

A new species of *Philocryphus* Fletcher, 1894 (Amphibia: Myobatrachidae) from north-east Victoria and south-east New South Wales.

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ABSTRACT

For some years it has been suspected by herpetologists that the frogs assigned to the species *Heleioporus australiacus* (Shaw and Nodder, 1795) in south-east Australia may comprise more than one species. The nominate form from the Sydney basin and nearby parts of New South Wales differs morphologically and genetically from those specimens found in the vicinity of south-east New South Wales and nearby north-east Victoria.

In spite of known differences between the two populations, the southern population has not been taxonomically recognized.

Due to the long-term threats to the ongoing existence of this taxon, it is important that it be scientifically recognized and named sooner, rather than later and before extinction occurs.

The genetic data presented by Morgan *et al.* (2007) confirms that the relevant population is sufficiently divergent from that further north so as to warrant being formally named at the species level.

This paper formally names the new taxon *Philocryphus hoserae* sp. nov. in accordance with the rules set out by the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The generic assignment of this taxon and the better known *Heleioporus australiacus* (Shaw and Nodder, 1795) in this paper is to the available genus *Philocryphus* Fletcher, 1894 in line with the placement by Wells and Wellington (1985). It is further supported by the genetic evidence of Morgan *et al.* (2007) at fig. 5.

Due to significant divergence from other west Australian *Heleioporus* Gray, 1841, the species until now known as *Heleioporus barycragus* Lee, 1967 is transferred to a new genus, *Paraheleioporus* gen. nov..

Keywords: Taxonomy; nomenclature; Frogs; *Heleioporus*; *australiacus*; *barycragus*; new genus; *Paraheleioporus*; new species; *hoserae*.

INTRODUCTION

The Giant Burrowing frog, most widely known as *Heleioporus australiacus* (Shaw and Nodder, 1795) is a well known and iconic species of frog from the Sydney region and nearby sandstone parts of coastal New South Wales.

The species as is currently known is described in Hoser (1999), with photos of adult male and female specimens of the typical Sydney form depicted.

They are usually found in association with sandy heath-type habitats, although they do extend to nearby forested areas in places such as Kurringai Chase on Sydney's northern outskirts, (that is dry forest habitats in close proximity to sandy heaths).

A disjunct southern population from far southern New South Wales and nearby parts of North-east Victoria until now treated as conspecific is the main subject of this paper and herein formally named as a new species.

Morphologically the adult specimens are quite different and this has led to a strong suspicion by many herpetologists that it may in fact be a separate taxon, worthy of formal recognition.

This view was summed up by Graeme Gillespie, who in 2010 wrote the following in a report:

"Subspecies: A distinct disjunction of 100km occurs in the distribution of the Giant Burrowing Frog records between Jervis Bay and Narooma (Lemckert *et al.* 1998; Gillespie and Hines 1999). There is genetic, morphological and bioclimatic evidence that populations to the north and south of this gap are distinct and separate evolutionary lineages (Penman *et al.* 2005a; Mahony *et al.* unpublished data). It is my opinion that these data are strong evidence of two distinct subspecies, although they have not yet been formally described as such. It has also been argued that they represent separate species (Penman *et al.* 2004, 2005a). Based upon the available evidence, these populations are different evolutionary and ecological management units and therefore should be treated as distinct taxa from a conservation perspective; here-in referred to as northern and southern forms of the Giant Burrowing Frog."

Genetic evidence provided by Morgan *et al.* (2007), confirm that the level of genetic divergence between northern and southern populations is of a level to warrant division at the species level. As a result of this data and obvious morphological divergence

between the geographically disjunct populations, I have absolutely no hesitation in formally describing the southern population as a new species.

Wells and Wellington further transferred the species *H. australiacus* to the genus *Philocryphus* Fletcher, 1894 without an explicit description as to their reasoning. However anyone vaguely familiar with the said frogs, would have realised that their transfer of both *H. australiacus* and *H. barycragus* Lee, 1967 was due to the morphological divergence between these two and other members within *Heleioporus sensu lato*. The more recent genetic evidence of Morgan *et al.* (2007), confirms the divergence of both taxa from the other species within *Heleioporus*, but in turn shows both *H. australiacus* and *H. barycragus* to also be sufficiently divergent to be placed in separate genera.

Their estimated divergence was in the order of about 30 MYA from one another and in terms of *H. barycragus*, 20 MYA from all other *Heleioporus*. *H. australiacus* showed a 30 MYA divergence from other *Heleioporus*.

The newly described species in this paper is self-evidently placed in the genus *Philocryphus* as it is clearly a species closely associated with the other member of that genus and formally named below.

MATERIALS AND METHODS

From the abstract and introduction, these are self-evident. In summary live specimens of all known species within *Heleioporus sensu lato* have been inspected by this author over some decades. The taxonomic decisions made in this paper derive from these inspections and the findings made and published in relevant scientific literature. The final result of relevance in this paper being the formal description of a new south-east Australian species of frog and a new Western Australian genus of frog, herein treated as monotypic.

Literature relevant to the taxonomic and nomenclatural decisions made and acts taken in this paper are the following: Anstis (1974, 2002), Barker *et al.* (1995), Cogger (2014), Cogger *et al.* (1983), Fletcher (1894), Gillespie (1990, 1997, 2010), Gillespie and Hines (1999), Gray (1841), Hoser (1989), Hoser (1991), Lee (1967), Lemckert and Brassil (2003), Lemckert *et al.* (1998), Littlejohn and Martin (1967), Mahony (1993), Morgan *et al.* (2007), Penman *et al.* (2004, 2005a, 2005b, 2006, 2008a, 2008b), Ride *et al.* (1999), Shaw and Nodder (1795), Watson and Martin (1973), Wells and Wellington (1985), Westaway *et al.* (1990), White (1999) and sources cited therein.

In terms of the descriptions below, in line with the stated preferences of the ICZN (as per the written guidelines on www.zoobank.org as of 2017), the new genus description is done before the new species description.

The spellings of each name should not be altered unless absolutely mandatory according to the rules of the ICZN as published in the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

PARAHELEIOPORUS GEN. NOV.

LSID urn:lsid:zoobank.org:act:40E9BC08-F4EC-4566-9AE4-739B51B9CC5

Type species: *Heleioporus barycragus* Lee, 1967.

Diagnosis: *Paraheleioporus gen. nov.* has until now been treated as a species within the genus *Heleioporus* Gray, 1841.

The genera *Heleioporus*, *Philocryphus* Fletcher, 1894 and *Paraheleioporus gen. nov.* (all until recently treated as being in the genus *Heleioporus*) are separated from all other Limnodynastidae frogs by the following suite of characters: Maxillary teeth are present; there are no bright red patches in the groin; no dentary pseudoteeth; fingers are without a trace of webbing; digits are without terminal discs; no frontoparietal foramen in adults; there are vomerine teeth between the choanae; inner metatarsal tubercle is white and unpigmented; adult sternum is calcified and bifid posteriorly.

Paraheleioporus gen. nov. is separated from all species of *Heleioporus* and *Philocryphus* Fletcher, 1894 by the following suite of characters: A back that is more-or-less uniform in colour, or otherwise lacking a marbled pattern and never with large white or yellow spots; dorsally a uniform chocolate-brown or dark grey with yellow or white spots restricted to the sides; inner metatarsal tubercle in adults is at least half the length of the fourth toe (versus less than half in *Philocryphus*); there are two rows of small papillae in the anterior corner of the eye (as opposed to a single flap in *Philocryphus*).

Distribution: Restricted to the Darling Range and foothills east of Perth in south-west Western Australia.

Content: *Paraheleioporus barycragus* (Lee, 1967) (Monotypic).

PHILOCRYPHUS HOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:02EA8F4A-1826-403F-885A-306648D7B4AA

Holotype: A preserved specimen held at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number: D67390, collected on the Bruthen to Nowa Nowa Road, 3.5 km west of Stony Creek, East Gippsland, Victoria, Latitude -37.70 S., Longitude 147.98 E. The National Museum of Victoria, Melbourne, Victoria, Australia allows access to its holdings.

Paratype: A preserved specimen held at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number: D73039, collected from East Gippsland, at Latitude -37.38 S., Longitude 148.35 E.

Diagnosis: The species *Philocryphus hoserae sp. nov.* has until now been treated as a southern population of *Philocryphus australiacus* (Shaw and Nodder, 1795), better known in most contemporary texts as *Heleioporus australiacus* (Shaw and Nodder, 1795). Both taxa are readily separated from all other Australian frogs, as *H. australiacus* by the keys and description in Cogger (2014).

Adult *P. hoserae sp. nov.* of both sexes are readily separated from adult *P. australiacus* of both sexes by colouration. Adult *P. hoserae sp. nov.* have numerous distinctive large yellow spots on each side of the flanks, numbering more than 25, versus few such spots and of significantly lesser size and intensity in *P. australiacus* always numbering less than 20, and usually far less than that.

In adult *P. hoserae sp. nov.* at the back of the upper jawline and below the ear is a thick yellow bar, which in adult *P. australiacus* is either thin or broken.

Adult female *P. australiacus* have noticeable significant lightening at the anterior of the upper snout, tending to a whitish grey colour, which is not the case in adult female *P. hoserae sp. nov.*

In tadpoles, *P. hoserae sp. nov.* has 5 teeth on either side of the top of the mouth versus 4 on either side in *P. australiacus*.

Philocryphus Fletcher, 1894 including the species *Philocryphus australiacus* (Shaw and Nodder, 1795) and *Philocryphus hoserae sp. nov.* (herein taken as including the entirety of the genus) are separated from all other species in *Paraheleioporus gen. nov.* and *Heleioporus* (all three genera treated as being the single genus *Heleioporus* in major texts such as Cogger (2014) preceding this paper) by the following suite of characters: A back that is not more-or-less uniform in colour or a back with a marbled pattern and with large white or yellow spots; dorsally a uniform chocolate-brown or dark grey with yellow or white spots restricted to the sides; inner metatarsal tubercle in adults is less than half the length of the fourth toe (versus at least half in *Paraheleioporus gen. nov.*); there is a single flap in the anterior corner of the eye (as opposed to two rows of small papillae in *Paraheleioporus gen. nov.*).

Distribution: South-east New South Wales, south from about Narooma, into north-east Victoria, being on the eastern side of the Great Dividing Range.

Etymology: Named in honour of my magnificent wife Shireen

Hoser in recognition of her monumental contributions to wildlife conservation over more than 2 decades.

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CONFLICT OF INTEREST

There are no conflicts of interest in terms of this paper and the author.

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