

**FIRST RECORD OF THE SWAMP-FOREST FROG,
RANA PARAMACRODON PARAMACRODON INGER, 1966
(AMPHIBIA: ANURA: RANIDAE) FROM SINGAPORE WITH
NOTES ON ITS TAXONOMY, ECOLOGY AND BIOLOGY**

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ABSTRACT. - This paper records for the first time, the occurrence of the swamp-forest frog *Rana paramacrodon paramacrodon* Inger, 1966 in Singapore. A taxonomic account of this frog is provided. Notes on its living colours as well as aspects of its biology and ecology are appended where available.

INTRODUCTION

While examining the amphibian material of the Zoological Reference Collection (ZRC) of the Department of Zoology, National University of Singapore, the author came across a ranid frog collected by C. F. Lim from an unspecified locality in Nee Soon, Singapore (Fig. 1) on 17 December 1974, and identified by the collector as *Rana paramacrodon* Inger, 1966. Lim's finding was never published, and *Rana paramacrodon* was not recorded as a member of the Singapore fauna (Berry, 1964; Berry & Hendrickson, 1963; Blandford, 1881; Boulenger, 1882, 1912; Bourret, 1942; Butler, 1904; Flower, 1896; Hanitsch, 1908, 1912; Inger, 1966; Johnson, 1964, 1973; van Kampen, 1923; Kiew, 1984a; Murphy, 1973; Smedley, 1931; Smith, 1930; Sworder, 1924, 1925; Taylor, 1962). Recently, between November and December 1988, the author and his colleagues obtained an additional six specimens of *Rana paramacrodon* from the Nee Soon swamp-forest. The presence of this species in Singapore can now be confirmed.

MATERIALS & METHODS

Vernier callipers were used to obtain measurements of snout-vent length, head length (from tip of the snout to posterior rim of the tympanum), head width and tibia length of the alcohol preserved specimens. All measurements are in millimetres. Specimens are deposited in the Zoological Reference Collection, Department of Zoology, National University of Singapore (ZRC).

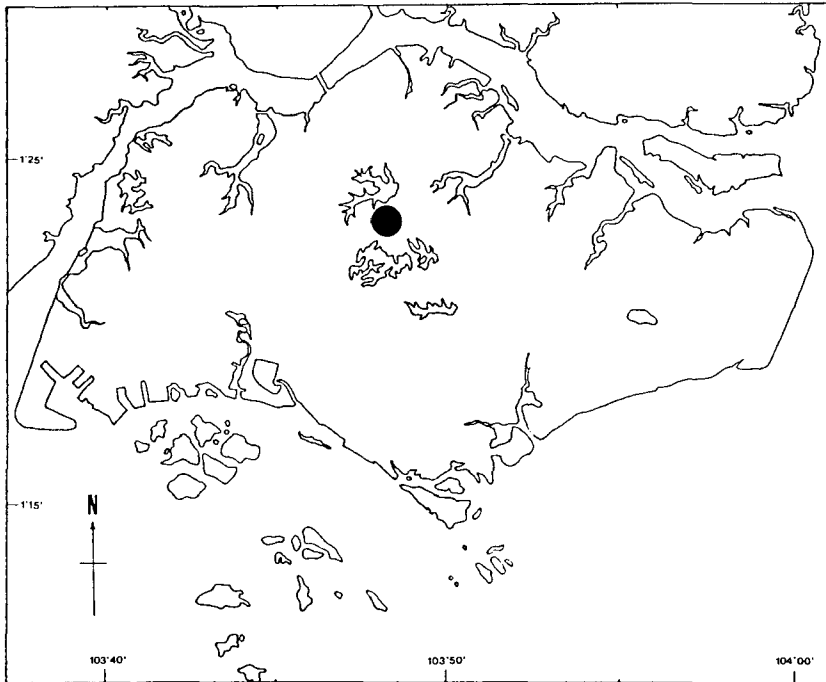


Fig. 1 Singapore island. Circle indicates site of collection.

TAXONOMY

ORDER ANURA RAFINESQUE, 1815

SUPERFAMILY RANOIDEA RAFINESQUE-SCHMALTZ, 1814

FAMILY RANIDAE RAFINESQUE-SCHMALTZ, 1814

SUBFAMILY RANINAE RAFINESQUE-SCHMALTZ, 1814

GENUS *RANA* LINNAEUS, 1758 SENSU LATO

Rana paramacrodon paramacrodon Inger, 1966

(Pl. 1)

Rana paramacrodon paramacrodon Inger, 1966: 228, Fig. 47

Rana paramacrodon - Kiew, 1972: 130, Pl. 49; Kiew, 1984b: 9; Berry, 1975: 83, Fig.57; Inger, Voris & Walker, 1985: 170

Rana paramacrodon paramacrodon - Dring, 1979: 203

Limnonectes (Limnonectes) paramacrodon - Dubois, 1986: 63

Diagnosis. - Small to medium-sized greyish-brown ranid, of the "ranae grunnientes group" of Boulenger (see Inger, 1966: 228); maximum snout-vent length 52 mm; dorsum granulated; head slightly longer than broad, sides of snout concave; posterior portion of upper eye-lids with small tubercles; tympanic fold well developed; with dark rhomboidal blotch covering tympanum except at anterior lower-most margin; fourth toe with two phalanges unwebbed; without distinct dorsal-lateral fold. Males without nuptial pads and vocal sacs.

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Material. - 1♀ (ZRC.1.1489), Nee Soon, leg. C. F. Lim, 17.xii.1974; 1 ♂ (ZRC.1.1557), Nee Soon swamp-forest, leg. K. Lim & H. C. Ho, 25.xi.1988; 1 ♂ (ZRC.1.1555), Nee Soon swamp-forest, leg. P. K. L. Ng & H. P. Ng, 29.xi.1988; 1♀ (ZRC.1.1563), 2 ♂ (ZRC.1.1564, 1-1573), Nee Soon swamp-forest, leg. P. K. L. Ng & K. Lim, 17.xii.1988; 1♀ (ZRC.1.1567), Nee Soon swamp-forest, leg. P. K. L. Ng, K. Lim & H. K. Lua, 31.xii.1988. All localities in Singapore.

Remarks. - Inger (1966) described *Rana paramacrodon* from Sabah and Northern Sarawak (Borneo). At the same time, he also described a new subspecies, *Rana paramacrodon kenepaiensis* from Western Borneo. The latter taxon differs from the nominate subspecies by being smaller in size, possessing proportionately longer legs, and having vocal sacs (Inger, 1966: 232). Dubois (1986: 63) regards the subspecies *kenepaiensis* as a distinct species, i.e. *Limnometes (Limnometes) kenepaiensis*.

Kiew (1972) first reported *Rana paramacrodon* from Peninsular Malaysia (Pahang and Selangor). He noted that his specimens differed "... from the Bornean ones by not having the eardrums completely covered by brown." (p. 132). He however, did not mention to what extent the tympanum was covered. From the figures he provided (his Pl. 49), it appears that about one-third of the upper part of the tympanum was covered. Whether this feature is characteristic of all the *Rana paramacrodon* in Peninsular Malaysia was not stated. Kiew did note however, that his frogs might represent a new subspecies, or even a new species altogether.

During (1979), on examining specimens collected from Trengganu, Peninsular Malaysia, confirmed that these frogs belong to the subspecies, *Rana paramacrodon paramacrodon*. He mentioned the specimens as having "..... a well-defined, lozenge-shaped, black tympanic mask" (p. 203). He did not however, state the extent of the black mask.

The present *Rana paramacrodon* from Singapore also agree closely with the nominate subspecies from Borneo. Females from 33.0 mm snout-vent length were found to contain pigmented ova. The tibia to snout-vent ratio ranges from 0.53 to 0.64 and the head length to snout-vent ratio from 0.40 to 0.44 (see Table 1). Dring (1979), on examining four female specimens (no males were obtained) (snout-vent lengths of 38.3 to 56.6 mm) from Trengganu, noted that the head to snout-vent length ratio ranges from 0.364 to 0.373. This ratio is smaller than those reported at present from Singapore (0.40 to 0.44), suggesting a proportionately longer head for the Singapore specimens. The Bornean examples of the nominate subspecies display a head-length to snout-vent ratio of 0.40 to 0.44 (Inger, 1966: 230) as in the Singapore series. Inger (1966: 233) suggests that the subspecies *kenepaiensis* possesses longer tibia length (tibia length to snout-vent length ratio of 0.56 to 0.59), as compared to the nominate subspecies *paramacrodon* (tibia length to snout-vent ratio of 0.49 to 0.55) in Borneo. Some Singapore specimens however, seem to display markedly longer tibiae than that of *kenepaiensis* (tibia length to snout-vent length ratio of 0.61 to 0.64), but others fall within the range of the Bornean *paramacrodon*. The available data (Table 1) seems to suggest that as the frogs grow, there is a corresponding shortening of the tibia. The tibia to snout-vent length ratios of the Trengganu and Singapore specimens (0.537 to 0.575 as against 0.53 to 0.64) appear comparable. Whether the slight differences in head proportions and tibia lengths are due to intraspecific (or intrasubspecific) variation will have to await detailed studies of more Malaysian specimens.

The uniform greyish-brown dorsum is granulated. The rhomboidal spot on the temporal region covers most of the tympanum except for the anterior lowermost margin (see Pl. 1A-C). In small specimens with snout-vent lengths of 38.0 mm or less, the area under the

TABLE 1

Catalogue Number	Sex	Snout-Vent Length (SV)	Tibia Length (TL)	Head Width (HW)	Head Length (HL)	TL-SV Ratio	HL-SV Ratio
ZRC.1.1567	♀	52.0	27.8	19.6	22.0	0.53	0.42
ZRC.1.1489	♀	48.2	26.2	16.7	20.0	0.54	0.41
ZRC.1.1573	♂	37.5	20.3	13.5	15.4	0.54	0.41
ZRC.1.1564	♂	34.2	19.5	11.9	13.9	0.57	0.41
ZRC.1.1563	♀	33.8	21.3	12.5	13.4	0.63	0.40
ZRC.1.1555	♂	30.9	18.8	11.7	13.5	0.61	0.44
ZRC.1.1557	♂	23.3	14.8	8.8	9.5	0.64	0.41

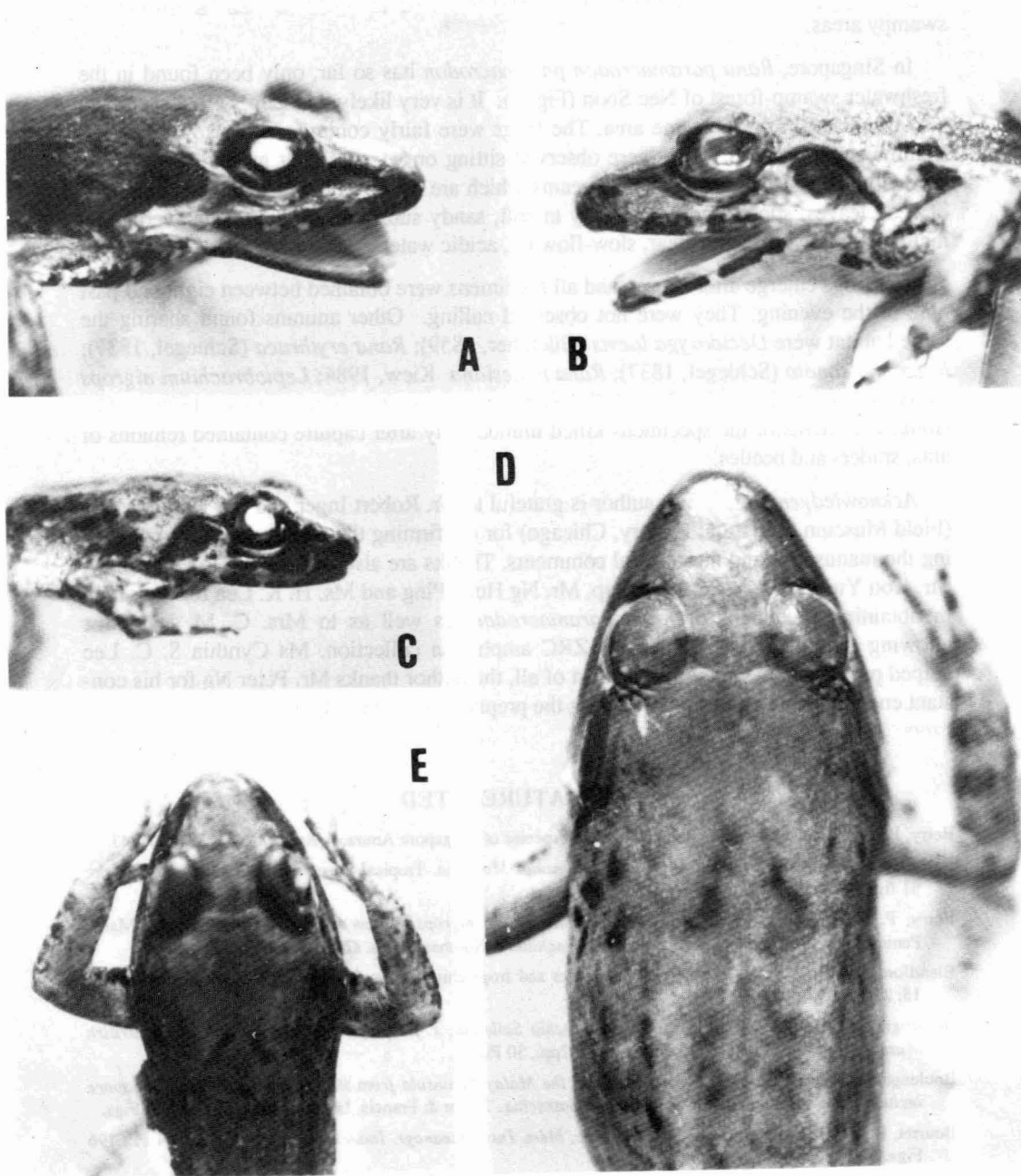
canthus rostralis is almost entirely dark. This dark area is restricted to a line under the canthus, not merging with the labial bars in larger individuals. In the smaller examples, the throat is a very distinct mottled grey which continues to the chest; whereas in the larger examples, the mottling is confined to the parts of the throat above the chest. In the larger specimens, the lower half of the abdomen, and the ventral surface of the femur is a pale sulphur yellow, but this colour tends to be brighter and extends into the sides of the chest in the smaller examples. In contrast to some of the Bornean specimens (fide Inger, 1966: 230), none of the Singapore frogs have vertebral stripes. The ventral surfaces are smooth. On the shoulder area of all the Singapore specimens, three or more small dark blotches are present. Inger (1966: 230) notes that none of the Bornean *R. paramacrodon paramacrodon* has an inverted V-shaped marking on the scapular region. This however, is present in five out of the seven Singapore specimens. The apex of the "V" is indistinct (P1. 1D-E). Neither Dring (1979) nor Kiew (1972) mentions the presence of this feature on the frogs from Peninsular Malaysia.

Dubois (1986) divided the genus *Rana* into many genera and subgenera on the basis of mainly osteological characters. He classified *R. paramacrodon paramacrodon* under the tribe Dicroglossini Anderson, 1871, in the nominate subgenus of the genus *Limnonectes* Fitzinger, 1843 (as a distinct species). The author prefers to retain the more widely used name *Rana* sensu lato for the Asiatic species until a comprehensive revision can be completed.

Kiew (1984b) proposed the local name "Coarse Frog", probably alluding to the granulated dorsum, for this species. The vernacular Malay name is "Katak Lembah" (p. 9), or "Swamp Frog".

Ecological notes. - *Rana paramacrodon paramacrodon* in Peninsular Malaysia and Borneo appears to be a swamp-forest dweller. Kiew (1972) obtained his specimens from the swamp-lake of Tasek Bera, Pahang, and states that the specimens from Selangor came from similar habitats. Berry (1975), on compiling the ecological notes of this species based on Inger's (1966) and Kiew's (1972) findings, states that the frog is "..... [f]ound in secondary and primary lowland forests in swampy situations and along gravel and clay banks of small streams (about 3 meters wide)." (p. 84). Dring (1979) recorded his Trengganu

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Pl. 1 *Rana paramacrodon paramacrodon*. A, B, C, showing tympanic mask; D, E, showing inverted V-shaped marking on scapular region.

A, ZRC 1. 1564 ; B, ZRC 1. 1573 ; ZRC 1. 1557 ; D, ZRC 1. 1489 ; E, ZRC 1. 1555.

A - C, showing extent of tympanic mask;

D - E, showing inverted 'V'-shaped marking on scapular region.

frogs as being found among leaf-litter by shallow muddy pools along logging tracks or in swampy areas.

In Singapore, *Rana paramacrodon paramacrodon* has so far, only been found in the freshwater swamp-forest of Nee Soon (Fig. 1). It is very likely that Lim's 1974 specimen also originated from the same area. The frogs were fairly common along several small, shallow streams there. They were observed sitting on vegetation at ground level, or on exposed patches at the edge of the streams which are heavily littered with accumulations of dead leaves, sticks, and with a silty to soft, sandy substrate. The streams averaged a metre or so in width, with clear, slow-flowing, acidic water.

The frogs emerge after sunset, and all specimens were obtained between eight and past nine in the evening. They were not observed calling. Other anurans found sharing the same habitat were *Occidozyga laevis* (Güenther, 1859); *Rana erythraea* (Schlegel, 1837); *Rana chalconota* (Schlegel, 1837); *Rana malesiana* Kiew, 1984; *Leptobrachium nigrops* Berry & Hendrickson, 1963, and *Polypedates leucomystax* (Gravenhorst, 1829). The stomach contents of the specimens killed immediately after capture contained remains of ants, spiders and beetles.

Acknowledgements. - The author is grateful to Dr. Robert Inger and Dr. Harold Voris (Field Museum of Natural History, Chicago) for confirming the identity of the frog, reading the manuscript and their useful comments. Thanks are also due to Dr. Ho Hua Chew, Mr. Koo Yuan Hsin, Mr. Patrick Yap, Mr. Ng Hock Ping and Ms. H. K. Lua for their help in obtaining specimens of *Rana paramacrodon*, as well as to Mrs. C. M. Yang for allowing the author to examine the ZRC amphibian collection. Ms Cynthia S. C. Lee helped proof-read the manuscript. Most of all, the author thanks Mr. Peter Ng for his constant encouragement and support during the preparation of this paper.

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