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A late Miocene–early Pliocene Mihirung bird (Aves: Dromornithidae) from Victoria, southeast Australia

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An incomplete tarsometatarsus identified as an indeterminate species of Dromornithidae is described from the upper Miocene–lower Pliocene shallow marine Black Rock Sandstone at Beaumaris, Victoria, Australia. This isolated specimen represents one of the few pre-Pleistocene dromornithids with a well-constrained geologic age. Additionally, it is one of the few pre-Quaternary dromornithid fossils recorded from southeast Australia. Comparisons with known dromornithid taxa suggest that the Beaumaris dromornithid is distinct from previously established species. This hitherto unknown species of dromornithid in the late Neogene of southeastern Australia cautions against deriving evolutionary patterns solely on the basis of fossils from northern Australia.

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Key words: Aves, bird, Dromornithidae, Australia, Miocene, Pliocene, fossil.

THE DROMORNITHIDAE or 'Mihirungs' are an extinct group of giant flightless cursorial birds that were endemic to Australia. Originally interpreted as ratites (Owen 1872, Fürbringer 1888, Stirling & Zietz 1896, Rich 1979), dromornithids were shown by Murray & Megirian (1998) to be neognathous birds in the Anseriformes. Nonetheless, it remains debatable as to which anseriform group is sister to Dromornithidae (Murray & Vickers-Rich 2004, Olson 2005, Agnolin 2007). Furthermore, the monophyly of the Mihirungs has been questioned (Olson 2005). Assuming monophyly, dromornithid fossils are known from the late Oligocene through to the late Pleistocene (Field & Boles 1998, Nguyen *et al*. 2010). An ancient origin for the group is implied by a possible dromornithid foot impression from the early Eocene of Queensland (Vickers-Rich & Molnar 1996). Following an overdue taxonomic revision of the Dromornithidae (Nguyen *et al*. 2010), the family includes seven accepted species in four genera, with a geographic distribution including every state except Western Australia (Table 1). Among other states, Victoria has a meagre record and until now, no pre-Pleistocene Dromornithidae. Here we document the geologically oldest occurrence of the Dromornithidae from Victoria and among the oldest osteological remains from southeast Australia: a partial right tarsometatarsus from the Black Rock Sandstone (upper Miocene–lower Pliocene, 6.2–5.0 Ma: Dickinson & Wallace 2009) at Beaumaris on Port Phillip Bay (Fig. 1).

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Materials and methods

Institutional abbreviations. NMV P: Museum Victoria Palaeontology Collection, Melbourne, Victoria, Australia. SAM P: South Australia Museum Palaeontology Collection, Adelaide, South Australia, Australia.

Museum Victoria (NMV) specimens compared include *Genyornis newtoni* Stirling & Zietz, 1896, (right tarsometatarsus cast NMV P207016 of SAM P17024) and *Ilbandornis* sp. (Rich 1979), (right tarsometatarsi NMV P231823 and NMV P231825). All other comparisons were made from figures presented by Stirling & Zietz (1900), Rich (1979), Murray & Vickers-Rich (2004) and Nguyen *et al*. (2010). Measurements were taken using Mitutoyo Absolute Digimatic CD-6″CSX callipers. Osteological terminology follows Baumel & Witmer (1993). Taxonomy follows the systematic revision of Nguyen *et al*. (2010; Table 1).

Systematic palaeontology

Class AVES Linnaeus, 1758
Order ANSERIFORMES Wagler, 1831
Suborder ANHIMAE Wetmore & Miller, 1926
Family DROMORNITHIDAE Fürbringer, 1888

Genus	Species	Age	Locality	Reference	ptw (mm)	pd (mm)
Barawertornis	*tedfordi*	Early to middle Miocene	Riversleigh, NW Qld	Rich (1979)	–	–
Dromornis	*australis*	?late Pliocene	Peak Downs, SE Qld	Owen (1872)	N/A	N/A
Dromornis	*planei*	Middle Miocene	Bullock Creek, W NT	Rich (1979)	120.0	> 20.4
Dromornis	*stirtoni*	Late Miocene to early Pliocene	Alcoota, S NT	Rich (1979)	*ca* 180.0	110.0
Genyornis	*lawsoni*	Late Miocene to early Pliocene	Alcoota, S NT	Rich (1979)	77.3	–
Genyornis	*newtoni*	Pleistocene	Lake Callabonna, NE SA	Stirling & Zietz (1896)	95.0–111.0	*ca* 75.9–*ca* 85.0
Ilbandornis	sp.	Middle Miocene	Bullock Creek, W NT	Rich (1979)	74.0–80.0	60.0
Ilbandornis	*woodburnei*	Late Miocene to early Pliocene	Alcoota, S NT	Rich (1979)	80.0–85.0	65.0–70.0
NMV P161489		Late Miocene to early Pliocene	Beaumaris, S Vic	This work	> 70.4	> 51.7

Table 1. Summary of all known dromornithid species, their localities, temporal distribution and tarsometatarsi measurements: Qld, Queensland; N/A, not applicable; NE, Northeast; NT, Northern Territory; NW, Northwest; pd, proximal depth; ptw, proximal transverse width; S, South; SA, South Australia; SE, Southeast; Vic, Victoria; W, West.

Dromornithidae indet. (Fig. 2)

Material. NMV P161489, proximal end of a right tarsometatarsus, collected by J. E. Dixon on 15/9/1919 (Fig. 2).

Locality. Western shore of Beaumaris Bay at Beaumaris, northeast side of Port Phillip Bay, central coastal Victoria, southeast Australia, near 37°59′34″S, 145°02′32″E.

Unit. Upper Miocene–lower Pliocene Black Rock Sandstone.

Description and comparisons. Tarsometatarsi are known for all dromornithid species, except *Dromornis australis* Owen, 1872, which is known only from an isolated femur (Rich 1979; Table 1). These tarsometatarsi were described in detail by Rich (1979) and Murray & Vickers-Rich (2004). Additional *Barawertornis tedfordi* Rich, 1979 tarsometatarsi were described by Nguyen *et al*. (2010). Museum Victoria (NMV) specimen P161489 is an incomplete right tarsometatarsus (Fig. 2). Only the most proximal part of the shaft and the extremitas proximalis are preserved; erosion of the extremitas proximalis has obliterated most details on this surface. The maximum proximodistal length of the specimen is 147.0 mm; maximum proximal transverse width is 70.4 mm; maximum proximal depth (dorsoventrally) is 51.7 mm. As a consequence of erosion, the proximal transverse width and proximal depth metrics represent minimum values. In cross-section, the shaft is almost rectangular proximally, becoming triangular distally. Viewed dorsally (Fig. 2A): the eminentia intercotylaris is greatly reduced; the fossa infracotylaris dorsalis is wide and moderately deep, its proximal border situated 20.9 mm distal to the most proximal point of the specimen; the two large and one small foramen vascularia proximalia are situated within the fossa infracotylaris dorsalis, 52.0 mm distal of the most proximal point of the specimen; and the sulcus extensorius is shallow. Plantarly (Fig. 2C): the hypotarsus is broad, lacks ridges, has a slight medial curve; and the plantar openings of the foramina vascularia proximalia occur on either side of the hypotarsus, with the lateral foramen situated slightly further proximal than the medial foramen. Viewed laterally, the specimen becomes dorsoplantarly compressed towards its distal extremity (Fig. 2B).

NMV P161489 is diagnosed as a dromornithid, distinguished from other Australian large flightless birds, i.e., Casuariidae, by: much larger size; robustness; less pronounced sulcus extensorius; and a broad hypotarsus. Within Dromornithidae, NMV P161489 can be distinguished from *Dromornis* species by its significantly smaller size (Table 1). Although the dimensions of NMV P161489 are some of the smallest recorded for a dromornithid, a more complete speci-

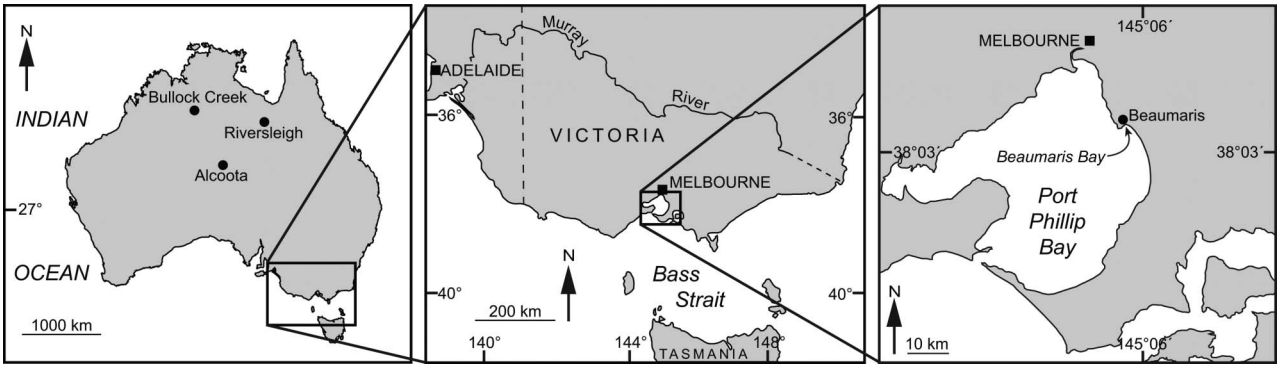

Fig. 1. Map showing the location of the Beaumaris fossil locality and major pre-Pleistocene dromornithid localities in northern Australia.

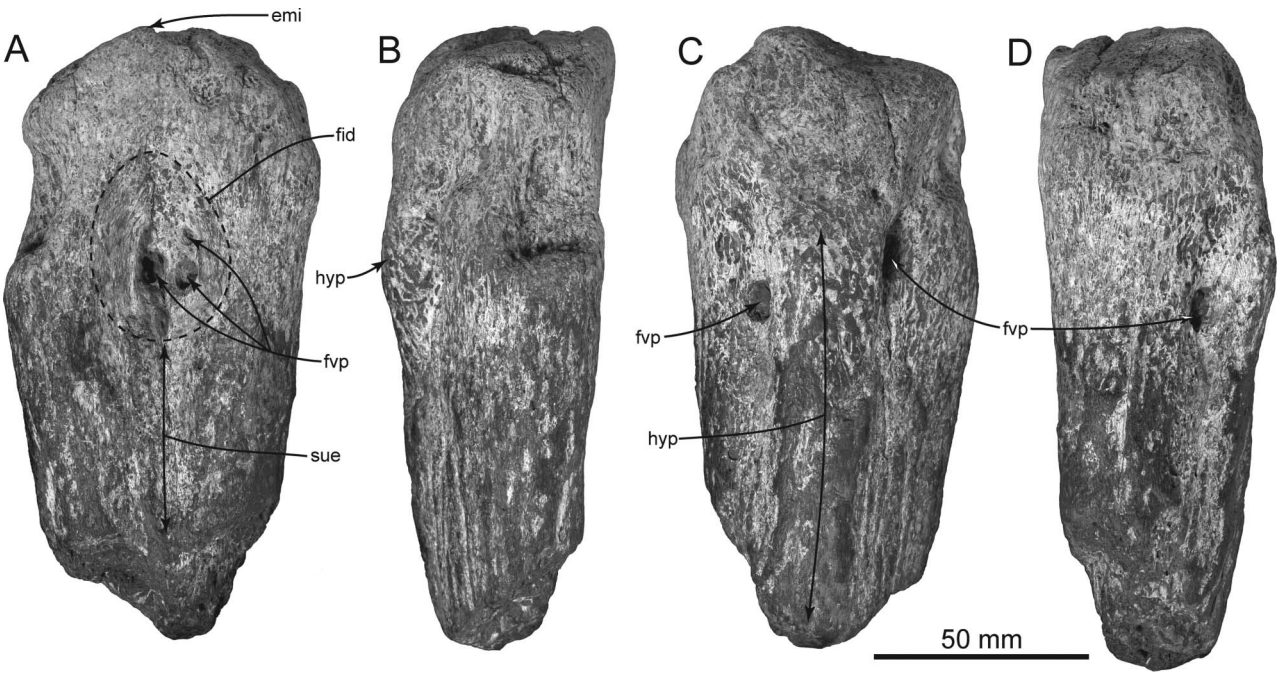

Fig. 2. Dromornithidae indet., NMV P161489, a partial right tarsometatarsus, in: **A**, anterior; **B**, lateral; **C**, posterior; and **D**, medial views. Abbreviations: emi, eminentia intercotylaris; fid, fossa infracotylaris dorsalis; fvp, foramen vascularia proximalia; hyp, hypotarsus; sue, sulcus extensorius.

men (without the erosion on NMV P161489) could conceivably fall within the size range of *Genyornis newtoni* Stirling & Zietz, 1896. Nonetheless, NMV P161489 differs from all other dromornithids by its lack of a distal foramen vascularia (referred to as a 'nutrient canal' by Rich 1979 and Stirling & Zietz 1900). NMV P161489 is considered here to be Dromornithidae, genus and species indet.

Discussion

With a geological age of 6.2–5.0 Ma, NMV P161489 is the oldest dromornithid recorded from Victoria by at least four million years. Previously, the only known dromornithid remains from Victoria were postcranial fragments from the late Pleistocene of Lancefield Swamp (Murray & Vickers-Rich 2004). The fragmentary nature of NMV P161489 prohibits its identification beyond Dromornithidae. Yet this isolated record confirms the presence of Dromornithidae in coastal Victoria during the late Miocene–early Pliocene. At least three species of dromornithid are known from penecontemporaneous assemblages elsewhere in Australia: *Dromornis stirtoni* Rich, 1979, *Genyornis lawsoni* and *Ilbandornis woodburnei* (Murray & Vickers-Rich 2004), and fragmentary material tentatively assigned to *Ilbandornis* sp. is known from the Curramulka Local Fauna in South Australia (Pledge 1992). Our comparisons between NMV P161489 and these taxa suggest that the Victorian specimen can not be referred to any described species. This hints at a greater diversity of late Neogene dromornithids than currently recognized and cautions against deriving broader evolutionary patterns solely from the Alcoota

Local Fauna. Despite the Black Rock Sandstone's deposition in shallow marine conditions, other terrestrial vertebrates (Diprotodontidae and Palorchestidae) have been recorded from this unit (Fitzgerald 2004, Piper *et al*. 2006). This occurrence of terrestrial vertebrates in a marine unit (with robust stratigraphic control and correlation to the Standard Chronostratigraphic Scale: Dickinson & Wallace 2009) renders the Beaumaris Local Fauna a key calibration point for the Waitean Australian Land Mammal Age (ALMA: Megirian *et al*. 2010). The Beaumaris Local Fauna and its approximate correlate the Alcoota Local Fauna share diprotodontid species (Woodburne *et al*. 1985). With the potential for dromornithid preservation at Beaumaris now realized, future discovery of more diagnostic fossils may facilitate further detailed correlation and calibration with the Alcoota Local Fauna and the Waitean ALMA.

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References

Agnolin, F.L., 2007. *Brontornis burmeisteri* Moreno & Mercerat, un Anseriformes (Aves) gigante del Mioceno medio de Patagonia, Argentina. *Revista del Museo Argentino de Ciencias Naturales 9*, 15–25.

Baumel, J.J. & Witmer, L.M., 1993. Osteologia. In *Handbook of Avian Anatomy: Nomina Anatomica Avium*. Baumel, J.J., King, A.S., Breazile, J.E., Evans, H.E. & Vanden Berge, J.C., eds, Publications of the Nuttall Ornithological Club 23, 45–132.

Dickinson, J.A. & Wallace, M.W., 2009. Phosphate-rich deposits associated with the Mio-Pliocene unconformity in south-east Australia. *Sedimentology 56*, 547–565.

Field, J.H. & Boles, W.E., 1998. *Genyornis newtoni* and *Dromaius novaehollandiae* at 30,000 b.p. in central northern New South Wales. *Alcheringa 22*, 177–188.

Fitzgerald, E.M.G., 2004. A review of the Tertiary fossil Cetacea (Mammalia) localities in Australia. *Memoirs of Museum Victoria 61*, 183–208.

Fürbringer, M., 1888. *Untersuchungen zur Morphologie und Systematic der Vögel*. Van Holkema, Amsterdam, 1751 pp.

Linnaeus, C., 1758. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Edition decima, reformata. Impensis Direct. Laurentii Salvii, Holmiae, Stockholm, 824 pp.

Megirian, D., Prideaux, G.J., Murray, P.F. & Smit, N., 2010. An Australian land mammal age biochronological scheme. *Paleobiology 36*, 658–671.

Murray, P.F. & Megirian, D., 1998. The skull of dromornithid birds: anatomical evidence for their relationship to Anseriformes. *Records of the South Australian Museum 31*, 51–97.

Murray, P.F. & Vickers-Rich, P., 2004. *Magnificent Mihirungs: the Colossal Flightless Birds of the Australian Dreamtime*. Indiana University Press, Bloomington, 410 pp.

Nguyen, J.M.T., Boles, W.E. & Hand, S.J., 2010. New material of *Barawertornis tedfordi*, a dromornithid bird from the Oligo-Miocene of Australia, and its phylogenetic implications. *Records of the Australian Museum 62*, 45–60.

Olson, S.L., 2005. Review of Magnificent Mihirungs: the Colossal Flightless Birds of the Australian Dreamtime. *The Auk 122*, 367–371.

Owen, R., 1872. [Untitled]. *Proceedings of the Zoological Society of London 1872*, 682–683.

Piper, K.J., Fitzgerald, E.M.G. & Rich, T.H., 2006. Mesozoic to early Quaternary mammal faunas of Victoria, south-east Australia. *Palaeontology 49*, 1237–1262.

Pledge, N.S., 1992. The Curramulka Local Fauna: a new Late Tertiary fossil assemblage from Yorke Peninsula, South Australia. *The Beagle, Records of the Northern Territory Museum of Arts and Sciences 9*, 115–142.

Rich, P.V., 1979. The Dromornithidae, an extinct family of large ground birds endemic to Australia. *Bulletin of the Bureau of Mineral Resources, Geology and Geophysics 184*, 1–194.

Stirling, E.C. & Zietz, A.H.C., 1896. Preliminary notes on *Genyornis newtoni*: a new genus and species of fossil struthious bird found at Lake Callabonna, South Australia. *Transactions of the Royal Society of South Australia 20*, 171–190.

Stirling, E.C. & Zietz, A.H.C., 1900. Fossil remains of Lake Callabonna. *Genyornis newtoni*. A new genus and species of fossil struthious bird. *Memoirs of the Royal Society of South Australia 1*, 41–80.

Vickers-Rich, P. & Molnar, R.E., 1996. The foot of a bird from the Eocene Redbank Plains Formation of Queensland, Australia. *Alcheringa 20*, 21–29.

Wagler, J.G., 1831. Einige Mittheilungen über Thiere Mexicos. *Isis von Oken 5*, 510–535.

Wetmore, A. & Miller, W. de W., 1926. The revised classification for the fourth edition of the A.O.U. check-list. *The Auk 43*, 337–346.

Woodburne, M.O., Tedford, R.H., Archer, M., Turnbull, W.D., Plane, M.D. & Lundelius, E.L., 1985. Biochronology of the continental mammal record of Australia and New Guinea. *South Australian Department of Mines and Energy, Special Publication 5*, 347–363.