IRCF REPTILES & AMPHIBIANS
CONSERVATION AND NATURAL HISTORY

Heterospecific Amplexus Between a Male Four-lined Treefrog, *Polypedates leucomystax* (Gravenhorst 1829) and a Female Dark-eared Treefrog, *Polypedates macrotis* (Boulenger 1891) (Anura: Rhacophoridae) from Peninsular Malaysia

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The Dark-eared Treefrog (*Polypedates macrotis*) is a medium to large-sized rhacophorid in which females (SVL = 66–85 mm) are larger than males (45–57 mm; Inger and Stuebing 1989). These frogs have broad dark-brown lateral bands that extend from the eyes across the tympana to the arms. They live in primary rainforests, secondary growth, and clearings surrounded by forest (Berry 1975; Inger and Stuebing 1989). This species is known from peninsular Malaysia, Thailand, Sumatra, Borneo, and the southwestern Philippines (Diesmos et al. 2004). The Four-lined Treefrog (*Polypedates leucomystax*) is a medium-sized rhacophorid in which females (SVL = 57–75 mm) are larger than males (37–50 mm; Inger and Steubing 1989). This species inhabits various types of habitat, mostly in disturbed areas, including human habitations, agricultural areas, gardens, roadside ditches, and the edges of primary rainforests (Berry 1975; Ibrahim et al. 2008; Shahriza 2016a). The species ranges from northeastern India eastward through China to Taiwan and south through Indochina and the Malay Peninsula to Singapore and Sumatra. It also occurs in the Philippines, throughout Borneo, Java, and Sulawesi (Grismer 2011).

Between 2100 and 2200 h on 25 November 2015, I encountered an amplected pair comprised of a male *P. leucomystax* (SVL = 43 mm) and a female *P. macrotis* (92 mm) in the Sungai Sedim Recreational Forest, Kedah, Peninsular Malaysia (5°25'N, 100°46'E; elev. < 150 m asl; Fig. 1). The pair was perched on a rotten log, approximately 1 m from a forest pool (4 x 2 m, 5–30 cm deep). Air temperature and relative humidity at the site were 22 °C and 80%, respectively. Because of the size difference (the female was approximately twice as large as the male), the cloacae of the two frogs were not juxtaposed. According to Duellman and Trueb (1986), the vents of female and male frogs must be close together for a successful fertilization.

When approached, the amplected pair jumped and then remained motionless in the leaf litter. Shortly thereafter, the female *P. macrotis* lowered her body until her venter fully contacted the substrate and both arms and legs were adpressed to the body. Such a crouched position is used by many anurans as a defensive mechanism (Toledo et al. 2011), reinforced in this instance by the camouflage provided by the coloration and dorsal patterns of both frogs matching very closely the soil and leaf litter at the site. I then collected the frogs and placed them in an aquarium during which the amplexus was maintained. After taking measurements, I released the frogs back into natural habitat.

Fig. 1. Heterospecific amplexus involving a male Four-lined Treefrog (*Polypedates leucomystax*) and a female Dark-eared Treefrog (*P. macrotis*).

Heterospecific amplexus occurs worldwide and has been recorded in various species of frogs, including *Duttaphrynus stomaticus* and *Sphaerotheca breviceps* (Vivek et al. 2014), *Hypsiboas albomarginatus* and *Hypsiboas raniceps* (Rocha et al. 2015), *Papurana elberti* and *Duttaphrynus melanostictus* (Reilly et al. 2016), *Hyperolius molleri* and *Phrynobatrachus dispar* (Bell et al. 2016), *Polypedates taeniatus* and *Polypedates maculatus* (Bhattarai et al. 2018) and *Duttaphrynus melanostictus* and *Rhacophorus dennysi* (Messenger and Spijker 2018). In peninsular Malaysia, heterospecific amplexus has been documented between *Rhacophorus prominanus* and *Polypedates leucomystax* (Shahriza 2016b) and between *Leptobrachium hendricksoni* and *Polypedates leucomystax* (Shahriza 2018).

Various factors might contribute to heterospecific amplexus, including overlap in reproductive activities (Hobel 2005), smaller numbers of females (Wogel et al. 2005), high numbers of competing males (Wells 2007), noisy environments (Wells 2007), confusion of chemical signals (Mollov et al. 2010), low selectivity (Machado and Bernarde 2011), long-term absence of conspecific females (Vivek et al. 2014), and explosive breeding strategies (Machado and Bernarde 2011; Vivek et al. 2014). Other species of frogs in and around the forest pool where I found the amplected pair included *Polypedates macrotis, P. leucomystax, Humerana miopus*, *Fejervarya limnocharis*, and *Occidozyga laevis*. A vast majority of the frogs were males emitting advertisement calls. Consequently, I suggest that overlapping reproductive activities, low selectivity, and low number of females, possibly enhanced by a noisy environment and a high number of males, could have led to the heterospecific amplexus between *P. leucomystax* and *P. macrotis*.

Acknowledgements

My heartfelt gratitude to Universiti Sains Malaysia, Penang for providing facilities and amenities. This research project was funded by Universiti Sains Malaysia, Research University Grant (1001/PFARMASI/8011004).

Literature Cited

Bell, R.C. and L.A. Scheinberg. 2016. *Hyperolius molleri* (Moller's Reed Frog) and *Phrynobatrachus dispar* (Peter's River Frog). Heterospecific amplexus. *Herpetological Review*. 47: 109.

Berry, P.Y. 1975. *The Amphibian Fauna of Peninsular Malaysia.* Tropical Press, Kuala Lumpur.

Bhattarai, S., P. Gotame, C.P. Pokheral, B.R. Lamichhane, R.C. Kandel, and N. Subedi. 2018. Interspecific amplexus of a Six-lined Treefrog, *Polypedates taeniatus* (Boulenger, 1908), and a Chunam Treefrog, *P. maculatus* (Gray, 1830) (Anura: Rhacophoridae), in Chitwan National Park, Nepal. *Reptiles & Amphibians* 25: 29–30.

Diesmos, A., A. Alcala, R. Brown, L. Afuang, G. Gee, J. Sukumaran, N. Yaakob, L. Tzi Ming, Y. Chuaynkern, K. Thirakhupt, I. Das, D. Iskandar, Mumpuni, R. Inger, R. Stuebing, P. Yambun, M. Lakim. 2004. *Polypedates macrotis*. *The IUCN Red List of Threatened Species* 2004: e.T58955A11861817.

Duellman, W.E. and L. Trueb. 1986. *Biology of Amphibians*. McGraw-Hill, New York.

Grismer, L.L. 2011. *Amphibians and Reptiles of the Seribuat Archipelago*. Edition Chimaira, Frankfurt am Main, Germany.

Hobel, G. 2005. *Rana palustris* (Pickerel Frog) and *Ambystoma maculatum* (Spotted Salamander). Reproductive behavior. *Herpetological Review* 36: 55–56.

Ibrahim, H.J., M.S. Shahrul Anuar, A. Norhayati, K.O. Chan, and M.A. Mohd Abdul Muin. 2008. *The Common Amphibians and Reptiles of Penang Island.* The State Forestry Department of Penang, Palau Pinang, Malaysia.

Inger, R.F. and R.B. Stuebing. 1989. *Frogs of Sabah.* Sabah Parks Trustees, Kota Kinabalu, Malaysia.

Machado, R.A. and P.S. Bernarde. 2011. Multiple and heterospecific amplexi between the toads *Rhaebo guttatus* and *Rhinella marina* (Anura: Bufonidae). *Herpetology Notes* 4: 167–169.

Messenger, K.R. and M.S.F. Spijker. 2018. *Duttaphrynus melanostictus* (Asian Common Toad) and *Rhacophorus dennysi* (Chinese Flying Frog). Heterospecific amplexus. *Herpetological Review* 49: 515.

Mollov, I.A. 2010. Cases of abnormal amplexus in anurans (Amphibia: Anura) from Bulgaria and Greece. *Biharean Biologist* 4: 121–125.

Reilly, S.B., A.L. Stubbs, and J.A. McGuire. 2016. *Papurana elberti* and *Duttaphrynus melanostictus* (Asian Common Toad). Interspecific amplexus. *Herpetological Review* 47: 114.

Rocha, S.M., D.O. Santana, I.R.S. Silva, and R.G. Faria. 2015. Interspecific amplexus between *Hypsiboas albomarginatus* (Spix, 1824) and *Hypsiboas raniceps* Cope, 1862 (Anura: Hylidae) in northeastern Brazil. *Herpetology Notes* 8: 213–215.

Shahriza, S. 2016a. Defensive strategies of *Polypedates leucomystax* (Gravenhorst, 1829) (Anura: Rhacophoridae) from peninsular Malaysia. *Herpetology Notes* 9: 163–165.

Shahriza, S. 2016b. Interspecific amplexus between male *Rhacophorus prominanus* and female *Polypedates leucomystax* from peninsular Malaysia. *The Herpetological Bulletin* 135: 30–31.

Shahriza, S. 2018. Interfamilial amplexus between a male *Polypedates leucomystax* (Gravenhorst 1829) (Anura: Rhacophoridae) and a female *Leptobrachium hendricksoni* Taylor 1962 (Anura: Megophryidae) from peninsular Malaysia. *Reptiles & Amphibians* 25: 151–152.

Toledo, L.F., I. Sazima, and C.F.B. Haddad. 2011. Behavioural defences of anurans: An overview. *Ethology Ecology & Evolution* 23: 1–25.

Vivek, S., M. Dinesh, K.R. Kumar, Y. Divaker, and K.K. Sharma. 2014. Interspecies mating interactions between *Duttaphrynus stomaticus* (Marbled Toad) and *Sphaerotheca breviceps* (Indian Burrowing Frog) at the Central Aravalli Foothills, Rajasthan, India. *Herpetology Notes* 7: 139–140.

Wells, K.D. 2007. *The Ecology and Behavior of Amphibians*. The University of Chicago Press, Chicago, Illinois.

Wogel, H., P.A. Abrunhosa, and J.P. Pombal-Junior. 2005. Breeding behaviour and mating success of *Phyllomedusa rohdei* (Anura, Hylidae) in south-eastern Brazil. *Journal of Natural History* 39: 2035–2045.