that the nominal congener *Pseudaptenodytes minor* be designated a *nomen dubium* pending the discovery of more complete material.

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Key words: Aves, bird, fossil penguin, Australia, late Miocene.

THE past two decades have seen a proliferation of research on fossil penguins (Spheniscidae) with the discovery of numerous informative specimens illuminating key stages in the group's evolution (Tambussi *et al.* 2005, Slack *et al.* 2006, Acosta Hospitaleche *et al.* 2007, Göhlich 2007, Ksepka & Clarke 2010, Jadwiszczak & Chapman 2011, Ksepka *et al.* 2012, Jadwiszczak *et al.* 2013). Despite this surge of research, Australian fossil penguins have received only minor attention with a few fossil species named in the early 1970s (Simpson 1970) and the last taxonomic work published in the 1980s (Jenkins 1985). However, current investigations are seeking to clarify the history of spheniscids on the continent (Park & Fitzgerald 2012). In this context, the late Miocene taxon, *Pseudaptenodytes macraei* Simpson, 1970, was restudied in an effort to augment the originally brief description using contemporary avian anatomical terminology and determining a refined geological age.

Materials and methods

Institutional abbreviations. NMV P: Museum Victoria Palaeontology Collection, Melbourne, Victoria, Australia. NMV B, NMV R, NMV O: Museum Victoria Ornithology Collection, Melbourne, Australia.

Museum Victoria (NMV) specimens compared with *Pseudaptenodytes macraei* include *?Pseudaptenodytes minor* Simpson, 1970 (partial left humerus of paratype

NMV P26671) and *Aptenodytes forsteri* Gray, 1845 (left humerus of NMV B18320), *Aptenodytes patagonicus* Miller, 1778 (left humerus of NMV B30374), *Anthropodyptes gilli* Simpson, 1959 (holotype right humerus NMV P17167), *Eudyptes chrysocome* Forster, 1781 (left humerus of NMV B7885), *Eudyptes moisleyi* Matthews & Iredale, 1921 (left humerus of NMV W6357), *Eudyptes pachyrhynchus* Gray, 1844 (left humeri of NMV B7879, NMV B7889), *Eudyptes robustus* Oliver, 1953 (left humerus of NMV B19894), *Eudyptes schlegeli* Finsch, 1876 (left humeri of NMV B30164, NMV B6232), *Eudyptula minor* Forster, 1781 (left humerus of NMV W8850), *Pygoscelis adeliae* Hombron & Jacquinot, 1841 (left humerus of NMV R6546), *Pygoscelis antarctica* Forster, 1781 (left humerus of NMV B12925), *Pygoscelis papua* Forster, 1781 (left humerus of NMV B7877), *Spheniscus demersus* Linnaeus, 1758 (left humerus of NMV B18433). Comparisons were also made with all Neogene taxa from the phylogeny published by Ksepka *et al.* (2012) using images from various previous papers.

Measurements were taken using Mitutoyo Absolute Digimatic CD-600CSX callipers. Osteological and orientational terminology follow Baumel & Witmer (1993). This study advocates the traditional classification of penguins in which Sphenisciformes is the Order to which the single family, Spheniscidae, belongs. Spheniscidae contains all known fossil and extant penguin species.

Systematic palaeontology

Class AVES Linnaeus, 1758

Order SPHENISCIFORMES Sharpe, 1891

Family SPHENISCIDAE Bonaparte, 1831

Pseudaptenodytes Simpson, 1970

Type and only included species. *Pseudaptenodytes macraei* Simpson, 1970 (see taxonomic status below).

Emended diagnosis. Humerus possessing the following autapomorphies: ventral partition of fossa tricipitalis distinctly shaped as a flattened ellipse; margo cranialis in form of a gentle curve.

Pseudaptenodytes macraei Simpson, 1970

Material. NMV P26668, partial left humerus lacking distal end, presented to Museum Victoria (then National

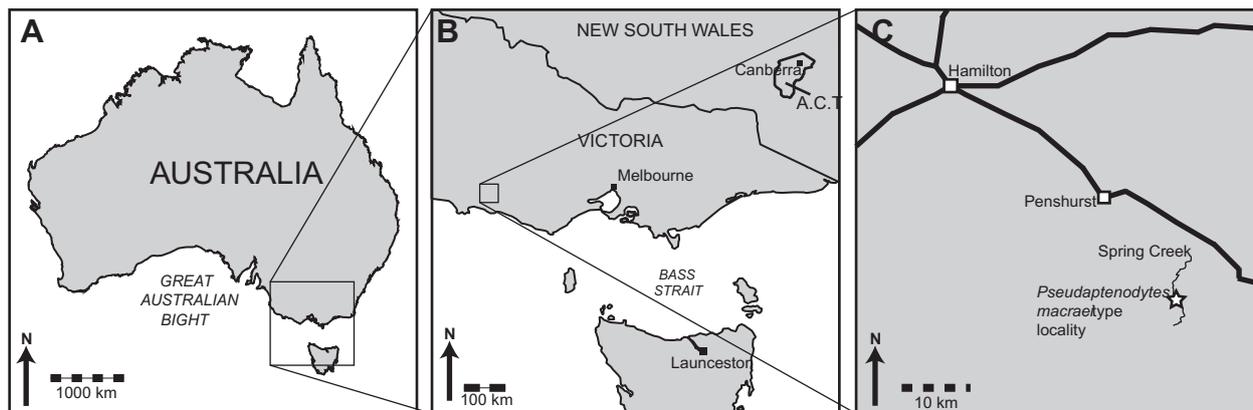


Fig. 1. Map showing location of *Pseudaptenodytes macraei* holotype locality (38°00'S, 142°25'E).

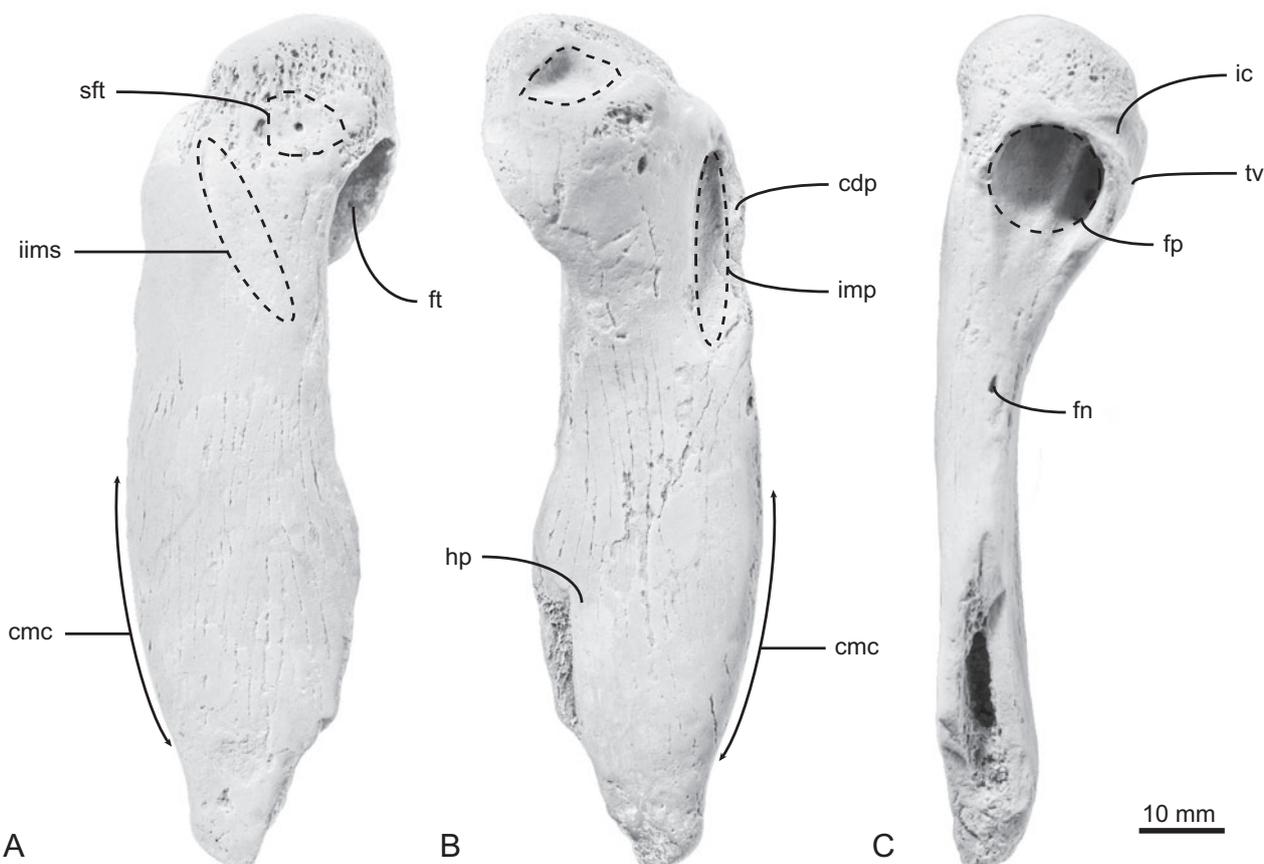


Fig. 2. *Pseudaptenodytes macraei*, NMV P26668, a partial left humerus, in: A, dorsal; B, ventral; and C, caudal views. Abbreviations: cdp, crista deltopectoralis; cmc, curved margo cranialis; fn, foramen nutriens; ft, fossa tricipitalis; hp, humeral plexus; ic, incisura capitis; iims, impressio insertii m. supracoracoideus; imp, impressio m. pectoralis; sft, secondary fossa tricipitalis; tv, tuberculum ventrale. Specimen coated with ammonium chloride (NH₄Cl). Scale bar = 10 mm.

Region	Length (mm)
Preserved length (proximal most point of head to distal most preserved part)	100.0
Craniocaudal width at level of distal edge of fossa pneumotricipitalis	21.7
Craniocaudal width at level of widest point of specimen	26.4
Dorsoventral thickness at level of distal edge of fossa pneumotricipitalis	19.2
Dorsoventral thickness at level of widest point of specimen	19.5

Table 1. Dimensions of *Pseudaptendytes macraei*, NMV P26668.

Museum of Victoria) by Mr J. Milligan on 26 October 1916.

Locality. Spring Creek near Minhamite, 41 km southeast of Hamilton, Victoria, Australia (38°00'S, 142°25'E; Fig. 1).

Formation and age. The holotype is derived from the Goodwood Formation, a green-grey marly fine sand with abundant pebbles (Gill 1964, p. 332). The macroinvertebrate assemblage is similar to that of the upper Miocene–lower Pliocene Black Rock Sandstone (Gill 1964, Simpson 1970). The age of the Goodwood Formation is late Miocene, 6.0–7.5 Ma (Tortonian–Messinian) based on molluscan biostratigraphy of the Spring Creek locality (Beu & Darragh 2001).

Diagnosis. Shaft robust and sigmoid. Pit for ligament insertion adjacent to the humeral head absent. Humerus size most similar to that of the extant *Aptendytes patagonicus*.

Referred material. A partial right carpometacarpus (NMV P27055) and a partial left carpometacarpus (NMV P27056) were tentatively referred to this species (Simpson 1970, Park & Fitzgerald 2012). Both specimens were derived from the upper Miocene–lower Pliocene (5.0–6.2 Ma, Messinian–Zanclean) Black Rock Sandstone at Beaumaris, Victoria, Australia.

Description. The holotype (NMV P26668) is an incomplete left humerus lacking its distal end (Fig. 2, Table 1). In proximal view, the humeral head possesses the characteristic reniform shape of all penguins (although this is also seen in the Northern Hemisphere flightless seabird group the Plotopteridae; Mayr 2005). The caudal-most portions of the humeral head and the tuberculum dorsale have been abraded away. Despite erosion, the pit for ligament insertion adjacent to the humeral head appears to have been originally absent.

In ventral view, the sulcus transversus forms an almost rectangular shelf adjacent to the humeral head. The sulcus transversus is clearly separated from the incisura capitis. The impressio m. pectoralis is a deep

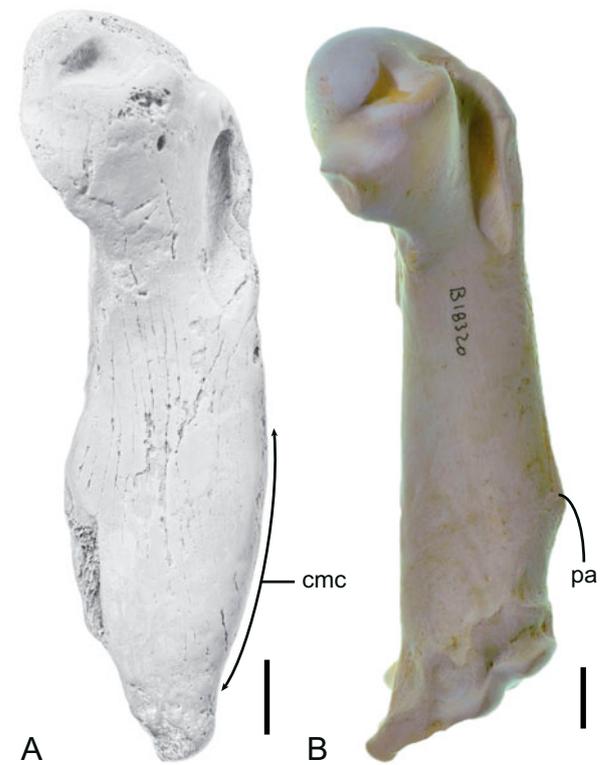


Fig. 3. Differences in the shape of the margo cranialis between: A, *Pseudaptendytes macraei*, NMV P26668; and B, *Aptendytes forsteri*, NMV B18320. Abbreviations: cmc, curved margo cranialis; pa, preaxial angle. *Pseudaptendytes macraei* coated in ammonium chloride (NH₄Cl). Scale bar = 10 mm.

oblong fossa. The humeral plexus is indicated by the presence of a single sulcus that runs obliquely to the long axis of the shaft just proximal of the break.

In dorsal view, the apex (most proximal point) of the humeral head is situated caudal to the midline of the humerus, a feature found in post-Oligocene penguin taxa (pers obs 2012). The insertii m. supracoracoideus runs slightly obliquely to the long axis of the humeral shaft. The insertii m. latissimus dorsi has not been preserved; thus the distance between these two features can not be ascertained. The secondary tricripital fossa is severely abraded but the incisura capitis clearly does not extend onto it. There is no distinct preaxial angle, rather the margo cranialis forms a gentle curve (Fig. 3), which appears to be a unique trait for this taxon. Simpson (1970) stated that the preaxial angle was ‘probably present’, but this examination could not confirm such an inference irrespective of erosional damage.

In caudal view, the coracobrachialis caudalis scar has been abraded but is still present. The texturing is obliquely distributed and contacts the distal margin of the humeral head. The proximal border of the fossa tricripitalis is concave and does not project caudally. The fossa tricripitalis is strongly bipartite, and the ventral partition is elliptical in outline (Fig. 4). The tuberculum ventrale, although abraded, is observable and is oriented ventrocaudally. The foramen nutiens is located on the

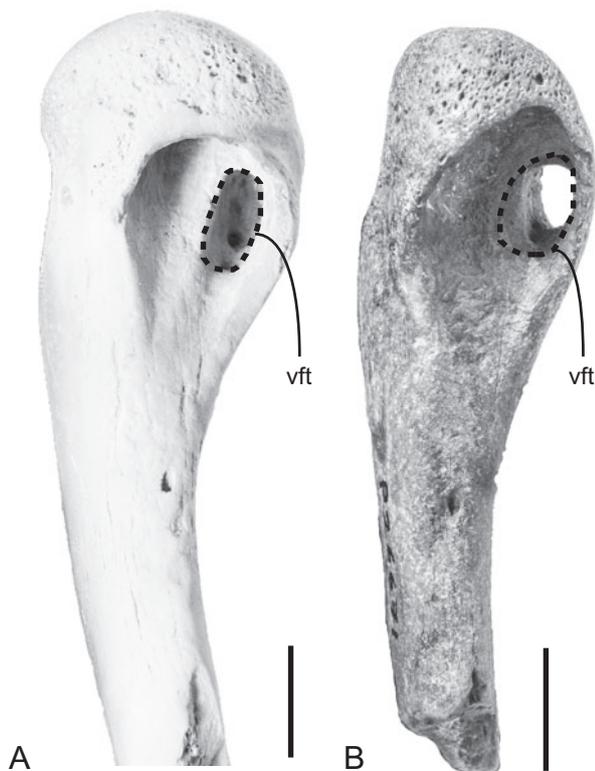


Fig. 4. Differences in the shape of the ventral partition of the fossa tricripitalis between: A, *Pseudaptendytes macraei*, NMV P26668; and B, *?Pseudaptendytes minor*, NMV P26671. Abbreviation: vft, ventral partition of fossa tricripitalis. *Pseudaptendytes macraei* coated in ammonium chloride (NH₄Cl). Scale bar = 10 mm.

caudal surface of the shaft, 15.82 mm distal to the distal border of the fossa tricripitalis.

Comparisons. *Pseudaptendytes macraei* differs from *Paraptendytes antarcticus* by having the apex of the humeral head located caudally to the midline of the shaft. It also contrasts with *Aptendytes forsteri*, *Pygoscelis papua*, *Megadyptes antipodes*, *Eudyptes* spp., *Eudyptula minor*, *Spheniscus* spp., *Eretiscus tonnii* and *Marplesornis novaezealandiae* in lacking a pit for ligament insertion adjacent to the humeral head (*Aptendytes patagonicus* and *Palaeospheniscus* spp. are variable in this character state depending on the individual). *Spheniscus* spp. can be distinguished from *P. macraei* via its concave proximal margin of the fossa pneumotricripitalis (*E. minor* exhibits polymorphic expression of this trait). *Pseudaptendytes macraei* further differs from *A. gilli* and *P. antarcticus* in possessing a bipartite fossa pneumotricripitalis, and from *P. antarcticus* in having a foramen nutriens situated on the caudal face of the humeral shaft. Finally, a rounded cranial margin of the humerus seems to be autapomorphic for *P. macraei*.

Taxonomic status of *Pseudaptendytes minor*

Simpson (1970) noted that a specimen (NMV P26671) referred to *P. minor* also has a similar-shaped ventral

partition of its fossa tricripitalis (Fig. 4). Although NMV P26671 does possess a small ventral partition, it lacks the flattened elliptical shape of *P. macraei*. The holotype of *?P. minor* (NMV P26669) is too incomplete to permit meaningful comparisons (Park & Fitzgerald 2012, fig 14). Consequently, *?P. minor* should be considered a *nomen dubium* pending the discovery of more complete material that would permit adequate circumscription of the species; thus *Pseudaptendytes* should be treated as a monotypic genus.

Conclusions

Pseudaptendytes macraei is identifiable as a valid taxon of fossil penguin on the basis of at least two unambiguous autapomorphies: a flattened elliptical ventral portion of the fossa tricripitalis; and curved margo cranialis lacking a preaxial angle. It can also be differentiated from the majority of modern penguin taxa by lacking a pit for ligament insertion adjacent to the humeral head. The characteristic morphology but unfortunately limited number of specimens (a single incomplete humerus) inhibit a phylogenetic appraisal. Nevertheless, the genus *Pseudaptendytes* should be considered monotypic based on the lack of diagnostic material for *?P. minor*.

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