

Phylogenetic Analysis and Biogeography of the Nocturnal Hornets, *Provespa* (Insecta: Hymenoptera: Vespidae: Vespinae)

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Relationships among the three species of nocturnal hornet of the genus *Provespa* Ashmead, 1903 are cladistically analyzed based on adult morphological characters and mitochondrial DNA sequence data. Monophyly of *Provespa* is supported and the species relationships are expressed as (*P. barthelemyi*+*(P. anomala*+*P. nocturna)*). *Provespa barthelemyi* (Du Buysson, 1905) is distributed mainly in the southeastern part of the Asian continent from eastern India to Indochina, while *P. nocturna* Vecht, 1935 and *P. anomala* (Saussure, 1854) occur mainly in Sumatra, Borneo, and the southern part of the Malay Peninsula. The speciation and biogeography of *Provespa* are briefly discussed, with reference to a supposed vicariance event around the Isthmus of Kra.

Key Words: Vespidae, Vespinae, *Provespa*, phylogeny, biogeography, South-east Asia.

Introduction

Wasps of the vespine genus *Provespa* Ashmead, 1903 are nocturnal and found new colonies as a swarm of workers accompanied by a single queen (Matsuura 1991). This genus, consisting of the three species *P. anomala* (Saussure, 1854), *P. barthelemyi* (Du Buysson, 1905), and *P. nocturna* Vecht, 1935, is distributed in southern Asia from eastern India in the west, through Indochina and southern China, to Sumatra, Borneo, and Java in the east.

Archer (2000) analyzed three morphological characters (apex of the aedeagus, tyloides of the male antenna, and anterior margin of the clypeus) of the three species of *Provespa* and proposed on this basis that the relationship among them could be expressed as (*P. barthelemyi*+*(P. anomala*+*P. nocturna)*). These three characters were those that “were found whose character states could be polarized by outgroup comparison” (Archer 2000: 127), but Archer did not specify any outgroup. He did summarize the distribution records of the three species and stated, referring to their phylogenetic relationships, that “the ancestor of *Provespa* first split into a mainland species (*P. barthelemyi*) and an island species which later split into two species (*P. anomala* and *P. nocturna*).”

In the present paper we conduct a cladistic analysis of *Provespa* based on both molecular and morphological data. Referring to these results and the historical ge-