

## TADPOLE OF THE CELEBES TOAD *BUFO CELEBENSIS* GÜNTHER (AMPHIBIA: ANURA: BUFONIDAE) FROM NORTHEAST SULAWESI

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**ABSTRACT.** - A developmental series is positively assigned as the diagnostic larval form of the Sulawesi-endemic toad *Bufo celebensis* Günther, 1858, based on association with adults at the habitat locality in the Minahasa Peninsula, northeast Sulawesi.

**KEY WORDS.** - Celebes, Sulawesi, Bufonidae, *Bufo celebensis*, anura, larva, tadpole, toad.

### INTRODUCTION

Of the known amphibian fauna of Sulawesi, only three representatives of the Bufonid family have been recorded thus far, *vis. Bufo biporcatus* Gravenhorst 1829, *B. melanostictus* Schneider 1799 and *B. celebensis* Günther 1858 (Van Kampen, 1923; Bourret, 1942; Iskandar, 1998). *Bufo melanostictus* is an introduced species (Iskandar, 1998) and is known to occur only around Makassar (Ujung Pandang) and some neighbouring rice-fields outside the city (Iskandar, pers. com.). Records of *B. biporcatus* in Sulawesi have been from Makassar, Teteadji, Lake Towuti and Luwu District, while *B. celebensis* (Fig. 1) has an almost island-wide distribution, found from Manado in the north to Makassar in the south (Van Kampen, 1923). Outside of Sulawesi, *B. biporcatus* has a wide regional distribution, occurring in



Fig. 1. Adult male *Bufo celebensis* (SVL = 54.4mm) from Kakaskasen Tiga, Minahasa Peninsula, northeast Sulawesi, Indonesia.

Sumatra, Java, Bali and Lombok (Iskandar, 1998). *Bufo celebensis* is endemic to Sulawesi (Frost, 1985; Inger, 1999). The larvae of *B. biporcatus* are known to resemble those of *B. melanostictus*, but differing in the labial tooth row lengths of the posterior labium (Van Kampen, 1923). However, previous descriptions of *B. celebensis* have focused on the adult characteristics alone, without any mention of its tadpole stage (Günther, 1858; Boulenger, 1882; Van Kampen, 1923).

### MATERIALS AND METHODS

While assisting Daisy Wowor (Lembaga Ilmu Pengetahuan Indonesia - LIPI) on a field expedition, both adults and larvae of the Celebes toad were encountered at the locality of Kakaskasen Tiga (1° 20' 34.2" N, 124° 50' 29.7" E, ca. 600 m elevation) in the Minahasa Peninsula, northeast Sulawesi, Indonesia, on the 30th and 31st of January, 2000. *Bufo biporcatus* was not observed from this area. Habitat was mixed agricultural plantation adjacent to hill forest, with narrow irrigation canals channeling water into terraces and ponds. Weather had been predominantly overcast with continuous drizzling in between showers for the preceding week. By day, the bufonid larvae could be observed in the clear, shallow water (1-5 cm depth, pH 6.5) at the periphery of a heavily vegetated pond. No other anuran larval types were obtained from this water body. Introduced fish species, *Poecilia reticulata* and *Clarias* sp. were observed in this lentic microhabitat. By night, adult males (inflating their subgular vocal sacs and

exhibiting conspicuous black nuptial glands on the dorsal surface of the first finger) were heard and seen calling in the vicinity, mostly adjacent to the water's edge.

Adult voucher specimens were collected (ZRC.1.3777-3779, SVL 53.9-55.8mm). Larval samples were also collected and reared in captivity in a glass tank (25x10x20cm) with submerged aquatic vegetation and substrate of dead leaves. Their diet consisted of commercial fish flakes and pellets. Individuals were preserved at representative stages (Gosner, 1960) and stored in 10% formaldehyde. Sliding calipers (to 0.1 mm) were used for morphometric measurements, which include body length (BL), tail length (TAL), total length (TL), maximum tail height (MTH), inter-orbital distance (IOD), inter-narial distance (IND); abbreviations and definitions follow Altig & McDiarmid, 1999. In addition, BW (body width - widest part of body) and BH (body height - measured at mid-body) were also taken. Description of oral apparatus and labial tooth row formula (LTRF) is in accordance with Altig, 1970.

Preserved specimens of both adult and larvae are currently deposited at the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), Department of Biological Sciences, National University of Singapore (NUS). A representative portion of these specimens will subsequently be deposited with Balitbang Zoologi, Puslitbang Biologi - LIPI [formerly Museum Zoologicum Bogoriense (MZB)], Bogor, Indonesia.

## DESCRIPTION OF TADPOLE

**Larval Morphology.** - (Fig. 2) Body ovoid, BW 0.61-0.73 of BL; slightly depressed, BH 0.69-0.83 of BW; widest region of body just posterior to eyes; snout broadly rounded; eyes dorsal, directed laterally, not visible from below, IOD 0.48-0.61 of BW, 1.27-1.45 of oral disc width; nostrils dorsal, open, nearer to eye than snout tip, rim elliptical, raised at the inner periphery, IND 0.37-0.48 of IOD; spiracle sinistral, ventro-lateral position, tube continuous with body wall, protruding towards posterior, visible from above and below, snout-spiracle 0.57-0.72 of BL; anal tube median, unattached to ventral fin. Tail with slight convex upper margin, straight lower margin, both tapering gradually to a rounded tip; caudal musculature robust in proximal half, but shallower than tail fins for distal half; dorsal fin originates at body-tail terminus, ventral fin originates immediately

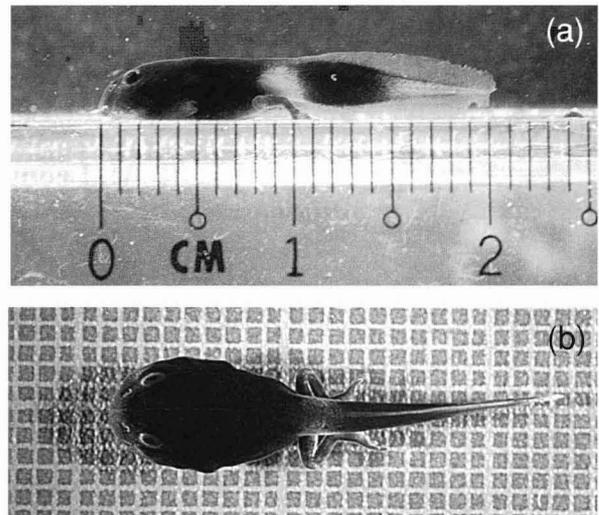


Fig. 2. Lateral (a) and dorsal (b) aspects of *Bufo celebensis* larva (Stage 34).

posterior to opening of vent tube; TAL 1.12-1.56 of BL, MTH 0.34-0.40 of TAL. Neither lateral line pores nor glands were visible.

**Colour/Markings.** - (In life) Dorsum and sides of body jet black, venter less heavily pigmented, margins/papillae of oral disc and semicircular patch posterior to oral disc lacking melanophores. In a few individuals, a fine white longitudinal line exists from snout tip to body terminus. Caudal musculature divided into three distinctly contrasting regions; proximal quarter white to creamy with a narrow ashy saddle on the dorsal ridge; central region heavily pigmented black (as on body); distal segment exhibiting same white/creamy colour of the proximal quarter. Both dorsal and ventral fins largely clear and unpigmented. In preservative, there is negligible degradation of colouration/pattern.

**Oral Disc.** - Mouth ventral, sub-terminal, width 0.43-0.52 of BW, short, conical marginal and submarginal papillae confined to the lateral corners of anterior and posterior labia, jaw sheaths finely serrated, edged with black, upper jaw sheath not exhibiting any median notch or convexity.

**LTRF.** - 2/3, 2(2)/3; second row of upper labium occasionally separated by a narrow median gap, labial tooth row lengths subequal.

**Feeding Behaviour.** - Unlike the voracious manner of larval *B. melanostictus*, constantly scouting for any available food source, those of *B. celebensis* spend much of their time at the bottom, casually nibbling on

Table 1. Progressive changes in BL and TL of larval *Bufo celebensis* reared ex situ.

STAGE	NO.	BL (mm)	TL (mm)
33	1	6.9	15.8
34	2	7.3-7.6	16.1-16.7
35	1	7.5	17.9
37	2	7.9-8.4	19.8-20.2
38	1	8.6	19.5
41	2	8.5-9.8	18.2-19.4
42	2	9.1-9.3	17.2-18.3
43	1	9.0	16.3
45	1	SVL = 8.1mm	

**Material examined.** - (n = 13); ZRC.1.3831-3842, ZRC.1.3843.

detritus. Between long bouts of apparent inactivity, they also graze on the surfaces of aquatic vegetation and decomposing leaves. Iskandar (pers. com.) has observed the larvae feeding around the submerged poles of bamboo bridges up to near the water surface.

**Development.** - At the time of collection, the larval sample were already at Stages 30-32 (possibly one to two weeks post-hatching). Viewing from above the water surface, the overall 'black-white-black-white' banding was already prominent as the larvae swam about in the pond. Approximately three to four more weeks after collection, fore-limbs began to erupt. At this stage (Stage 42), crossbands are already visible on all limbs. Upon emergence of the fore-limbs, jaw formation and tail resorption was almost complete after 48 hours. Throughout development, changes in body length (BL) and total length (TL) were monitored (Table 1). The emergent attained a snout-vent length of 8.1mm. The estimated total time required from time of hatching till complete metamorphosis should be between four to six weeks.

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