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Biodiversity Record: Rediscovery of the mantisfly, *Euclimacia gerstaeckeri*, in Singapore and first record for Malaysia, with notes on putative models

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Subjects: Gerstaecker's mantisfly, *Euclimacia gerstaeckeri* (Insecta: Neuroptera: Mantispidae).

Subjects identified by: Zestin W. W. Soh and Michael Ohl.

Locations, dates and times: Two records from separate locations and dates —

1. Singapore Island, Dairy Farm Nature Park, near the Wallace Centre; 29 September 2018, 0833 hrs.

2. Pulau Ubin, Sungei Mamam; 29 September 2019, 2028 hrs.

Habitats: Mature secondary forest at Dairy Farm Nature Park. Mature coastal forest on Pulau Ubin.

Observers: Marcus F. C. Ng and Gan Cheong Weei.

Observations: Two separate observations —

1. At Dairy Farm Nature Park, one example of about 2 cm total length was photographed perched on a leaf in a tree about 2 m from the ground (Fig. 1) by Marcus F. C. Ng.

2. On Pulau Ubin, an individual of about 2 cm total length was found on a light sheet during a survey for moths (Fig. 2) by Gan Cheong Weei. The survey was conducted with a research permit under the National Parks Board's Comprehensive Ubin Biodiversity Survey.

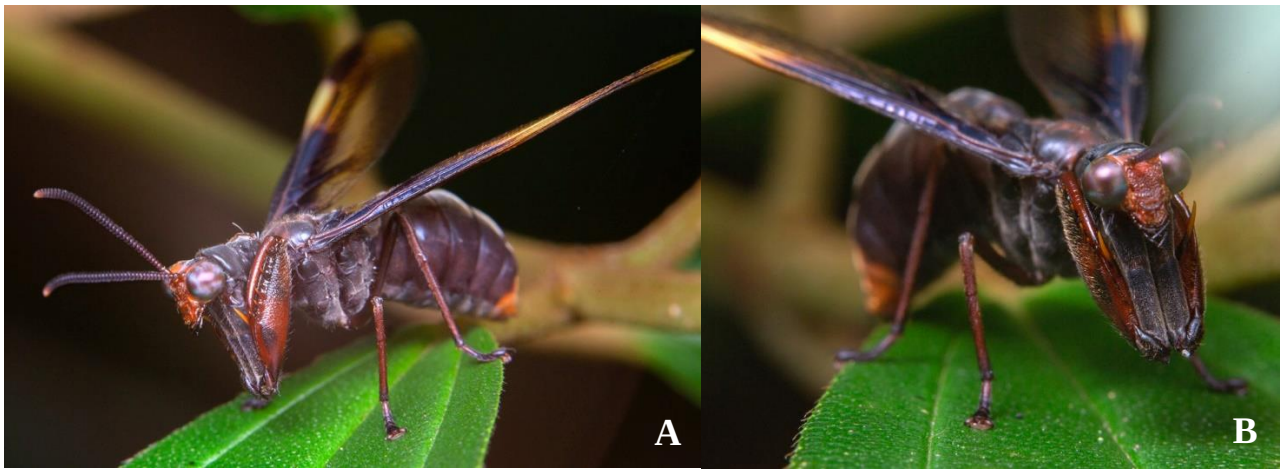

Fig. 1. Lateral (A) and frontal (B) views of *Euclimacia gerstaeckeri* at Dairy Farm Nature Park. (Photographs by: Marcus F. C. Ng)

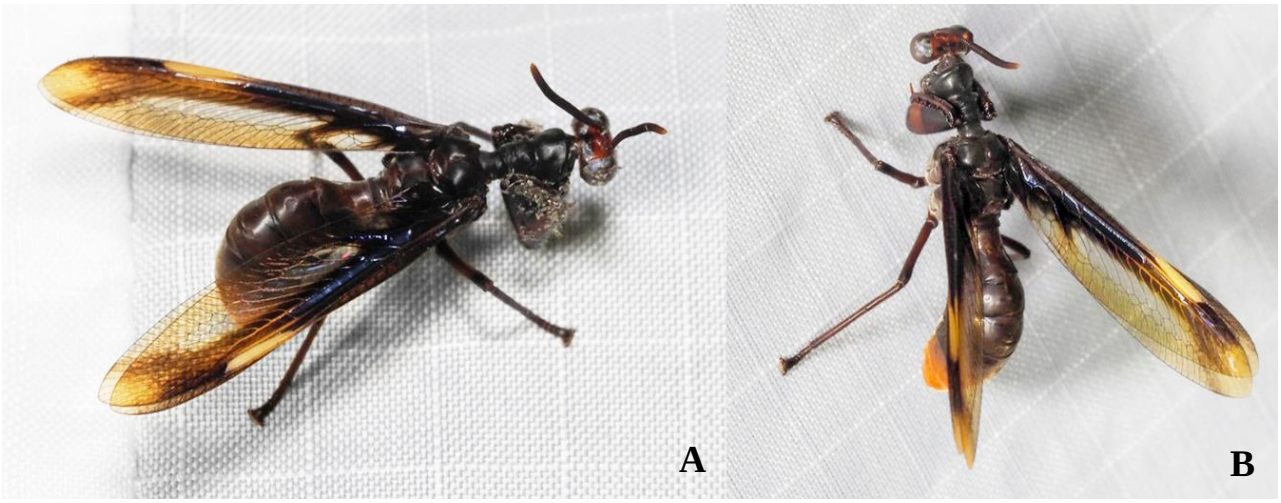

Fig 2. Dorsal aspects of *Euclimacia gerstaeckeri* on a light sheet at Pulau Ubin with a view of the orange-tipped abdomen (B). (Photographs by: Gan Chong Weei)

Remarks: The Mantispidae is an enigmatic family of insects with interesting morphology and fascinating life histories (Snyman et al., 2020). Their raptorial forelegs, used to hunt other insects, gives them an appearance similar to praying mantises (Mantodea), with which they are unrelated (Cannings & Cannings, 2006). In Singapore, they are rarely encountered in the field and poorly studied. Basic information on their taxonomy, ecology, distribution and behaviour is lacking.

The genus *Euclimacia* comprises medium to large taxa that often mimic social wasps in their general body shape and colour pattern (Ohl, 2004a). Around 25 described species are known from Southeast Asia, although several new species are likely to be discovered (New, 1998; Ohl, 2005; Snyman et al. 2018). Two species of *Euclimacia* are known from Singapore according to a world catalogue by Ohl (2004b): *Euclimacia gerstaeckeri* Banks, 1920 (type locality Singapore) and *Euclimacia regina* Esben-Petersen 1917 (type locality unknown but assumed to be in the Sunda Islands) (Handschin, 1961; Ohl, 2004b). There is a third morphospecies that does not appear to match the original description of either of the two previously recorded species. Photographs of this third species can be viewed at https://singapore.biodiversity.online/species/A-Arth-Hexa-Neuroptera-000001. There are also two specimens of *Euclimacia* collected by the late Dennis H. Murphy that are deposited in the Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum, at the National University of Singapore, but these have yet to be studied.

We identify the species reported from Dairy Farm and Pulau Ubin as *Euclimacia gerstaeckeri* Banks 1920. The only previously known example of this species is the type specimen from Singapore, which was collected pre-1920 (exact collection date unknown) by Charles Fuller Baker (Banks, 1920; Ohl, 2004b), potentially during his tenure as the Singapore Botanic Gardens' acting assistant director from 1917 to 1918 (Essig, 1931). The photographed specimens correspond with the original description by Banks (1920), and comparisons with photographs of the holotype stored in the Museum of Comparative Zoology (MCZ) at Harvard University also confirmed identical wing venation and wing colour pattern. There are some integumental differences in colour – the face, vertex and forelegs are red instead of entirely black in the type (Fig. 3, reproduced with permission), but we attribute this to intraspecific variation, which is known to occur in many mantispids (Kuwayama, 1920; Opler, 1981; Ohl, 2005). Although the sex of the specimens observed is currently unknown, there is the possibility of sexual dimorphism in the species.

At the ZRC, there is a specimen of *Euclimacia gerstaeckeri* collected by Dennis H. Murphy from Tapah Hills Forest Reserve, Perak (Fig. 5). The collection date is unknown, but likely to be in the 1970s. It apparently represents the first record for the species in Malaysia. This specimen has a black face, similar to the holotype, but shares the colour pattern of red with two black spots on the foreleg with the recent Singapore specimens, as well as an identical number and pattern of teeth on the meso- and metatarsal claws visible in the specimen photographed from Dairy Farm.

Euclimacia gerstaeckeri was named after Dr. Karl Adolph Gerstaecker, a prolific German entomologist. Putative models for *Euclimacia gerstaeckeri* include the social yellow-vented hornet, *Vespa analis* Fabricius 1798 (Fig. 4A), and the solitary spider-hunting wasp, *Tachypompilus analis* Fabricius 1781 (Fig. 4B), which co-occur locally and share similar body size and colouration, notably the striking red to orange tip of the abdomen. Indeed, it may be that the variation of reddish to black in *Euclimacia gerstaeckeri* may be to mimic these two common wasps, akin to that of the polymorphic Neotropical *Climaciella brunnea* (see Opler, 1981). The spider-hunting wasp *Tachypompilus analis* is an especially interesting model as it often captures huntsman spiders (Sparassidae), which are known to be host of *Euclimacia* (see Ohl, 2011). The records of *Euclimacia gerstaeckeri* in Singapore and Perak suggests it may occur more widely in mature forests in the region, although it is evidently rare.

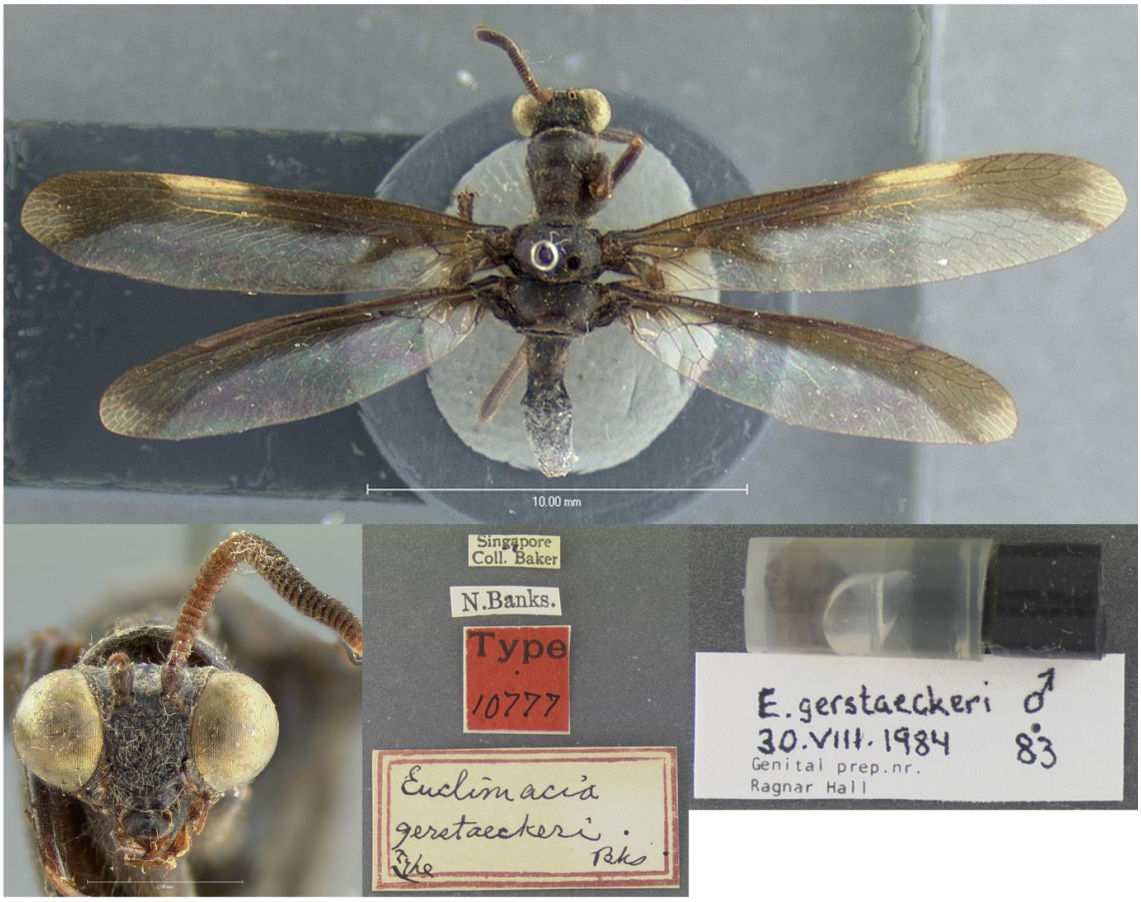

Fig. 3. Holotype of *Euclimacia gerstaeckeri* collected by Charles Fuller Baker from Singapore (collection date unknown). The specimen was dissected and determined to be a male in 1984. Photographs are reproduced here with permission from the MCZ, and accessible at https://mczbase.mcz.harvard.edu/guid/MCZ:Ent:10777.

Fig. 4. Specimen of *Euclimacia gerstaeckeri* collected by D. H. Murphy from Tapah Hill Forest Reserve, Malaysia, and deposited in the Lee Kong Chian Natural History Museum. The collection date is unknown but likely to be ca. 1970. A: lateral habitus; B: face; C: dorsal habitus; D: raptorial femur; E: specimen label. (Photographs by: Zestin W. W. Soh)

Fig. 5. Putative models for *Euclimacia gerstaeckeri*. A: Yellow-vented hornet (*Vespa analis*) worker, from Kranji Coastal Nature Park; B: *Tachypompilus analis*, preserved specimen from Pulau Ubin in the Lee Kong Chian Natural History Museum. (Photographs by: Zestin W. W. Soh)

Note: We thank Melissa Aja of the Museum of Comparative Zoology, Harvard University, for permitting use of the museum's photographs of the type specimen in this paper. We are also especially grateful to Hwang Wei Song and Ang Yu Chen of the Lee Kong Chian Natural History Museum for facilitating visits to the ZRC to study mantispid specimens.

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