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Notes on reproductive ecology of *Kalophrynus sinensis* (Peters, 1867) on Mindanao Island, Philippines

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Location: Mambuntan Falls, Barangay Lubilan, Municipality of Naawan, Misamis Oriental Province, Mindanao Island, Philippines. 08°24'46.536" N, 124°21'5.02" E.
Elevation: 440 metres ASL.
Habitat: Temporary pool in mixed secondary growth habitat.
Date and time: 17 March 2019, 19:30 hrs.

Identity of subject:
Rufous-sided Sticky Frog (or 'Philippine Sticky Frog'), *Kalophrynus sinensis* (Amphibia: Anura: Microhylidae)

Description of records:
During herpetological fieldwork in Mambuntan Falls on 14-18 March 2019, the breeding habit of Rufous-sided Sticky Frog *Kalophrynus sinensis* was observed. Four adult male *K. sinensis* individuals in a shallow temporary pool (1.7m length x 1.2m width) within a mixed secondary forest were observed simultaneously vocalizing in a loud synchronized chorus after heavy rainfall in the afternoon, and exhibited parental care by guarding egg masses (Figs 1 and 2). The area was humid (RH=78%), and the habitat comprised regrown dipterocarps, bamboos, shrubs and understorey vegetation (Fig. 4). There was a flowing stream 2.5m away from the temporary pool.

Fig. 1 Male *K. sinensis* guarding egg masses © Erl Pfian T. Maglangit

Clutch size ranged from 90-98 eggs (mean clutch size=94; *n*=5) and these were enclosed in a cylindrical film-like structure. Upon closer examination, the eggs were already in Stage 8 and Stage 12 of development (Gosner, 1960). Differentiated blastomeres and light hemispheres were already visible and slightly pronounced. Subsequently, a pair of partially submerged *K. sinensis* in inguinal amplexus, adjacent to the four-male *K. sinensis* group, was also observed (Fig. 3).

Fig. 2 Male *K. sinensis* guarding egg masses © Erl Pfian T. Maglangit

Fig. 3 A pair of *K. sinensis* in amplexus in a shallow pool © Erl Pfian T. Maglangit

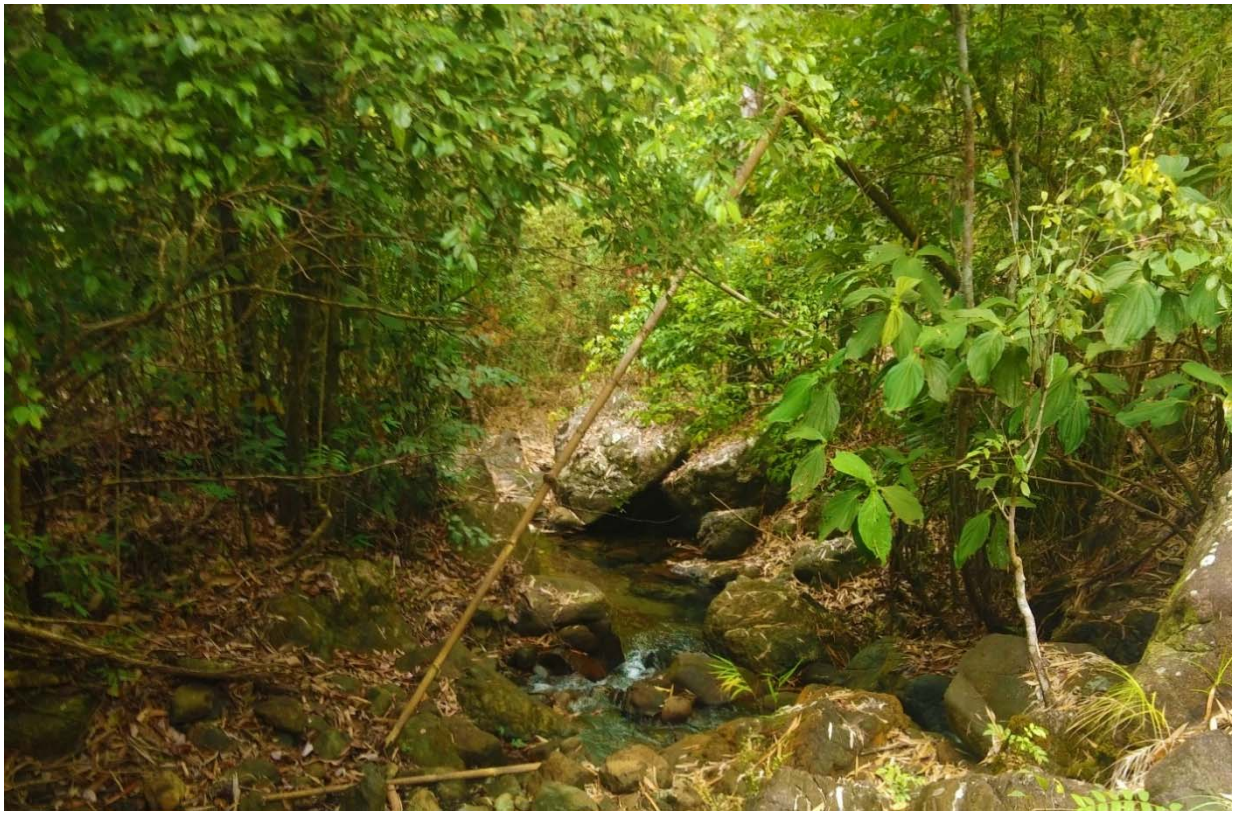

Fig. 4 Mixed secondary forest habitat © Erl Pfian T. Maglangit

Remarks:
Kalophrynus sinensis, previously identified as *K. pleurostigma*, is native to the Philippines (Diesmos et al, 2015). It is a medium-sized microhylid with (i) distinct dark mark on the back, (ii) dorsal skin forms thick glandular cover from behind the eyes to vent, (iii) dorsal surface lightly rugose to granular rugose, (iv) no spiny tubercles aside from pigmented dome-like tubercles common on posterior third of trunk, (v) coarsely granular body on dorsal and ventral section, (vi) body widest on sacral region, (vii) well-developed subarticular tubercles, (viii) absence of vomerine teeth, (ix) lack of webbing on fingers with slightly swollen and rounded tips, and (x) presence of nuptial pads which are distinct in males (Inger, 1954; Zug, 2015).

In the Philippines, it is known to occur on the islands of Basilan, Bohol, Camiguin Sur, Culion, Dinagat, Leyte, Mindanao and Samar (Diesmos et al. 2015; Venturina et al. 2020) and it usually hides under leaf litter during the day and forages on the forest floor at night (Zug, 2015). It breeds in small, shallow pools and is frequently encountered during the rainy season while calling and floating in temporary pools (Zug, 2015; Sanguila et al. 2016).

The reproductive ecology and parental care of the genus *Kalophrynus* is not well-documented. Available information is mostly on species-habitat occurrences and advertisement calls (Orlov and Ananjeva 2007; Matsui et al. 2012). Breeding behavior of some species documented (e.g. *K. cryptophonus* and *K. yongi*) were phytothelm breeders, which use specific ecological niche (e.g. bamboo stems, bromeliads, pitchers, etc.) for the survival of their offspring (Vassilieva et al., 2014; Zug, 2015).

Microhylid frogs often use small or temporary ponds for breeding (Zug, 2015). Frogs that breed in small water bodies either produce fewer eggs or disperse their clutch to several small aquatic sites and/or exhibit parental care for their eggs and/or tadpoles (Duellman and Trueb, 1985; Krügel and Richter, 1995). Small eggs and large clutch sizes are typical of species ovipositing in water, whereas large eggs and small clutch size are typical of those ovipositing out of water (Alcala, 1962). The *K. sinensis* population in Naawan, Mindanao Island utilized a temporary pool and deposited large clutches of eggs and exhibited unique parental care. Parental association with their developing offspring is relatively uncommon yet advantageous for the survival of offspring.

Our observation provides new information on parental care strategy, breeding preference, multiple egg clutch placement and egg clutch size for *K. sinensis*.

Note:
Photographic vouchers were deposited in the Lee Kong Chian Natural History Museum, National University of Singapore (NUS) (ZRC [IMG] 1.185-1.186).

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References:

Alcala, A. C. (1962). Breeding behavior and early development of frogs of Negros, Philippine Islands. *Copeia* 1962(4): 679-726.

Diesmos, A. C., Watters, J. L., Huron, N. A., Davis, D. R., Alcala, A. C., Crombie, R. I., Afuang, L. E., Das, G. G., Sison, R. V., Sanguila, M. B., Penrod, M. L., Labonte, M. J., Davey, C. S., Leone, A. E., Diesmos, M. L., Sy, E. Y., Welton, L. J., Brown, R. M. and Siler, C. D. (2015). Amphibians of the Philippines, Part I: checklist of the species. *Proceedings of the California Academy of Sciences* 62: 451–531.

Duellman, W. E. and Trueb, L. (1985). Biology of amphibians. McGraw-Hill Book Company, New York.

Gosner, K. (1960). A simplified table for staging anuran embryos and larvae with notes on identification. *Herpetologica* 16(3):183-190.

Inger, R. F. (1954): Systematics and zoogeography of the Philippine Amphibia. *Fieldiana: Zoology* 33(4): 335–339.

Krügel, P. and Richter, S. (1995). A bromeliad breeding frog with free swimming, non-feeding tadpoles (Anura: Microhylidae). Copeia 1995(4): 955-963.

Matsui, M., Nishikawa, K., Belabut, D. M., Norhayati, A. and Yong, H. S. (2012). A new species of *Kalophrynus* (Amphibia, Anura, Microhylidae) from Southern Peninsular Malaysia. Zootaxa 3155: 38-46.

Sanguila, M. B., Cobb, K. A., Siler, C. D., Diesmos, A. C., Alcala A. C. and Brown, R. M. (2016). The amphibians and reptiles of Mindanao Island, southern Philippines, II: the herpetofauna of northeast Mindanao and adjacent islands. *ZooKeys* 624: 1-132.

Orlov, N. L., and Ananjeva, N. B. (2007). Amphibians of South-East Asia. St. Petersburg University Press, St. Petersburg. 270 pp.

Vassilieva, A. B., Galoyan, E. A., Gogoleva, S. S. and Poyarkov, N. A. Jr. (2014). Two new species of *Kalophrynus* Tschudi, 1838 (Anura: Microhylidae) from the Annamite mountains in southern Vietnam. *Zootaxa* 3796(3): 401-434

Venturina, E. L. V., Del Prado, Y. L. C., Kamir, R. A. C., Balmores, M. N. and Diesmos, A. C. (2020). A Revised Checklist of Amphibians and Reptiles in Camiguin Sur, Misamis Oriental, Mindanao, Philippines. *Asian Herpetological Research* 11(1): 28-43.

Zug, G. R. (2015). Morphological and systematics of *Kalophrynus interlineatus-pleurostigma* populations (Anuran: Microhylidae: Kalophryninae) and taxonomy of genus *Kalophrynus* Tschudi, Asian Stick Frogs. *Proceedings of the California Academy Sciences* 62: 135-190.