THE RAFFLES BULLETIN OF ZOOLOGY 1998 **46**(2): 471-475

LARVAL IDENTITY OF THE MONTANE HORNED FROG, *MEGOPHRYS LONGIPES* (BOULENGER) (AMPHIBIA: ANURA: MEGOPHRYIDAE)

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ABSTRACT. - The free-swimming larval form of a montane megophryid frog, *Megophrys longipes* (Boulenger, 1885) is described from association of larvae with the adults, although earlier speculations suggested direct development in this species.

KEYWORDS. - Larval identity, *Megophrys longipes*, Megophryidae.

INTRODUCTION

The megophryid frog, *Megophrys longipes* (Boulenger, 1885) was described from a single adult specimen from the mountains of Perak, Peninsular Malaysia at an elevation of about 1000m. No larval description was provided. This species is subsequently recorded in the highlands of Thailand, Cambodia, southern Vietnam and Peninsular Malaysia (Bourret, 1941; Frost, 1985; Taylor, 1962; Manthey & Grossmann, 1997).

Butler (1904) hinted the possibility of direct larval development in this species from observations at the Larut Hills, Perak. He had "...never seen it enter water of its own accord..." and also found clusters of about a dozen large frog ova "...deposited under damp moss on tree trunks...". The eggs were "...about half an inch in diameter and contained tadpoles with the hind limbs and tail well developed...". Butler (1904) tentatively assigned these larvae to *Megophrys longipes* and added that "...the larval existence of this frog is not aquatic...". Butler's speculations were subsequently cited but not refuted (Boulenger, 1908, 1912; Taylor, 1962; Berry, 1975; Yong et al., 1988). In addition, Berry (1975) noted that "...six similar large ova, with developing tadpoles inside them, were collected by Dr. D. Wells from among mosses growing on a tree-trunk, 2 ft. from the ground in Gunong Bunga Buah, Selangor (4200 ft.)...".

Of the known larval identities of *Megophrys* species, all tadpole types are free-swimming and possess the characteristic funnel-mouth structure specialised for surface-feeding (Inger

Received 6 Feb 1998 Accepted 16 Mar 1998

& Stuebing, 1997). For example, this is observed in the larvae of *Megophrys nasuta* (Inger, 1966, 1985; Inger & Stuebing, 1989), *M. aceras* (Smith, 1926; Bourret, 1941), *M. parva* (Bourret, 1941) and *M. pelodytoides* (Smith, 1930). Hence, to observe direct development in *M. longipes* would be taxonomically and evolutionarily inconsistent.

Descriptions of the ova found by Butler (1904) are comparable to that described for *Philautus aurisfasciatus* (Yong et al., 1988) in terms of egg size. Both egg batches were discovered from the highland forests of Peninsular Malaysia, where *P. aurifasciatus* is also known to occur (Berry, 1975). It is likely that Butler misidentified the ova as that of *M. longipes* based on the dark brown, 'H'-shaped marking on the dorsum of the advanced larvae. This characteristic marking is observable in the live adults of both *Philautus aurifasciatus* and *Megophrys longipes*.

Specimens are deposited at the Zoological Reference Collection (ZRC) of the Department of Biological Sciences, National University of Singapore.

LARVAL DESCRIPTION

On the night of 11 December, 1996, an exploration through the forest trails at Fraser's Hill, Pahang, Peninsular Malaysia bypassed a number of shallow, narrow streams. A batch of free-swimming larvae with very wide, upturned funnel mouths was collected from the shallow sand banks and under submerged leaf litter (ZRC.1.3458; Stages 26-36, after Gosner, 1960; n=15). Further downstream, adults of *Megophrys longipes* were sighted, of which two specimens were found perched atop vegetation overhanging the stream and subsequently collected (ZRC.1.3460; SVL=37.1, 37.8 mm; Fig. 1). An advanced larva with well developed fore- and hind-limbs was also collected from the same site and exhibited characteristics (see below) comparable with the adults of *M. longipes* (ZRC.1.3459; Stage 43). Other anuran species observed at the site include *Limnonectes blythii*, *Taylorana hascheana*, *Rana signata*, *Rhacophorus bipunctatus*, *R. promianus* and *Metaphrynella pollicaris*. Other than *M. longipes*, no other members of the family Megophryidae were encountered. The larvae from Fraser's Hill also agree closely with those found at Robinson Waterfalls, Cameron Highlands, Peninsular Malaysia (Manthey & Grossmann, 1997; Plate 47) and can be assigned to the parental species of *M. longipes*. Description of the larvae is as follows:

Larval Microhabitats. - Larvae were observed to inhabit the shallow side pools of small (about 50-80 cm width) mountain streams (1200m a.s.l.) with moderate to swift-flowing water. When disturbed, the larvae attempted to conceal themselves among submerged leaf litter.

Larval Morphology. - Head-body elongate to ellipsoidal, cross-section nearly circular, slightly depressed above, body width 0.46-0.61 of head-body length; eyes located dorso-laterally, not visible from ventral aspect; nares open, rim projecting dorso-laterally, inter-narial 0.86-0.94 of inter-orbital; oral disc dorso-terminal, labia expanded into surface-oriented funnel, open funnel width 1.27-1.90 of head-body width, anterior margin of lower lip sinuate, lateral corners pointed, lower lip deeper than upper lip, lips without denticles but possessing numerous protuberances pigmented brown and radiating from the centre, marginal papillae absent, lower lip with low, rounded infra-marginal papillae, both beaks thin, edged with fine, pointed serrae. Spiracle sinistral, low on left flank, tube free from body at tip; snout-spiracle 0.48-0.52 of head-body length; anal tube median, unattached to ventral fin. Tail

slender, tapering gradually to a pointed tip; tail length 2.13-2.64 times head-body length, maximum depth 0.19-0.27 of tail length; caudal muscle strong, deeper than tail fins except at posterior quarter, ventral fin slightly deeper than dorsal. (Dimensions from ZRC.1.3458, n=15, Stages 26-36, total lengths: 17.2-38.1 mm)

Colour/Markings. - (in life) Head-body and tail muscle olive, mottled with dark brown specks on dorsum and along flanks; ventral surface uniform buff, finely dusted with brown; tail fins occasionally speckled with dark brown patches.

Feeding Behaviour. - At the hill streams, the larvae were observed to feed in a manner similar to that seen in *Megophrys nasuta* larvae. In shallow water (<1 cm depth), the *M. longipes* larvae contact the water surface with fully expanded funnel lips, forming a noticeable depression of the water surface at the position of the mouth (Fig. 2). With swift gulping

Fig. 1. Lateral view of adult *Megophrys longipes* Boulenger (ZRC.1.3460), Fraser's Hill, Peninsular Malaysia.

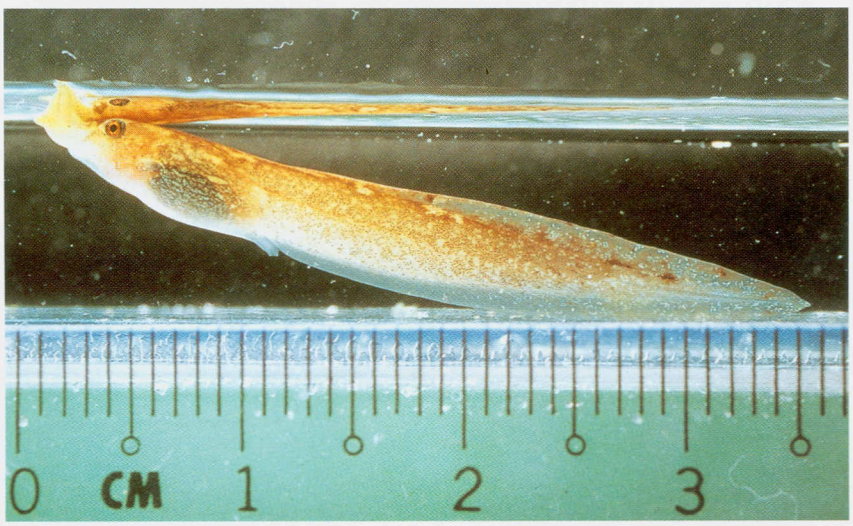

Fig. 2. Lateral aspect of *Megophrys longipes* larva (Stage 32) in feeding position.

movements of the mouth, floating debris are drawn rhythmically towards the lips, which sieve out the larger particles, while allowing the finer ones in. When the larvae are not feeding, they lie on the stream bed with the funnel mouth collapsed. In this non-feeding position, the extreme lateral corners of the lips are folded upwards and inwards, forming a crescent-shaped pair of 'horns' (Fig. 3).

Development. - The advanced stage larva collected (ZRC.1.3459; Stage 43, total length 33.2 mm) provided the essential link between larval and adult stages. The specimen still possessed the characteristic mottled tail of the larva described earlier. Diagnostic features which are observable in adults of *M. longipes* were exhibited in this specimen. These include a small, soft dermal projection on the medial edge of upper eyelid; distinct canthus rostralis; slender fingers, first finger as long as second; slender, long toes with rudiment of web; both subarticular and metatarsal tubercles absent; smooth skin dorsally with two pairs of delicate oblique folds converging posteriorly on the scapular region; distinct supratympanic fold; smooth ventral surface. In life, the larva was olive-brown dorsally; limbs with dark cross-bars. A dark brown 'H'-shaped marking overlapped the region of the dorsal, central dermal ridges but this colour pattern faded upon fixation and preservation. After eventual tail resorption, the specimen would have a snout-vent length of 12.8 mm.

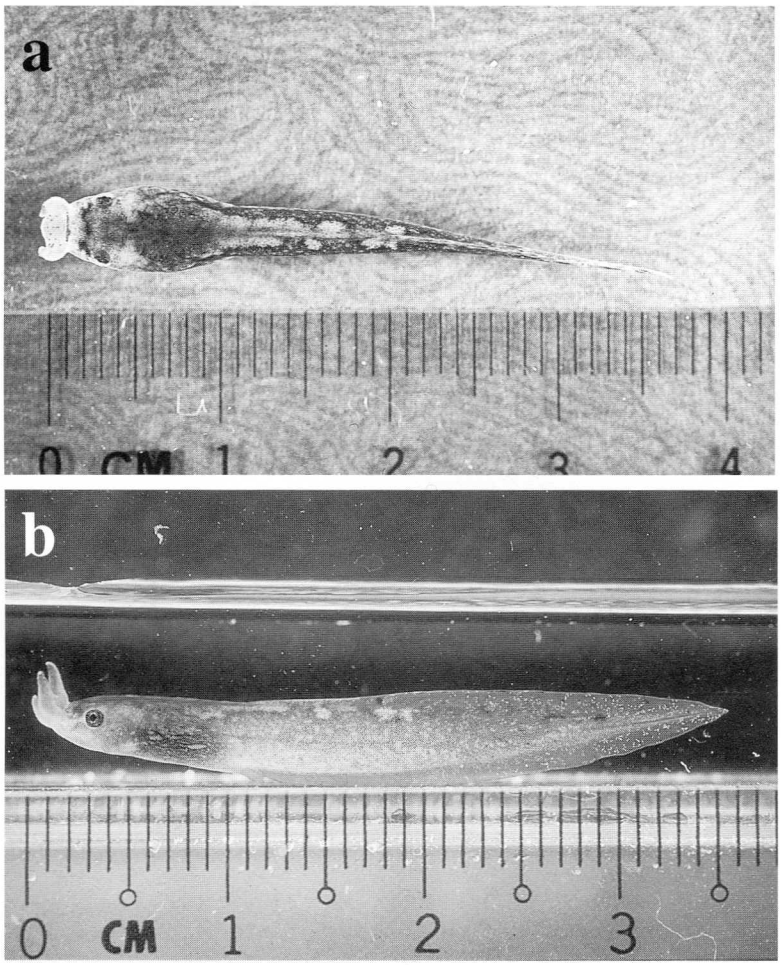

Fig. 3. Dorsal (a) and lateral (b) aspects of *Megophrys longipes* larva (Stage 32) in non-feeding position.

Diagnosis. - The larvae of *Megophrys longipes* may be distinguished from the known tadpoles of other *Megophrys* species by the exceptionally elongated lateral labial projections.

ACKNOWLEDGEMENTS

The authors would like to thank T. P. Leong for his enthusiastic field assistance and Kelvin K. P. Lim (ZRC, Department of Biological Sciences, NUS) for the generous loan of literature and specimens.

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