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# APODOUS AMPHIBIA OF THE EASTERN GHATS, SOUTH INDIA

By Dr. L. S. RAMASWAMI

*(Department of Zoology, Intermediate College, Mysore)*

HERPETOLOGISTS have reported the occurrence of Apoda (Amphibia) from the Western Ghats of India, and as far as I know, there is no similar record from the Eastern Ghats.

The Western Ghats stretch from Cape Camorin to the Tapti Valley and the Palni Hills are an easterly extension of the same. Mysore and Coorg have on their western margin these Ghats from where specimens of Apoda (Ichthyophis and Gegenophis) are procured. South of Mysore, the Western and Eastern Ghats meet forming the Nilgiri Hills. The Eastern Ghats are not such a continuous stretch as the Western and extend away from the coast, from Orissa to Nellore on the east coast, the Nallamalai, Nagari and Javadi Hills and the Shevroys forming parts of this chain. The average altitude of the Eastern Ghats is about 2,000 feet.

Nagalapuram Hills (Text-Fig. 1) are isolated in the north-western corner of Tiruvallur taluq, Chingleput district, to the east of Nagari Hills extending into the Kalahasti zamindari. Kambakkam reserved forest is a part of this hill and at the foot of the Kambakkam Hill, as it is locally known, there is a forest Rest House called Thantipandal (about 340 feet above sea-level). Opposite the hut, is a small pool of water near which a well-grown specimen of *Ichthyophis monochrous* (Bleek.) was collected by me. However, there was a white patch, behind the eyes, running from one side of the head to the other which is not present in specimens from the Western Ghats.

About four furlongs from the hut, there is a Dry Cow Salvage Station, instituted by the Madras Government, and opposite this is a brook which supplies water to the station.

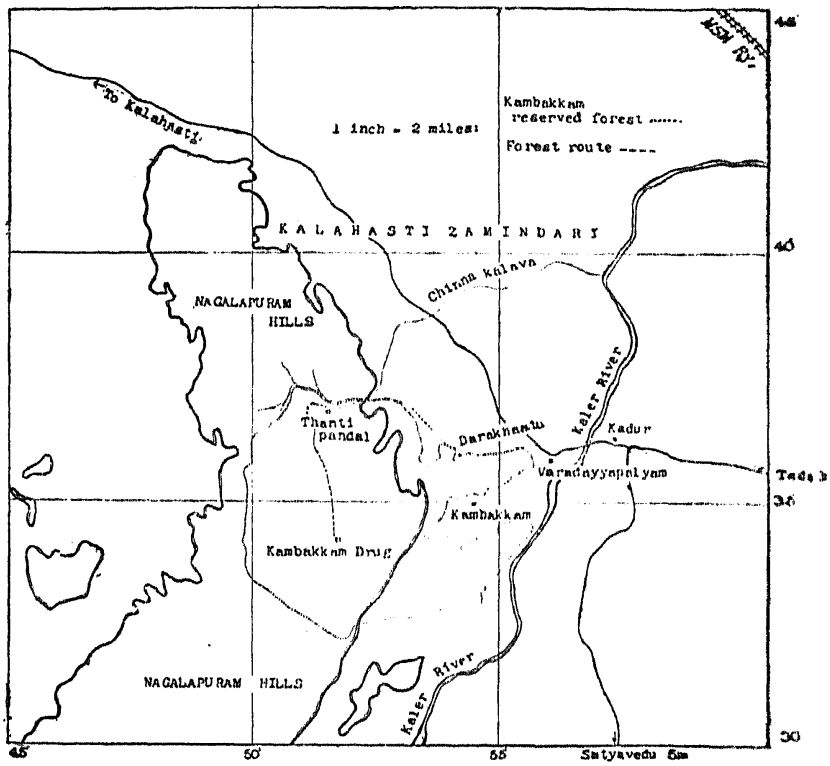


FIG. 1. Map of Kambakkam reserved forest area (after Survey of India map nr. 57-0 /ne) in Nagalapuram Hills, Eastern Ghats.

The stream was diverted and the loose soil overgrown with grass was pulled out and a number of larvæ of *Ichthyophis monochrous* secured. It is interesting to note that these animals breed even during cold months also.

Dr. F. H. Gravely who was the first to collect two apodan specimens from Kambakkam locality sent them to America and I learn that they are still unidentified. In his letter, Dr. Gravely

stated that the specimens were secured "from under a dead log beside the mountain stream at Kambakkam in the valley between its fall from a higher altitude to low level and the canebrake near Tantipandal. If I remember rightly it was not much below the fall". The area to which Dr. Gravely refers is away in the jungle from where I collected. I showed my specimens to him but he was unable to say whether his resembled mine.

These primitive Amphibia have hitherto been unknown from the Eastern Ghats and no description of the larvæ of *I. monochrous* exists. The available literature shows that the larvæ of both *I. glutinosus* and *I. monochrous* are mixed up in description. A comparison of the larval stages of *I. glutinosus* and *I. monochrous* shows that the latter larvæ can be easily distinguished from those of its congener.

Late embryos of *I. glutinosus* show the presence of three pairs of external gills and also a 'spiraculum' in which *two* projections are noticeable between which a single cleft opens. In the aquatic larvæ where the external gills have been absorbed, the 'spiraculum' shows the two projections with a cleft in between them. Gadow,[1] however, described correctly the structure of the 'spiraculum' as above. The yellow band, so characteristic of the species appears only after the larva has grown a little; in a larva measuring 79-80 mm. there are no bands while in that measuring 82-85 mm. the bands are just visible. However, Sarasins,[2] confirming the observations of Müller, noted *three* projections in the 'spiraculum' of *glutinosus* corresponding with the second, third and fourth ceratobranchials, and two gill slits between the second and the third and the third and fourth arches respectively. In his descriptions of early larval stages of *glutinosus*, Deraniyagala[3] noticed that in a larva measuring 94-96 mm. each 'spiraculum' disclosed three vestigial branchial arches and he delineated three projections in the 'spiraculum' in his Figs. 1 and 2 (Plate XXXVII). In a stage which he characterised as the next during metamorphosis of this species ('terrestrial larva', 157 mm. long) he recorded that the 'spiraculum' showed only *two* vestigial branchial arches but no reference has been made to the number of slits either in this or in his previous 'aquatic' larval stage.

Boulenger[4] in describing the systematics of Apoda, draws figures of the larvæ of *I. monochrous* (Pl. IV, Fig. 1-1c); in the profile of the head, the figure seems to show only two projections in the 'spiraculum' and the exact number of annuli intercepted by the anus could not be made out in Fig. 1c.

In a sectional view of a larva described as belonging to *I. glutinosus*, Norris and Hughes[5] show the second gill slit passing evidently between the third and fourth branchial arches since a portion of the fourth branchial arch is also depicted. These authors are also describing a larva with two pairs of gill slits.

Since the yellow bands are not formed in the early larvæ of *I. glutinosus*, it is possible that the collections of Sarasins and of Deraniyagala contain larval forms of both species of *Ichthyophis* which could not thus be differentiated and the latter author has, therefore, regarded those with three projections as an earlier aquatic larval stage of *glutinosus*. Further, while Sarasins show three projections in some figures (Pl. XXIV, Figs. 119, 120) and sectional views (Figs. 121, 122), only two plate-like structures are depicted in Figs. 48 and 51 (Pl. V); obviously the collection is a mixed one.

After examining a closely graded series of embryos (egg clusters with mothers) and larvæ of *I. glutinosus* from Kotgehar (Mysore State) and having sectioned stages earlier than those studied by Deraniyagala, I am unable to corroborate the observations of Sarasins and of Deraniyagala with regard to the number of projections and slits.

The characters of the larvæ of *Ichthyophis monochrous* and *Ichthyophis glutinosus* can now be described as follows:—

*I. monochrous* (Bleeker): Larva studied 200 mm. in length with a very prominent tail fin, the dorsal lobe of which extends in front of the anus; snout length less than the inter orbit; no yellow bands, a uniform steel blue; head shows thick lips, two milky eyes with a tentacular orifice in front of each eye (even in a larva measuring 100 mm., the smallest that I possess, this orifice is present); sensory openings on the head; 322-325 rings on the body; the cloacal opening interrupts seven annuli; eight postanal annuli and a small posterior

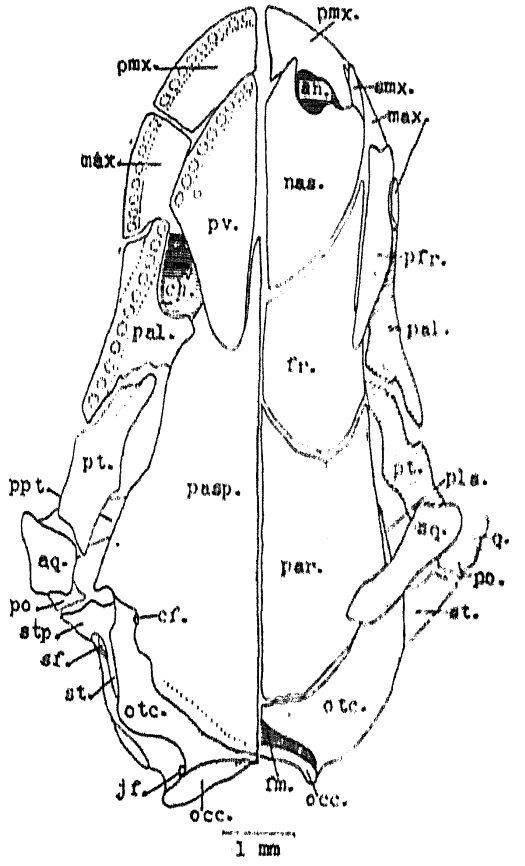


FIG. 2. Skull of a larva of *Ichthyophis monochrous* (Bleek.) (ventral aspect on left side).

*an.*, anterior naris; *aq.*, articular facet of quadrate; *cf.*, carotid foramen; *ch.*, choana; *fm.*, foramen magnum; *fr.*, frontal; *jf.*, jugular foramen; *mx.*, maxilla; *nas.*, nasal; *occ.*, occipital condyle; *otc.*, otic capsule; *pal.*, palatine; *par.*, parietal; *pasp.*, parasphenoid; *pfr.* prefrontal; *pls.*, pleurosphenoid; *pmx.*, premaxilla; *po.*, processus oticus; *ppt.*, processus pterygoideus; *pt.*, pterygoid; *pv.*, prevomer; *q.*, quadrate.