

A NEW GENUS AND TWO NEW SPECIES OF LEPTODACTYLID FROGS FROM WESTERN AUSTRALIA

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INTRODUCTION

The frog fauna of the south-western portion of Western Australia is well known and has been the subject of a field guide by Main (1965). In contrast, there are elements of the fauna of the northern part of the State still being discovered, whilst other components remain known from a few preserved specimens in museum collections.

In recent years the Western Australian Museum has devoted a considerable proportion of its efforts to gathering specimens and data in the northern districts, and the present paper reports a new genus and two new species of leptodactylid frogs obtained in this way.

Material and methods

With the exception of one paratype now in the South Australian Museum, all of the specimens reported here are deposited in the Western Australian Museum. The abbreviations preceding the registration numbers of the specimens are SAM and WAM respectively.

Because one of the species reported here is known from a single specimen, numerous radiographs were prepared from a variety of aspects to establish data about skeletal anatomy, and so minimise the need for dissection. Essential dissections were performed using a low-power stereoscopic microscope, and measurements were obtained on this and the other specimens using a pair of dial callipers.

Methods of measurement follow those of Tyler (1968), whilst the abbreviations used in referring to various features employed in morphometric investigations are: S-V snout to vent length; TL tibia length; HL head length; HW head width; E-N eye to naris distance; IN internarial span.

Arenophryne new genus

Type species

Arenophryne rotunda sp. nov.

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Diagnostic definition

1. Skull distinctly broader than long. 2. Frontoparietal foramen very large. 3. Mandibles well developed, with pronounced post-articular extremities. 4. Maxilla and premaxillae dentigerous. 5. Tongue long, slender and free behind. 6. Tympanum entirely absent. 7. Omosternum absent. 8. Clavicles broad and fused medially. 9. Coracoids broad and posteromedially directed. 10. Epicoracoids and mesosternum calcified or ossified in adults. 11. Sacral diapophyses broadly dilated. 12. Musculus intermandibularis with elongate median aponeurosis. 13. M. intermandibularis not differentiated and not attached upon ventral surface of M. submentalis. 14. M. depressor mandibulae with two bodies. 15. Fingers and toes short. 16. Fingers of males lacking nuptial pads. 17. Liver large: extending for entire length of body cavity. 18. Parotoid and flank glands present. 19. Skin surrounding body forming loose sac extending to knee and elbow. 20. Eggs large and unpigmented. 21. Development probably direct.

A discussion of the diagnostic characters and phylogenetic affinities of the new genus are given below in the remarks on *A. rotunda*.

Arenophryne rotunda new species

Holotype

WAM R.39120. An adult male collected approximately 100 m from False Entrance Well Tank (26° 23'S; 113° 18'E), Carrarang Station, 320 km NNW of Geraldton, Western Australia, on 24 August 1970 by A. Baynes and Tom A. Smith.

Description

Habitus stout and head considerably broader than long (Fig. 1a). Eye large but not particularly prominent, its diameter equivalent to distance separating it from tip of snout. Snout blunt and evenly rounded when viewed from above and in profile (Fig. 1b). Nostrils small and inconspicuous and directed dorsolaterally. Distance between eye and nostril considerably less than internarial span (E-N/IN 0.769). Canthus rostralis inconspicuous and very gently rounded. No tympanum. Pupil horizontal. No vomerine teeth. Tongue long and half free.

Fingers very short, fourth very broad and reduced to a single phalanx (Fig. 1c). Fingers in decreasing order of length 3>2>1>4. Hindlimbs particularly short and enveloped in a loose-fitting patagium. TL/S-V ratio 0.167. Toes rather short (Fig. 1d), in decreasing order of length 4>3>2=5>1. A very weak inner but no outer metatarsal tubercle.

Skin of dorsal surface thick and smooth. A prominent postocular ('supratympanic') gland. Skin on tip of snout highly modified to produce a

colourless and almost translucent appearance. Ventral surfaces of body smooth except for sparse folding on abdomen.

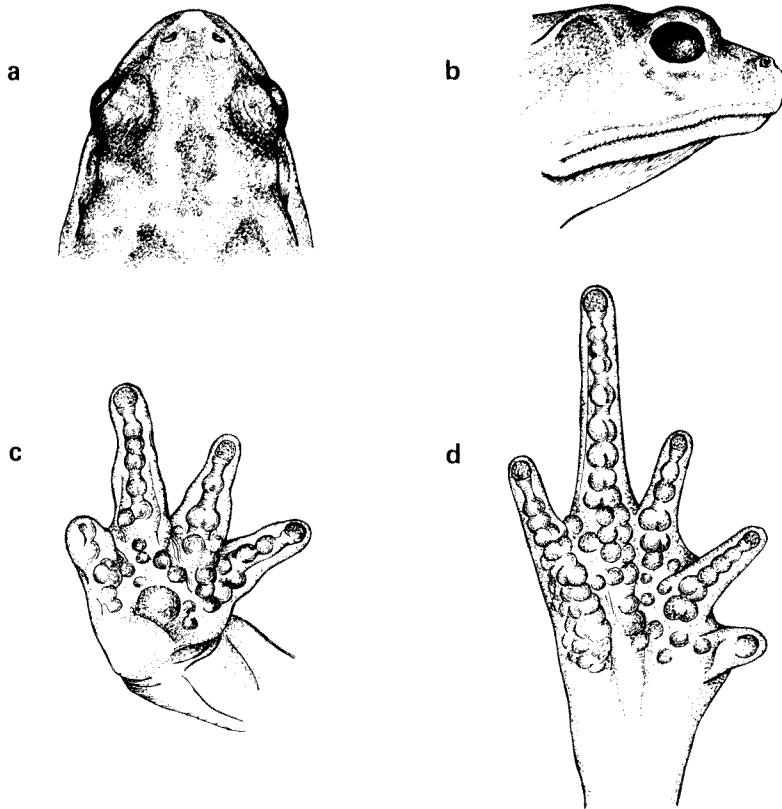


Fig. 1. *Arenophryne rotunda* new species: WAM R39119 (paratype) (a) dorsal view of head; (b) lateral view of head; (c) palmar view of hand; (d) plantar view of foot.

Vocal sac a submandibular structure with a single aperture in floor of mouth on left side of tongue. No nuptial pads.

Dorsal surface of body and limbs dull cream with brown stippling. Stippling concentrated on and between upper eyelids and on dorsolateral surfaces of body, flanks and each side of posterior half of midline. Ventral surface a paler shade of cream with small isolated clusters of dark stippling.

Dimensions

Snout to vent length 30.4 mm; tibia length 5.1 mm; eye to naris distance 2.0 mm; internarial span 2.6 mm; eye diameter 4.6 mm.

Variation

There are nine paratypes all of which were collected at the type locality. Five adult paratypes (WAM R39115-17, 39119, 39123) were taken with the holotype on 24 August 1970, and the four juveniles (WAM R39118, 39121-22, SAM R14521) were collected on 20 August 1970. The adults consist of two gravid females 30.2-31.4 mm S-V, two males 26.4-27.7 mm, one eviscerated unsexed specimen 23.8 mm. The juveniles range in size from 13.3 to 17.8 mm.

All of the paratypes are squat, short-legged frogs. The gravid females have large unpigmented eggs, and the juveniles are all very much darker coloured than the holotype and other adults. There is evidence of ontogenetic retrogression in digital subarticular tubercles, for these are most pronounced in juveniles and scarcely detectable in adults.

At Carrarang Station the mean annual rainfall over a 61-year period up to 1970 was 27.4 cm. On average 87% fell during the period April-September. The type locality may have a slightly higher rainfall but will nevertheless be exposed to long periods of drought.

The False Entrance Well Tank at the type locality is fed by a mill and is reported by Mr Baynes to be the only source of permanent fresh water in the district. The tank was not accessible to the frogs, and only the flooding spillway could provide a source of reasonably fresh water.

It is situated on the edge of coastal sand dunes and it was amongst these dunes that all of the frogs were found. Whether or not the frogs require fresh water for breeding purposes is uncertain, but the spillway would appear to be the only possible site. However, the ovarian eggs are large (up to 3 mm in diameter), and direct development is strongly indicated. Baynes and Smith found all of the type specimens following showers of rain.

Phylogenetic affinities

At first glance *Arenophryne* could be mistaken for a short-legged *Pseudophryne* species. Its phylogenetic affinities seem to lie with that genus and with *Myobatrachus*.

As currently defined, *Pseudophryne* includes eleven species (if Blake's (1972) proposals to suppress the monotypic Western Australian genus *Metacrinia*, and to refer *M. nichollsi* to *Pseudophryne* are supported). The vast majority of these species are diminutive creatures with warty skins, short limbs and moderate to long cylindrical digits. Parotoid, inguinal and femoral cutaneous glands occur commonly in the members of this genus.

Arenophryne differs from *Pseudophryne* in the following respects:

1. Gross enlargement, reinforcement and spreading of the component portions of the pectoral girdle (Fig. 2);

2. Reduction of the length of the digits by a process of loss of various phalanges;
3. Adaptation of the dermis on the tip of the snout;
4. Enlargement and elongation of the liver;
5. A loose, voluminous skin;
6. Increased size of ova;
7. Probably direct development (possibly shared by *P. nicholli*);
8. Absence of extensive areas of dark pigmentation on the ventral surface of the body.

Judging from the listed generic criteria of Lynch (1971), the presence of two bodies to the Musculus depressor mandibulae would also appear to distinguish *Arenophryne* from *Pseudophryne*, for the latter is stated to have only one. However, I have examined the M. depressor mandibulae in six species of *Pseudophryne*, and found a bipartite muscle in each one. A second point of variance with Lynch's definition of *Pseudophryne* involves the nature of the palatine bones, which he states are reduced to splinter-like bones lacking contact with the maxillae. This is certainly descriptive of the majority of *Pseudophryne* species, including the two examined by Lynch, but it will not embrace *P. guentheri*, because maxillary contact persists in that species, and the palatines are much more substantial features.

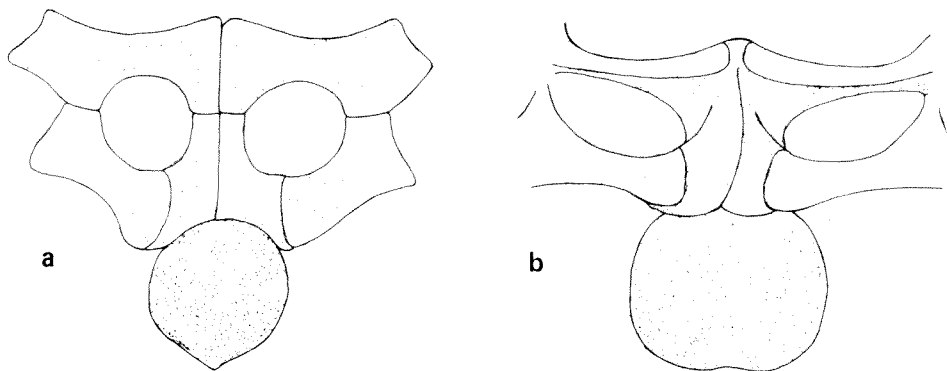


Fig. 2. Pectoral girdles. (a) *Arenophryne robusta*; (b) *Pseudophryne guentheri*. Light stippling = bone and dense stippling = cartilage.

The reinforced pectoral girdle of *Arenophryne* (Fig. 2) is reminiscent of the condition in *Myobatrachus* (Parker, 1940, Fig. 20). However, the monotypic *Myobatrachus* is a more substantial form, structurally even more highly-adapted to a fossorial life. For example, the vast musculature of the hind limbs of *Myobatrachus* creates a demand for an increase in the surface

area of ischium and pubis for their attachment. Hence comparison of radiographs of the pelvic regions of *Myobatrachus* and *Arenophryne* shows a large post-acetabular, ischial zone in *Myobatrachus*.

Myobatrachus has a much smaller head than *Arenophryne*, possesses a tympanum (although hidden), has a greatly reduced maxilla and lacks teeth. Despite the number of differences between *Pseudophryne* and *Myobatrachus*, the existence of this new genus suggests that a reasonably close relationship may exist between them.

Limnodynastes depressus new species

Holotype

WAM R43896. An adult male collected near the former Argyle Downs homestead, Ord River, Western Australia (now submerged by Lake Argyle), by a survey party from the Western Australian Museum on 12 January 1972.

Description of holotype

A moderately-sized frog of rather elongate habitus with a flattened head (Fig. 3a). Head approximately as long as broad (HL/HW 0.979). Eye small and rather depressed, with an exceptionally prominent upper eyelid jutting horizontally outwards like a shelf. Snout bluntly rounded when viewed from above and more gently rounded in profile (Fig. 3b). Nostrils small and directed superiorly. Distance between eye and naris less than internarial span (E-N/IN 0.892). Canthus rostralis quite straight and inconspicuous. Tympanum completely covered with skin. Vomerine teeth situated between and completely posterior to choanae. Tongue broad and partly free behind.

Fingers rather long and without terminal discs, lateral fringes and webs (Fig. 3c). Fingers in decreasing order of length $3 > 4 = 2 > 1$. Hindlimbs muscular and relatively short. TL/S-V 0.410. Toes elongate, unfringed and unwebbed (Fig. 3d), in decreasing order of length $4 > 3 > 5 > 2 > 1$. A small but prominent inner but no outer metatarsal tubercle; prominent subarticular tubercles present. Palmar tubercles large; digital subarticular tubercles rounded and prominent.

Skin of dorsal and ventral surfaces of body and limbs quite smooth. No supratympanic fold.

Vocal sac a submandibular and apparently unilobular structure. No nuptial pads.

Dimensions

Snout to vent length 38.5 mm; tibia length 15.8 mm; head length 14.0 mm; head width 14.3 mm; eye to naris distance 3.3 mm; internarial span 3.7 mm; eye diameter 3.4 mm; tympanum diameter 2.4 mm.

Dorsal surface a very pale grey liberally marked with small brown vermiculations. Ventral surface of body and limbs uniformly immaculate cream.

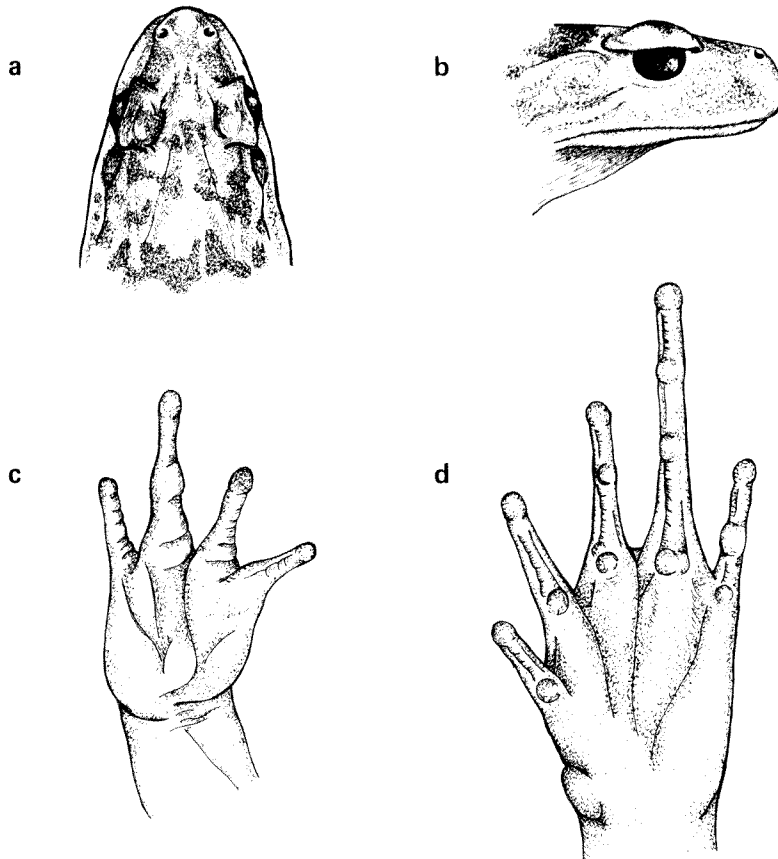


Fig. 3. *Limnodynastes depressus* new species: WAM R43896 (holotype) (a) dorsal view of head; (b) lateral view of head; (c) palmar view of hand; (d) plantar view of foot.

Comparison with other species

The most conspicuous morphological features unique to *L. depressus* and distinguishing it from all congeners are: 1. the short vomerine teeth rows; 2. the fact that these rows are medially separated from one another, and 3. the shelf-like nature of the upper eyelid.

The majority of *Limnodynastes* species occur thousands of kilometres distant in southeastern Australia, and in fact the only species known to be

sympatric with *L. depressus* is *L. ornatus*. The latter species is a distinctly robust-bodied animal with a shovel-shaped inner metatarsal tubercle. *Limnodynastes convexiusculus* could conceivably be sympatric, but this is a larger animal that has a high instead of a flattened head and invariably a sub-aural glandular fold, and adult males have dense submandibular dermal pigmentation.

The extent of morphological divergence renders the generic disposition of this solitary specimen suspect. Additional specimens are required to confirm the matter, and for the present it is expedient to consider it a member of the genus *Limnodynastes*. It is at least possible that the collection of additional material will cause a new genus to be erected for this unique frog.

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