

A NEW GENUS FOR THE AUSTRALIAN LEPTODACTYLID FROG *CRINIA DARLINGTONI*

by

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With five text-figures

INTRODUCTION

Crinia darlingtoni Loveridge, 1933, was described from a series of four specimens collected by P. J. Darlington at the Queensland National Park, Macpherson Range, Queensland, and distinguished by the rudimentary condition of the first finger and the extremely small first toe. Loveridge noted that some specimens bore a resemblance to *C. acutirostris* Andersson in colouration but did not discuss the phylogenetic relationships of his new species.

For a generic revision Parker (1940) examined a juvenile paratype and on the basis of a similarity in the condition of the prevomer, he associated *C. darlingtoni* with *C. leai* Fletcher, *C. rosea* Harrison and *C. laevis* (Günther). In the last species he also recognized two sub-species, *C. l. laevis* and *C. l. victoriana* Boulenger, which Littlejohn & Martin (1964) later restored to specific rank. The most recent contributor (Lynch, 1971) did not examine *C. darlingtoni* but, on the basis of published data, supported the concept of *C. darlingtoni* being most closely related to *C. laevis* and *C. victoriana*.

Straughan & Main (1966) reported that male *C. darlingtoni* possess bilateral brood pouches in the inguinal region, in which they found larvae at various stages of development up to metamorphic climax. Such structures and the habit of parental care are unique amongst Australian frogs; *C. darlingtoni* therefore contrasts strikingly with the other members of the genus which lack such structures and have free-living tadpoles. Straughan & Main considered *C. darlingtoni* to be of considerable antiquity, persisting in a restricted habitat, which they argued had probably remained unchanged since the late Tertiary.

Straughan & Main did not question the generic disposition of *C. darlingtoni*, but concluded that this species represents a unique species group characterised by a highly modified life-history. This assessment of the taxonomic significance of the biological divergence, and of the morphological

adaptations associated with it, is at variance with those of other authors on the Neotropical frogs with comparably modified life-histories. Such authors refer frogs that possess brood pouches to distinct genera maintained on the basis of this character (e.g., the hylid genus *Gastrotheca* in which juveniles are carried by the female in a skin-pouch on the back, and the leptodactylid *Rhinoderma*, in which metamorphosis takes place within the enlarged vocal sac of the male).

When I studied *Crinia* whilst reappraising the subfamilial disposition of Australo-Papuan leptodactylid genera (Tyler, 1972), I did not have access to specimens of *C. darlingtoni*. Through the courtesy of Miss Jeanette Covacevich of the Queensland Museum I have recently dissected a series. Here I report the results, as a consequence of which a new genus is proposed to accommodate *C. darlingtoni*.

MATERIAL AND METHODS

The following adult specimens have been examined: Queensland Museum J19624, 19649, 19652-57, 19659, 19661, 19663, 19664; South Australian Museum R 12744. All were collected at the Queensland National Park, Macpherson Range, Queensland.

The terminology of superficial mandibular musculature and vocal sac follows Tyler (1971); pectoral musculature, Jones (1933) and hyoid structure and musculature Trewavas (1933).

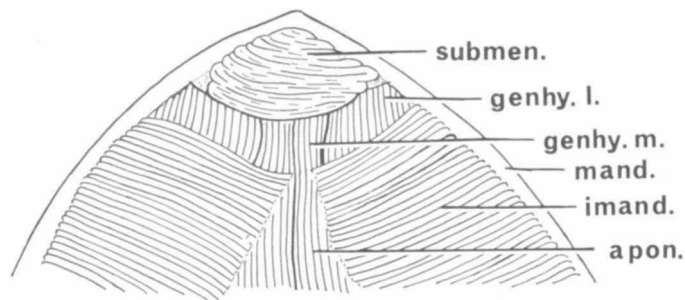


Fig. 1. Anterior portion of superficial mandibular musculature in ventral aspect. apon = median aponeurosis of Musculus intermandibularis; genhy. l. and genhy. m. = lateral and medial portions of Musculus geniohyoideus; imand. = Musculus intermandibularis; mand. = mandible; submen. = Musculus submental.

MORPHOLOGY

(a) Superficial mandibular musculature and vocal sac (fig. 1). — The Musculus intermandibularis is not differentiated. Anterior development

of this muscle is arrested so exposing the mandibular sites of attachment of the *Musculus geniohyoideus medialis* and *M.g. lateralis*. The most anterior portion of the *M. intermandibularis* bears a median aponeurosis. The *Musculus interhyoideus* is large, and extends posteriorly into a large, single, median lobe extending posteriorly beyond the post-articular extremities of the mandibles.

The vocal sac is large, single and median, occupying a submandibular position, and lying above the *M. interhyoideus*. The vocal sac apertures are slit-like, bordered medially by the anterior cornua of the hyoid, and equivalent in length to one-third of the length of the mandible.

(b) Pectoral girdle (fig. 2). — The omosternum is elongate and pitcher-shaped, entirely cartilaginous and not differentiated from the anterior segment of the epicoracoids. The left epicoracoid lies ventral to the right. The clavicles are extremely slender, distally reaching the base of the omosternum. The procoracoids are of moderate width. The coracoids are slender and the xiphisternum is dilated proximally.

In association with the elongate omosternum, the *Musculus episterno-humeralis* and *Musculus supracoracoideus superficialis* are large muscles. The *M. supracoracoideus profundus* is distinct and the *Musculus pectoralis abdominalis* particularly well developed.

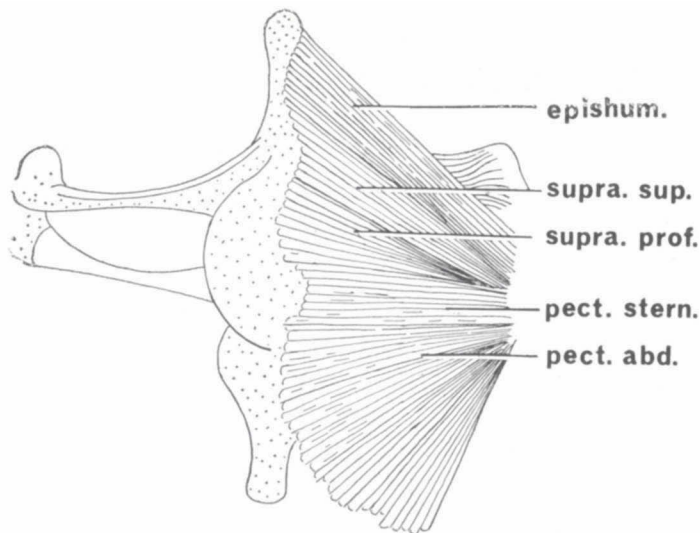


Fig. 2. Pectoral girdle in ventral aspect. Muscles removed from right side. epishum. = *Musculus episternohumeralis*; pect. abd. = *Musculus pectoralis abdominalis*; pect. stern. = *Musculus pectoralis sternalis*; supra. prof. = *Musculus supracoracoideus profundus*; supra. sup. = *Musculus supracoracoideus superficialis*.

(c) Hyoid (fig. 3). — The hyoid is as broad as long and has slender anterior cornua. The alary processes are variable in shape, being either a roughly rectangular broad extension of the plate, or possessing a distinct style. Each form occurs in the specimen illustrated (SAM 12744). The postero-lateral processes are large and triangular in shape with irregular borders. The lateral processes are slender and extremely acutely inclined to the body of the plate.

The site of attachment of the *Musculus sternohyoideus* extends from the base of the anterior cornu, and from that position passes medially and posteriorly to the midline on a level with the posterior margin of the

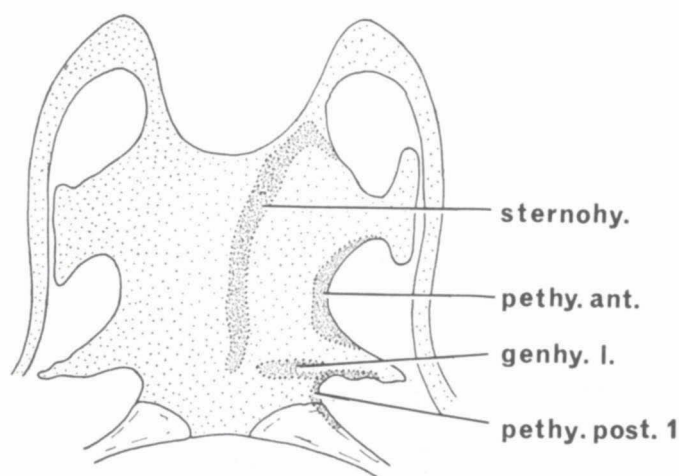


Fig. 3. Hyoid structure in ventral aspect. Sites of muscle attachment on left side indicated by dense stippling. genhy. l. = *Musculus geniohyoideus lateralis*; pethy. ant. = *Musculus petrohyoideus anterior*; pethy. post. I = *Musculus petrohyoideus posterior I*; sternohy. = *Musculus sternohyoideus*.

postero-lateral processes. There is no *Musculus omohyoideus* in this species. In association with the transversely disposed posterior processes, the most anterior slip of the posterior petrohyoideus passes parallel to these processes. This portion of the petrohyoideus arises principally from the lateral edge of the plate posterior to the postero-lateral processes and attaches upon the crista parotica.

From Trewavas' (1933) description and illustration of the larynx of *C. signifera*, which I have confirmed, the present species differs in possessing a much larger oesophageal process.

(d) Cranial morphology. — My observations on the prevomerine bones are at variance with those of Parker (1940) who reports, "a small anterior

portion bounding the choana antero-mesially, is connected by a narrow strip with a small posterior portion overlying the mesial end of the palatine." In the specimens that I have examined, there is only a post-choanal portion lying anterior to or partly overlying the palatine.

The palatines are elongate, curved structures broadening distally and abutting the maxilla. The sphenethmoids are large and medially united.

The *Musculus depressor mandibulae* arises in three distinct segments — a thick anterior segment of moderate width composed of short fibres attached to the inferior and posterior margins of the tympanum; a thick, broad, medial segment composed of long fibres attached to the pro-otic, and a thin, slender,

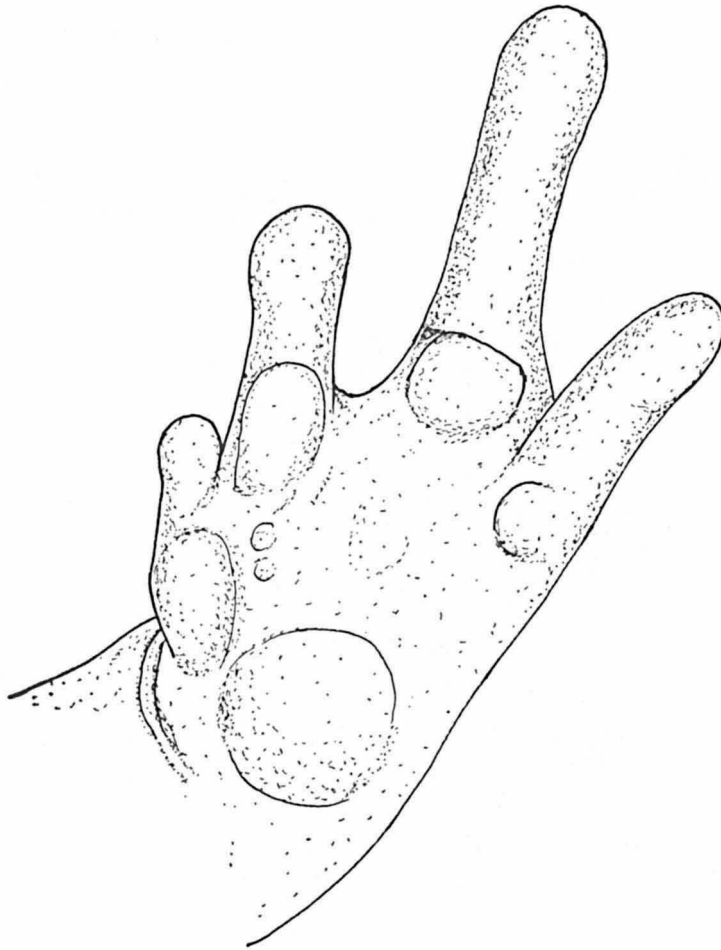


Fig. 4. Palmar surface of left hand.

posterior segment (partly overlying and extending above the superior limit of the medial segment) attaching upon the dorsal fascia.

(e) Vertebrae. — There are eight pre-sacral vertebrae. The sacral diapophyses are broadly dilated; the urostyle articulates with the sacrum by two condyles.

(f) Hand (fig. 4). — As reported by Parker (1940) the fingers are very short. The first finger is vestigial and lacking phalanges, terminates at the distal head of the metacarpal. The terminal phalanges of the other fingers are conical.

(g) Brood pouch (fig. 5). — In its vestigial condition, when it does not contain any embryos, the brood pouches are separate, sac-like structures which occupy a ventro-lateral position on each side of the body. Each aperture is a horizontally orientated, longitudinal slit in the inguinal region anterior to, and on a level with, the upper surface of the thigh. Each aperture



Fig. 5. Posterior portion of body of male in dorsal view, showing dermal folds at margins of apertures of inguinal brood pouches.

is bounded externally by a thickening of the dermis. The wall of the sac is composed of an inversion of the skin, becoming progressively thinner distally, and there resembling the connective tissue of lymphatic septa. The sac extends anteriorly to the post-axillary region and is bounded inferiorly by the most superior portion of the *M. pectoralis abdominalis*.

In specimens in which the sacs hold small metamorphosed frogs, the brood pouches occupy the entire space formed by the ventro-lateral and abdominal, sub-dermal, lymphatic sacs, and are apparently confluent medially. The abdominal cavity of the parent is completely compressed.

DISCUSSION

The Myobatrachinae currently comprises the genera *Crinia*, *Glauertia*, *Metacrinia*, *Myobatrachus*, *Pseudophryne*, *Taudactylus* and *Uperoleia*, the members of which are small frogs sharing the following features: (1) tongue small; (2) alary processes of hyoid broad, wing-like structures; (3) eight pre-sacral vertebrae; (4) *M. intermandibularis* not differentiated; (5) no attachment of *M. intermandibularis* upon ventral surface of *M. submentalis*.

Crinia is numerically the largest genus; eighteen species are currently recognized. Following Parker (1940) the principal diagnostic morphological features of *Crinia* may be considered as: (1) maxillary teeth present; (2) very large fronto-parietal foramen; (3) prevomerine bones present; (4) ear fully developed; (5) sacral diapophyses slightly dilated; (6) omosternum not fully differentiated from procoracoids; (7) terminal phalanges simple; (8) oesophageal process of cricoid broad or almost absent.

Crinia darlingtoni however, differs from all other species of *Crinia* in the following respects: (1) the sacral diapophyses are broadly dilated; (2) the terminal phalanges are conical; (3) the oesophageal process of the cricoid is pronounced; (4) prevomerine bones are reduced to post-choanal portions. From the other *Crinia* species and all other myobatrachine frogs it is further distinguished by: (5) the roughly rectangular or pedunculate alary processes of the hyoid; (6) absence of phalangeal bones in the first finger; (7) possession of brood pouches in the male; (8) the habit of parental care.

These morphological and biological differences collectively represent considerable divergence from the typical species of *Crinia*. I have therefore been faced with either modifying the generic definition of *Crinia* to enable it to continue to accommodate *darlingtoni*, or of erecting a separate genus for *darlingtoni*. In assessing the significance of the divergence I have not regarded it quantitatively simply as justification for removing *darlingtoni* from *Crinia*. Rather I consider that to retain *darlingtoni* in *Crinia* would

involve maintaining an unacceptably heterogeneous assemblage of species.

Accordingly I propose the erection of a new genus to accomodate *darlingtoni*. This I name and define as follows:

***Assa* gen. nov.**

1. Musculus submentalis entirely visible in ventral view; 2. Musculus intermandibularis not differentiated; 3. Anterior development of M. intermandibularis arrested; 4. Musculus omohyoideus absent; 5. Vocal sac single, median and submandibular; 6. Large fronto-parietal foramen; 7. Prevomerine bones reduced to post-choanal portions; 8. Palatine bones reach maxillae; 9. Postero-medial and postero-lateral processes of hyoid plate transversely inclined to medial plane; 10. Alary processes of hyoid plate rectangular or pedunculate; 11. Ear present; 12. First digit of hand vestigial; 13. Eight pre-sacral vertebrae; 14. Sacral diapophyses broadly dilated; 15. Omosternum not differentiated from procoracoids and epicoracoids; 16. Pupil a horizontal slit; 17. Male with bilateral brood pouches; 18. No free-swimming tadpole; metamorphosis within brood pouches.

Content: *darlingtoni* (Loveridge).

Geographic distribution: confined to mountain ranges on the extreme north-eastern border of New South Wales with Queensland.

Generic name: *Assa* (L.) (f.) = dry nurse. It refers to the habit of caring for young without providing nourishment.

SUMMARY

A study of cranial and post-cranial myology and osteology reveals that *Crinia darlingtoni* differs markedly from the other species of frogs currently referred to *Crinia*. In addition to this morphological divergence, the male carries young within highly specialised, subdermal sacs that intrude within the lymphatic sacs of the flanks. This morphological and biological divergence is considered to necessitate the erection of a new genus to accommodate *darlingtoni*. The new genus *Assa* is proposed and defined.

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