

**OOPHAGA PUMILIO (Strawberry Poison Frog). PREDATION.** Bright coloration in dendrobatid frogs is presumed to function as an aposematic signal to natural predators with color vision (Saporito et al. 2007. *Copeia* 2007:1006–1011), thereby warning predators such as birds of the frog's alkaloid-based chemical defenses. The known natural predators of dendrobatid frogs are based largely on anecdotal reports, and include an amphibian, ant, fish, spiders, and snakes (Santos and Cannatella 2011. *Proc. Nat. Acad. Sci.* 108:6175–6180). *Dendrobates auratus* was reportedly preyed upon by an adult *Baryphthengus martii* (Rufous Motmot) at the La Suerte Biological Station in northeastern Costa Rica (Limon Province), representing the only known bird predator of dendrobatid frogs (Master 1998. *Herpetol. Rev.* 29:164–165). Herein, we report an additional observation of predation by a Rufous Motmot on *Oophaga pumilio*.

*Oophaga pumilio* ranges from southern Nicaragua to western Panama (Guyer and Donnelly 2005. *Amphibians and Reptiles of La Selva, Costa Rica, and the Caribbean Slope*. Univ. California Press, Berkeley. 299 pp.), and falls well within the geographic range of *B. martii* (Garrigues and Dean 2007. *In The Birds of Costa Rica*, p. 146). On 15 May 2011, at the OTS La Selva Biological Station in northeastern Costa Rica (Heredia Province), between 1000–1100 h, we observed two independent events in which one individual of a pair of adult *B. martii* landed on a branch carrying an adult *O. pumilio* in their beak (Sendero Tres Rios trail between 100–150 m; Fig. 1). The pair of Rufous Motmots was observed carrying the captured *O. pumilio* to their nest of chicks only a few meters away, presumably feeding the frogs to their young. Motmots typically nest in deep cavities, and therefore we were not able to observe the chicks feed on the frogs; however, the pair of Rufous Motmots was also observed bringing to its nest spiders and fruits of *Virola koschnyi* (Myristicaceae). Rufous Motmots are reported to feed on the fruits of palms and members of the plant genus *Heliconia*, as well as insects, spiders, small frogs, lizards, fishes, and crabs (Stiles and Skutch 1989. *In A Guide to the Birds of Costa Rica*, p. 242). To the best of our knowledge, this represents only the second report of a Rufous Motmot feeding upon a dendrobatid, and the first report of these birds feeding their young a dendrobatid poison frog. Further research is needed to determine the extent to which *O. pumilio* is preyed upon by *B. martii*, the importance of *O. pumilio* as a dietary source for developing chicks, and how *B. martii* are presumably immune to the alkaloid defenses of *O. pumilio*.



FIG. 1. An adult *Oophaga pumilio* (Strawberry Poison Frog) being preyed upon by an adult *Baryphthengus martii* (Rufous Motmot) at La Selva Biological Station, Costa Rica during May 2011.

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**PELOPHYRNE MISERA (Kinabalu Dwarf Toad). NOVEL MICROHABITAT AND MAXIMUM SIZE.** *Pelophryne misera* is a minute anuran (to 21 mm SVL in males, and 23 mm SVL in females) (Inger and Stuebing 2005. *A Field Guide to the Frogs of Borneo*. 2<sup>nd</sup> ed. Natural History Publications [Borneo] Sdn. Bhd. Kota Kinabalu. viii + 201 pp.) which is endemic to Borneo (Mount Kinabalu in Sabah and Mount Murud in Sarawak of Malaysia, and Upper Sulon in East Kalimantan of Indonesia) (Malkmus et al. 2002. *Amphibians and Reptiles of Mount Kinabalu [North Borneo]*. A.R.G. Gantner Verlag K.G. Ruggell. 424 pp.; Veith et al. 2004. *Tropical Zool.* 17:1–13; Inger and Stuebing 2005, *op. cit.*). The species inhabits primary and old secondary mossy forests on the forest floor (breeding site) and sometimes in low vegetation 10–50 cm from the ground at 1450–3140 m elev. (Malkmus et al. 2002, *op. cit.*). The species is listed as Vulnerable in 2011 IUCN Red List of Threatened Species primarily due to restricted distribution, but is deemed locally abundant (Inger et al. 2004. *In IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2.* <www.iucnredlist.org>. Accessed on 15 June 2012). There is still inadequacy in the natural history understanding on *P. misera* attributed to the scarcity of its record of occurrence, and thus, herein we report a novel microhabitat at an extended vertical dimension, and maximum size for *P. misera*.

On 11 December 2008, between 1900 and 2200 h, three *P. misera* were discovered via opportunistic examination at Geludu Trail (6°N, 116.5375°E; 1478 m elev.) on Geludu Hill, Bundu Tuhau, Ranau District, West Coast Division, Sabah, Bornean Malaysia. Air temperature was 17.3°C, and relative humidity was 86%. The individuals were located among mosses covering a part of an old iron water pipe at 150 cm above the ground. Approximately 25 m of the 30-cm-diameter pipe was exposed from the ground caused by erosion that happened quite some time ago as indicated by surrounding thick leaf litter and compacted soil, while the rest of the pipe was still buried underground. The three *P. misera* were found close to one another about 5 m from a buried edge of the pipe. The pipe is utilized to supply clean water to nearby villages.

Intensive search did not find potential predators in proximity. The finding of three individuals, coupled with the absence of predators omit the causal factors of randomness and predator avoidance for the occurrence of *P. misera* at the novel microhabitat. Moisture might have played a role in motivating *P. misera* to occupy the long patch of live mosses on the exposed water pipe as moisture is an imperative factor determining the selection of non-breeding microhabitats for anurans for foraging, thermoregulation, and dispersal (Blomquist and Hunter 2009. *Herpetol. Conserv. Biol.* 4[2]:142–160). Documentation and understanding of non-breeding microhabitats are equally as crucial as of breeding sites and tadpole habitats in the conservation of anurans (Gillespie et al. 2004. *J. Trop. Ecol.* 20:439–448; Regosin et al. 2005. *J. Wildl. Mgmt.* 69[4]:1481–1493), particularly of non-stream breeding species such as *P. misera*.

The three adult *P. misera* were determined to be two females (27 mm SVL, mass 0.4 g and 27 mm SVL, mass 0.3 g) and one male (16 mm SVL, mass 0.3 g) based on the presence of a row of yellowish brown mandibular spines on the male (Malkmus et al. 2002, *op. cit.*), and adult SVL ranges (Inger and Stuebing 2005, *op.*