

## Breeding biology of *Microhyla heymonsi* Vogt, 1911 (Anura, Microhylidae) from Kedah, Peninsular Malaysia

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Currently eight species of microhylids, including *Microhyla heymonsi* are present in Peninsular Malaysia (Amphibia my, 2009). *M. heymonsi* is a small-sized frog, with snout-vent length of males and females reaching at 16-21 and 22-26 mm, respectively (Amphibia my, 2009). This commensal species is widely distributed in Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Singapore, Taiwan, China, Thailand and Vietnam, and can be found from sea level up to 1,400 m asl (IUCN, 2015).

In Peninsular Malaysia, it can be encountered in clearings and disturbed forests (Berry, 1975; Ibrahim et al., 2008). Ephemeral pools (Ibrahim et al., 2008), temporary rain puddles, paddy fields, ditches, marshes and slow flowing streams (IUCN, 2015) are utilized as breeding sites.

In December 2015, between 2100 and 2300, two amplexed pairs of *M. heymonsi* were detected and captured at Sungai Sedim Recreational Forest, Kedah, Peninsular Malaysia (5° 25'N, 100° 46'E; < 150 m asl). Both amplexed pairs were collected at the edge of ephemeral puddle, approximately 2 m length, 1 m width and 2-15 cm depth, and located at the open areas, approximately 6 m from the main river. The puddle was directly exposed to the sunlight, and these usually dry up within two weeks, if there is no rain. Other frog species, including *Polypedates leucomystax* and *Fejervarya limnocharis* were also sighted around this area. Both amplexed pairs were captured after heavy downpours. The air temperature and relative humidity of the sampling site were 23° C and 82%, respectively.

In the laboratory, each amplexed pair was reared in a

medium-sized aquarium (60 x 30 x 30 cm), consisting of tap water, dead leaves and drift woods. Both pairs displayed axillary amplexus, where males clasped the females at axillary area. The amplexus activity persisted until the females deposited eggs, with both females depositing eggs in the aquariums within 10 hours after capture. The eggs were rounded in shape, pigmented, dark-brown in colour, coated with viscous jelly and floating on the surface of the water. The egg clutches were composed of 386 and 492 eggs. Five eggs from each clutch were randomly selected and measured its diameter by using a microscope, accompanied with ocular micrometer. The mean  $\pm$  SD (min-max, N) of egg diameter was  $0.9 \pm 0.11$  (0.8-1.1, 10) mm. The snout-vent length (SVL), head width (HW) and mass (W) of male (SVL=21 and 18 mm; HW=7 and 7 mm; W=2 and 1 g) and female (SVL=24 and 27 mm; HW=7 and 8 mm; W=2 and 3 g) specimens were measured by using digital calliper and electronic balance. SVL was measured from the tip of the snout to cloacal area, HW is the widest area of the head, and W is the weight of the specimens. All specimens were released back to their natural habitats.

Each egg clutch was raised in the same aquarium (60 x 30 x 30 cm) until hatching. The aquarium consisted of tap water, dead leaves and an aerator to supply oxygen. Between 48 and 60 hours from oviposition the eggs from both clutches hatched. Only 342 (89%) out of 386, and 428 (87%) out of 492 eggs were hatched and became free swimming tadpoles. At this phase, the size of the tadpole is approximately 2-3 mm (Gosner's stage 19). After a week, the mean  $\pm$  SD



**Figure 1.** An adult male of *M. heymonsi* from Kedah, Peninsular Malaysia



**Figure 2.** Axillary amplexus performed by *M. heymonsi*



**Figure 3.** Free swimming tadpoles of *M. heymonsi*

(min-max, N) total length of the tadpole was  $4.5 \pm 0.71$  (4-6, 10) mm (Gosner's stage 25). The tadpole is dark-brown to black in colour, slender in shape, tapering tail, dorso-lateral eyes, and having a white spot on its head. The tadpoles are filter feeders, frequently swimming on the surface of the water. Previous studies on reproductive biology of a range of frogs from Peninsular Malaysia and Singapore have been carried out, including Berry (1964), Ibrahim et al. (1999), Sheridan et al. (2009) and Shahriza et al. (2010, 2012, 2015, 2016). This work adds to this knowledge and increases our understanding on frog breeding biology, especially from tropical region. Photos of adult male, amplexed pair and tadpoles of *M. heymonsi* are shown in Figs. 1-3.

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