

Research Note**NEPENTHEXENIC BEHAVIOR OF *Hemithyrsocera* sp. (BLATTODEA: BLATTELLIDAE) ON *Nepenthes peltata* Sh.Kurata FROM MT. HAMIGUITAN RANGE WILDLIFE SANCTUARY, PHILIPPINES¹****Tristan Luap P. Senarillos^{2,3}*, Ana P. Ocena², Cristian C. Lucañas⁴**

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ABSTRACT

Nepenthexenic behavior of *Hemithyrsocera* sp., the first report outside the usual predator-prey relationship, is reported from *Nepenthes peltata* Sh. Kurata from Mt. Hamiguitan, Davao Oriental, Philippines. The cockroaches were observed intaking water from the pitcher pool and moving without difficulty in the waxy interior walls of the pitcher trap.

Key words: cockroach, interactions, nepenthexene, phytotelmata, pitcher plant

INTRODUCTION

The Old-World pitcher plants, *Nepenthes* L. (Nepenthaceae), are unique due to their specialized pitcher-shaped leaves. They use the leaves to attract, trap and digest different invertebrate taxa (Beaver, 2008), and to some extent, small vertebrates such as rodents (Bauer et al., 2015; Nerz & Koch 2018). Despite that, these water-filled structures also serve as distinct microhabitats, known as phytotelmata (Maguire, 1971), for several species of microorganisms (e.g., Takeuchi et al., 2015; Kanokratana et al., 2016), invertebrates (e.g., Ng & Lim, 1987; Mogi & Yong, 1992; Karl & Bauer, 2020) and even vertebrate groups (e.g., Beaver, 1979; Das & Haas, 2010; Lim et al.,

2014). These organisms known as *Nepenthes* infauna have formed mutualistic, commensal or parasitic interactions with pitcher plants (Adlassnig et al., 2010).

Currently, there are 60 species of *Nepenthes* in the Philippines (King & Cheek, 2020), the highest within the Old World. Despite that, little is known about the *Nepenthes* infauna in the Philippines. In a recent exploration on Mt. Hamiguitan Range Wildlife Sanctuary, Davao Oriental, Philippines (Figure 1A), several individuals of cockroaches were observed frequenting pitcher pools of *Nepenthes peltata* Sh. Kurata. This paper aims to document the field observations on the probable association between *N. peltata* and the cockroach.

Methodology. Pitcher traps of *N. peltata* were observed during the day. No specimens of the cockroaches were collected, but images were obtained *in situ* using a digital Lumix DSLR camera. Hence, identification was possible only down to genus level.

RESULTS AND DISCUSSION

Within the Dipterocarp forest of Mt. Hamiguitan Range Wildlife Sanctuary (Figure 1A-C), in Mindanao, in the southern part of the Philippines at 800-853 masl, *N. peltata* thrives in several clumps in an open, less vegetated area dominated by boulders and gravel (Figure 2A-C). Similarly, an unidentified *Hemithyrsocera* sp. (Blattodea: Blattellidae) is abundant in the area, particularly in rock crevices and leaf litter beds.

Hemithyrsocera sp. were observed taking water from the pitcher pool and moving without difficulty on the waxy interior walls of the pitcher trap of *N. peltata* (Figure 2D-E). This interaction is the first record of this kind between a cockroach and *Nepenthes* pitcher plants. This behavior, albeit uncommon, could be an adaptive response to the relative water scarcity in the area during the dry season, where the pitcher fluids of *N. justinae* Gronem et al. and *N. peltata*, may serve as the only stable source of water. Meanwhile, it is also possible that *Hemithyrsocera* sp. feeds on the decaying matter or even the fly larvae found on the pitchers.

Other known *Nepenthes*-cockroach interactions usually involved predation of pitcher plants on cockroaches (i.e., an unidentified Blattidae from *N. gracilis* and *N. ampularia* (Dover, 1928)). No other *Nepenthes*-cockroach interaction had been reported in more recent studies (Clarke & Kitching, 1993). Meanwhile, Wray & Brimley (1943) and Bell et al. (2007) noted several winged male adults of four species of *Parcoblatta* (*P. fulvescens*, *P. uhleriana*, *P. virginica*, and *P. lata*), *Ischnoptera deropeltiformis*, and both sexes of *Cariblatta lutea* from the nectaries of Neotropical pitcher plant, *Sarracenia flava* L. (Sarraceniaceae), possibly seeking nectar as a source of energy.

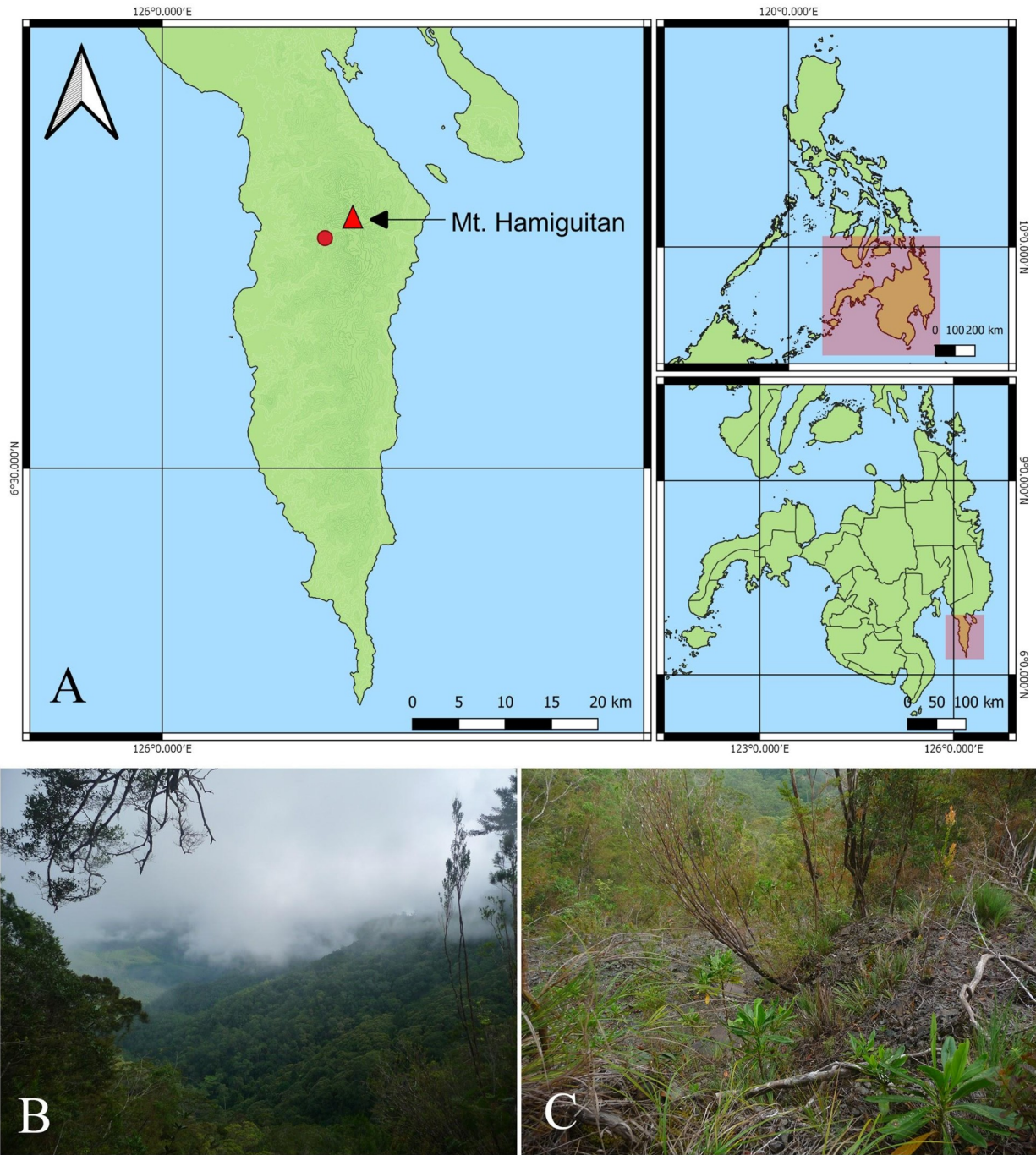


Figure 1. Mt. Hamiguitan Range Wildlife Sanctuary: A. Locality map (red dot: observation plot; inset: overview with respect to Mindanao Island, and the Philippines); B. Overview of the Dipterocarp forest; C. Open areas of the Dipterocarp Forest where *Nepenthes peltata* Sh. Kurata are abundant.



Figure 2. *Nepenthes-Hemithyrsocera* interaction in Mt. Hamiguitan, Davao Oriental, Philippines: A. Clumps of *N. peltata* Sh. Kurata along the open areas of the dipterocarp forest; B-C. Close-up of the lower pitchers of *N. peltata*; D. *Hemithyrsocera* sp. drinking inside the pitchers of *N. peltata*; E. closer view of *Hemithyrsocera* sp. inside the pitcher.

The relationship between *Hemithyrsocera* sp. and the *N. peltata* pitcher food web is still unknown. However, our preliminary observations suggest that *Hemithyrsocera* sp. is a nepenthexene, a species not normally associated with pitchers but are occasionally encountered in them (Beaver, 1979).

Although observed for the first time, this unusual interaction may not be as uncommon as first observed. There are around 182 known species of *Nepenthes* (King & Cheek, 2020; Murphy et al., 2020) and 71 known species of *Hemithyrsocera* Saussure (Beccaloni, 2014), with their distribution almost overlapping. In the Philippines, the 60 known species are distributed throughout the country, many of which are narrow endemics (Pelser et al., 2011). On the other hand, only two species of *Hemithyrsocera* have been reported in the country: *H. silbergliedli* (Roth, 1985) from Luzon and Mindanao Islands; and *H. tawitawiensis* (Roth, 1985) from Tawi-tawi Island. It would not be surprising that other *Nepenthes* - *Hemithyrsocera* interactions are observed with extended fieldwork with such diversity.

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