

Limnonectes shompenorum, a new species of ranid frog of the *Rana macrodon* complex from Great Nicobar, India

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Abstract

Limnonectes shompenorum, a new species of ranid of the *Rana macrodon* complex, from Great Nicobar Island, India, is described. *Limnonectes shompenorum* can be differentiated from congeners of the species complex by a combination of the following characters: a head that is narrower than the body, and longer than broad; interorbital distance greater than the upper eyelid width; fingers with movable dermal fringe; tips of fingers weakly swollen; finger 4 longer than finger 2; completely webbed toes; presence of a dark, horizontal loreal stripe; absence of the inverted V-shaped fold on the scapular region; and partially pigmented eggs.

Key words: Anura; Ranidae; *Limnonectes shompenorum*; *Rana macrodon*; Nicobar; India.

Introduction

Limnonectes macrodon was described by Duméril et al. (1841) based on material from Java and Celebes (= Sulawesi), Indonesia. Inger (1954), in his review of the Philippine amphibians, considered four large aquatic ranid species then assigned to the genus *Rana* (*R. acanthi*, *R. magna*, *R. macrocephala* and *R. visayanus*), to be subspecies of *Rana macrodon*. In a later paper however, Inger (1958) separated these taxa from *R. macrodon* because they possessed vocal sacs and eggs with densely-pigmented hemispheres. Subsequent workers reported *R. macrodon* to be widespread in the Sunda region, including Borneo, Sumatra, Mentawai Islands, the Malay Peninsula and the Riau Archipelago (Inger, 1966). In his monograph of the genus *Rana*, Boulenger (1920) described a "variety" of *R. macrodon*, *R. m. blythi*, which Inger (1966) considered a full species, basing his opinion on features such as the relatively long hind limbs and narrower head, and on noticing the sympatry of *R. macrodon* and *R. blythi* in Borneo. Kiew (1984) subdivided the broad-headed taxon further into two

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taxa, each of which he considered to be distinct species: *R. (Limnonectes) macrodon*, restricted to Java and a new species, *R. (L.) malesiana* (type locality: Bukit Timah, Singapore). The latter species is now known from peninsular Malaya, Sumatra, Borneo and Java, as well as many of the smaller associated islands (Frost, 1985). Kiew (1978) also described another species of the *Rana macrodon* complex, *Rana (L.) ingeri* (type locality: Sungei Sepupok, Niah, Fourth Division, Sarawak, East Malaysia); this species is also presently known from Java and the Mentawai Islands (Frost, 1985).

Species of the *Rana macrodon* group were assigned to the subgenus *Limnonectes* by Dring (1979). Dubois (1981) included *R. macrodon* in the *Rana grunniens* group, and subsequently (Dubois, 1992) referred the *grunniens* group to the genus *Limnonectes*. *Limnonectes macrodon* has also been recorded from Sikkim, eastern India, by Dutta (1992), although no further details on the material were provided. Sarkar (1990) reported a collection of a single example of "*Rana macrodon* var. *blythi*" from Tribeni Nullah, Campbell Bay, in Great Nicobar, India. The collection of fresh material from the island in 1994 permits re-evaluation of the Nicobarese specimens, which have proven to represent an undescribed taxon, and described as a new species herein.

Material and methods

All measurements were taken with Mitutoyo™ dial vernier calipers (to the nearest 0.1 mm) from formalin-fixed specimens that are preserved in 70% ethanol, seven to eight months after collection. The following measurements were taken: snout-vent length, SVL (from the tip of the snout to the vent); tibia length, TBL (the distance between the surface of knee to the surface of heel, with both tibia and tarsus flexed); body width, BW (the greatest width of the trunk); head length, HL (the distance between the angle of the jaws and the snout-tip); head width, HW (measured at the angle of the jaws); eye diameter, ED (the diameter of the orbit); tympanum diameter, TY (the greatest diameter of the tympanum); upper eyelid width, UE (the greatest width of the upper eyelid); interorbital width, IO (the least distance between the upper eyelids); eye to snout-tip distance, E-S (the distance between the anterior-most point of the eyes to the tip of the snout); eye to nostril distance, E-N (the distance between the anterior-most point of the eyes and the nostrils); fore limb length, FOL (the length of the outstretched left fore limb, from axilla to the tip of its longest finger); and hind limb length, HIL (the length of the outstretched left hind limb, from vent to the tip of its longest toe). Colour (terminology after Smith, 1974; 1981) notes are based on examination of Fujichrome 100 ASA colour transparencies of the holotype in life.

Limnonectes shompenorum sp. nov.

(Figure 1)

Holotype. ZSI A8741, 76.9 mm SVL adult female; ca. 2 km east of Kopen Heat, ca. 14 km on the East-West Road, Great Nicobar, India; coll. I. Das and S. Bhaskar, 18 March 1994.

Paratypes. ZSI A8742, A8743 and A8744, 3 ex., 71.8-79.0 mm SVL, adult females; coll. 19 March 1994. Other data same as holotype.

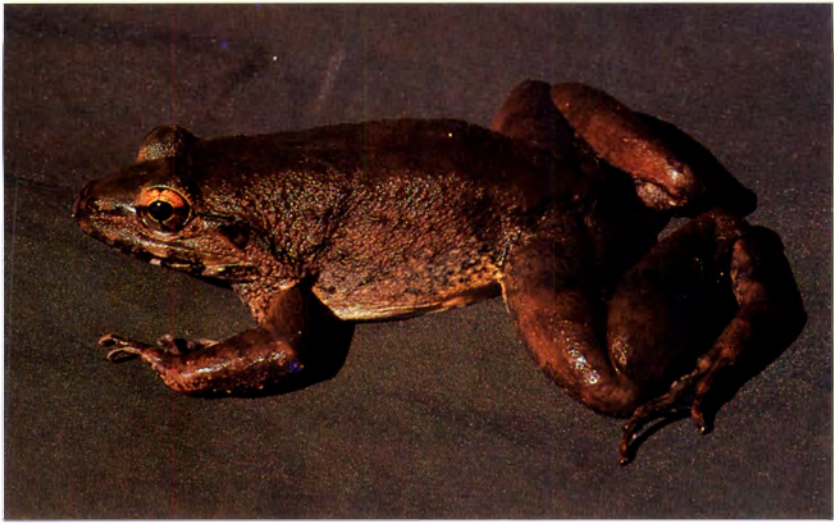


Figure 1. Photograph of living *Limnonectes shompenorum* sp. nov., 76.9 mm SVL holotype female (now ZSI A8741), from Great Nicobar, India.

Diagnosis

A large (female SVL \leq 79.0 mm) ranid, that can be distinguished from other species of the *Rana macrodon* complex in possessing the following suite of characters: (1) head narrower than body, and longer than broad; (2) interorbital distance greater than the upper eyelid width; (3) fingers with movable dermal fringe; (4) tips of fingers weakly swollen; (5) finger 4 longer than finger 2; (6) toes completely webbed; (7) dark horizontal loreal stripe; and (8) partially pigmented eggs.

Description of holotype

Adult female having a robust habitus, BW 38.8% SVL; head large, longer than wide, HW 95.7% HL; comparatively wide, HW 34.4% SVL (Fig. 2); mandible with two sharp odontoids near symphysis, bounding the median hook of the mandible; snout projecting, slightly rounded; nostrils slit-like, protuberant, dorsolaterally orientated; HL 36.0% SVL; snout subacute in dorsal view, slightly arched dorsally in lateral view; nostrils oriented anterolaterally, nearer to snout-tip than to the eyes; canthus rostralis concave; internarial area flat; eyes large, ED 35.7% HL; eye diameter greater than the distance between the eyes and the nostrils, E-N 94.9% ED; interorbital region flat, with a weak fold of skin between the mid-posterior level of the upper eyelids, which are narrower than the interorbital distance; IO 65.7% ED. Tympanum large, oval, situated posteroventrally to the eyes and almost touching the angle of the jaws, TY 64.7% ED; supratympanic fold fleshy, commencing behind the posterior edge of the orbit, continuing over the tympanum and terminating a little beyond the insertion of the fore limb. Tongue large, elongated, bifid and free posteriorly for 33.9% of its length. Vomerine teeth in two large, oblique groups, each containing 11 teeth; lateral edge of dentigerous process extending laterally to the

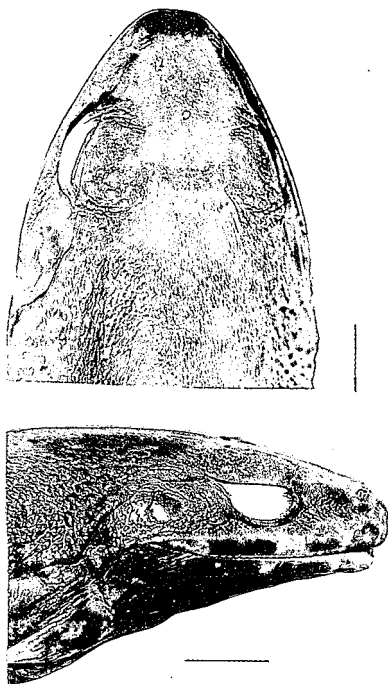


Figure 2. (a) dorsal and (b) lateral views of the head of the holotype of *Limnonectes shompenorum*; scale bar = 10 mm.

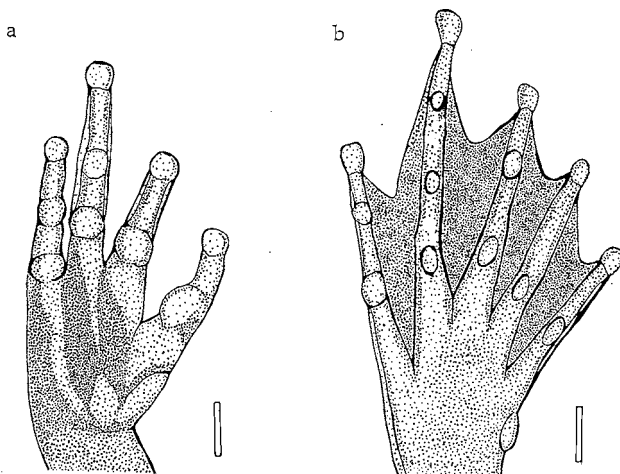


Figure 3. (a) ventral aspect of right hand and (b) right foot of the holotype of *Limnonectes shompenorum*, 76.9 mm SVL; scale bar = 5 mm.

level of median edge of choanae, separated by a distance less than 25% of the length of each row. Choanae oval, each 66.7% the length of the vomerine rows, separated from each other by a gap 305% of the length of each choana. Cloacal opening directed posteriorly, slightly below the upper level of thighs. Skin smooth dorsally, rugose with small warts laterally, the largest warts lateral to the scapular region and on the upper eyelids; ventral skin with fine transverse wrinkles.

Fore limbs robust. Subarticular tubercles on palm large, flat, the proximal tubercles larger than the distal tubercles (Fig. 3). Fingers unwebbed, fingers 2 and 3 with distinct dermal fringes on both sides of digit; fingers 1 and 4 without dermal fringe. Fingers, especially finger 1, weakly swollen at the tip, lacking circum-marginal grooves. Fore limb long, FOL 49.8% SVL, relatively thick, fore limb width 16.7% SVL. Outer metatarsal tubercle absent; inner metatarsal tubercle elongated; subarticular tubercles oval. Toes webbed to their weakly swollen tips. Movable flaps of skin on outer edge of toe 5 and on inner edge of toe 1. Webbing on toe 4 up to penultimate tubercle, reaching the distal tubercle as a movable flap. When toes 4 and 5 are brought together, the edge of the narrowest part of the interdigital membrane is below the middle subarticular tubercle of toe 4. Toe tips swollen. Tibia long, TBL 54.0% SVL. Hind limbs long, SVL 61.9% HIL; the femoral region thick, femur 13.3% HIL; shanks overlapping when hind limbs are adpressed; tibio-tarsal articulation extends to anterior corner of the eye. Subdigital formulae: fingers: $3 > 1 > 2 > 4$. Measurements, in mm, of the digits of the left palm: 10.5-8.6-11.7-7.7. Toes: $4 > 3 > 5 > 2 > 1$. Measurements, in mm, of the digits of the left sole: 11.2-17.5-27.7-35.6-23.9.

A summary of the measurements of the type series is given in Table 1.

Colour. (See also Fig. 1); in life, dorsum of head and trunk burnt umber; inguinal region orange-yellow, mottled with burnt umber. Supratympanic fold, canthal ridge, and upper and lower lips barred with fuscous. Dusky brown band across interorbital region between middle level of upper eyelids. Throat dark brownish olive. Undersurface below throat pale horn colour.

Etymology

The species name is a reference to the Shompen tribe, the last of the true hunter-gatherers of the Nicobars. An account of these highlanders, whose long-term survival is threatened by settlement, deforestation, and diseases introduced by settlers, can be found in Rizvi (1990).

Table 1. Major body measurements of the type series of *Limnonectes shompenorum* (in mm). Abbreviations are as follow: SVL, snout-vent length; TBL, tibia length; HW, head width; HL, head length; BW, body width; ED, eye diameter; TYD, tympanum diameter.

	SVL	TBL	HW	HL	BW	ED	TYD
Holotype							
ZSI A8741	76.9	41.5	26.5	27.7	29.8	9.9	6.4
Paratypes							
ZSI A8742	71.8	39.9	24.4	24.8	30.8	8.5	5.3
ZSI A8743	77.6	42.4	26.1	25.8	28.9	9.9	4.9
ZSI A8744	79.0	43.8	28.6	27.0	25.4	8.2	4.6

Comparisons

In the scheme of classification of Boulenger (1882; 1890), *Limnonectes shompenorum* sp. nov. resembles *L. macrodon* in having odontoid processes on the mandible; a distinct tympanum, and vomerine teeth in two oblique series commencing from the inner front edge of the choanae. Additional features that are in common to these two taxa include a large head; broadly webbed toes; unwebbed finger; finger 1 > finger 2; absence of outer metatarsal tubercle; long inner metatarsal tubercle and long hind limb; and the tibio-tarsal articulation which reaches or exceeds the eye. However, the new species differs from *L. macrodon* in having a head that is narrower than the body; interorbital distance greater than the upper eyelid; tips of fingers weakly (not distinctly) swollen and finger 2 much longer than finger 4 (vs. subequal in *L. macrodon*).

Limnonectes shompenorum resembles *L. blythi* and *L. ingeri* in the possession of webbed toes (Inger, 1966: 166), but differs from *L. blythi* in lacking the inverted V- or W-shaped fold on the scapular region; having bicoloured (vs. unicoloured eggs; Dring, 1979; Inger, 1966) and significantly smaller body size (SVL of the types of the new species ranged between 71.8-79.0 mm, versus the 85-125 mm range given for the females of *L. blythi* by Inger & Stuebing, 1989). The new species however, falls within the reported size range of *L. ingeri*, SVL 70-127 mm (Inger & Stuebing, 1989). *Limnonectes shompenorum* resembles *L. malesiana* in SVL (> 50 mm) and the absence of a tarsal fold. However, it can be distinguished from *L. malesiana* in having a distinct canthus rostralis (indistinct in *R. malesiana*); completely webbed toes (vs. three-fourths webbed); fingers with dermal fringe (vs. none); head longer than broad (vs. broader than long) and maxilla not separated from lower eyelid by a concave pigmented depression.

Key to species of the *Rana macrodon* complex from the Nicobars, the Malay Peninsula and the Sundas:

1. Toes completely webbed 2
- 1'. Toes not completely webbed *Limnonectes malesiana*
2. Head broader than body; tips of fingers distinctly swollen *Limnonectes macrodon*
- 2'. Head narrower than body; tips of fingers not distinctly swollen 3
3. No dark line from the eye to the nostril *Limnonectes ingeri*
- 3'. A dark line from the eye to the nostril 4
4. Absence of the inverted V-shaped fold on the scapular region; bicoloured eggs; female SVL 71.8-79.0 mm *Limnonectes shompenorum*
- 4'. Inverted V- or W-shaped fold on the scapular region; unicoloured eggs; female SVL 85-125 mm *Limnonectes blythi*

Natural history

The holotype and three paratypes were collected from a forest path in an evergreen forest in a nonriparian situation on Great Nicobar (Fig. 4), between 2025-2040 hours. No streams were present within 200 m of the sites of capture. The frogs were located by their dull orange eye-shine using a spotlight, and caught by hand. The stomachs of the type series indicate that they were feeding on large prey. The holotype had a large gravid beetle in its stomach; wing length of 11.4 mm. Each paratype contained a single item in the stom-

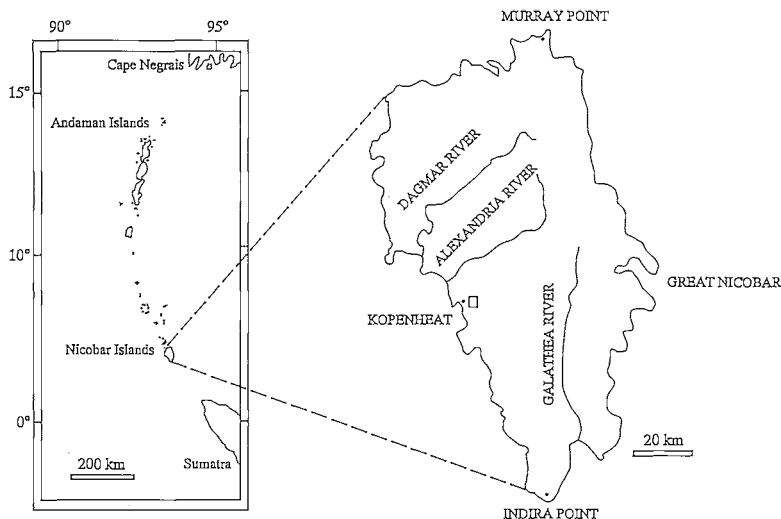


Figure 4. The Andaman and Nicobar Archipelago, showing Great Nicobar (enlarged) and the type locality (marked with a square) of *Limnonectes shompenorum*.

ach, an indeterminate species of gravid frog with a SVL of 20.3 mm, a cockroach, and a beetle, respectively. The holotype and two of the paratypes are gravid females with pigmented eggs having a mean diameter 2.2 mm. The fourth example has distended oviducts, suggesting the recent deposition of eggs.

No males are represented in the sample obtained. The males of *Limnonectes shompenorum* are suspected to be even larger than the females and voiceless, lacking vocal sacs, similar to *L. blythi* and *L. ingeri*, in both of which female-biased sex ratios have been reported by Emerson & Berrigan (1993).

Bufo melanostictus, an undescribed species of *Polypedates*, and *Rana chalconota* occur sympatrically with *Limnonectes shompenorum*. *Rana chalconota* was hitherto known from peninsular Malaya, the Sundas and Sulawesi (Frost, 1985), and thus is a new record for both the Nicobars and the Republic of India.

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