

Scientific Note: First record of the remarkable clearwing moth, *Akaisphecia melanopuncta* O. Gorbunov & Arita, 1995 (Sesiidae: Sesiinae: Osminiini), from Thailand, with comments on likely Batesian mimicry

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ABSTRACT

The sesiid moth, *Akaisphecía melanopuncta* O. Gorbunov & Arita, 1995, is recorded from Thailand for the first time, having originally been described from Vietnam and subsequently recorded from Laos. Photographs of a living individual are presented that illustrate that in life it is a very good mimic of red-and-black aposematic Hemiptera (Heteroptera) such as various predatory pyrrhocorids.

Introduction

Akaisphecía melanopuncta (Lepidoptera: Sesiidae) is a highly distinctive red and black sesiid moth with a prominent abdominal 'filament' reminiscent of the ovipositor of a parasitoid wasp. *A. melanopuncta* was described by Gorbunov & Arita (1995) based on three individuals collected in 1950 in Vietnam by Dr Jean Romieux. The type locality of the three Vietnamese individuals was given as "Vang Lom", which Gorbunov & Arita (1995) could not locate on any map, but as Dr Romieux was known to have worked extensively in Quảng Ninh province in north-eastern Vietnam this seems the most likely area to be their provenance. More recently, Gorbunov (2015) collected several individuals of *A. melanopuncta* in a primary rainforest site in Laos (Ban Khou-Kham [=Ban Na-Hin], 200 m, 18°13' N, 104°31' E) in early April 2005 and he presented colour photographs of set individuals in that paper.

Here we report this distinctive species from north-central Thailand (Phetchabun Province) and present photographs of a living individual 'puddling' (Figs 1-3) and of a potential aposematic model bug seen close to the same location (Fig. 4). This is a new country record for the sesiid indicating that it is likely widely distributed in suitable habitats throughout S. E. Asia, although considering its highly conspicuous colouration, it may seldom be common.

Materials and methods

Photography

Photographs of the living insects were made using a Nikon D40 with macro lens.

Observations

DLJQ and AG were photographing butterflies and other insects along a roadside in Tat Mok National Park, Phetchabun Province, Thailand, on 20.ix.2017, and both of us walked past a red-and-black insect 'feeding' at a presumed mineral seepage on an otherwise white-painted road bridge. Both of us assumed that it was a red-and-black hemipteran belonging to one of the many similar species that occur throughout the Old World tropics, including in Thailand. Not being especially interested in Hemiptera we both at first ignored it, but then something about its movements suggested that it might be something other than an hemipteran. Upon close inspection we found it to be a sesiid moth with an abdominal process very reminiscent of the ovipositor sheathes of a parasitoid wasp such as those possessed by females of many larger Braconidae or Ichneumonidae. We took many photographs but did not observe it in flight. It was not easily disturbed and flash photography had no apparent effect on its behaviour. Most of the time the highly tufted (plumose) bright red hind legs were almost completely concealed, adding to the bug-like appearance. The abdominal appendage was variously directed posteriorly in line with the moth's body (Fig. 2) or angled sub-vertically (Fig. 4).

DISCUSSION

Some Neotropical moths have a conspicuous terminal abdominal process that resembles the ovipositor of a parasitoid wasp (e.g., the sesiid genus, *Alcathoe*) or maybe the 'dangling' hind legs of venomous pompilid wasps (e.g., the erebid genus, *Trichura*) (Quicke 2017). Whilst mimicry complexes (homeochromatic assemblages) involving conspicuous braconid and ichneumonid wasps, including the evolution of false ovipositors, are present in S.E. Asia, there is as yet no con-

vincing evidence as to which species in these complexes are the models and which the mimics. The function of the abdominal process in sesiids is unknown, and although *A. melanopuncta* fairly closely resembles various red-and-black braconid wasps that are common in the Holarctic and Neotropical regions, there are no likely braconid or ichneumonid models with that colour pattern in S.E. Asia. We therefore suspect the appendage in this part of the world is not part of any particular mimetic resemblance and may serve another function. Further, unlike in resting braconid and ichneumonid wasps, the moth frequently angled the appendage near vertically rather than in the same plane as the insect's body, thus detracting from any parasitoid-like resemblance. Unfortunately, we cannot find any published observations of living New World clearwing moths that possess a 'pseudo-ovipositor' appendage so we do not know whether they erect it vertically or not. Interestingly, other representatives of the family Sesiidae which have a filiform process at the tip of the abdomen, such as *Alcathoe pepsioides* Engelhardt, closely resemble stinging Pompilidae wasps which do not have long ovipositors such as are found in females of many Ichneumonidae or Braconidae wasps. This further supports the theory that this appendage does not serve a mimetic function at all, and if so, this may also be the case in *A. melanopuncta*. Also, in those representatives of the clearwing moth genus *Alcathoe*, for which females are known, only the males have long abdominal appendages, potentially indicating it may serve a pheromone-related function. The sex of the observed individual was not determined, however the mud-puddling behaviour it was displaying is almost entirely restricted to male Lepidoptera (in the family Sesiidae, strictly only males have been observed puddling, for example Skowron et al. 2015), thus it seems reasonable to assume it was a male. It is possible that females of *A. melanopuncta* do not have a filiform process. We therefore conclude that the most likely Batesian models for *A. melanopuncta* are aposematic heteropteran bugs. In the same area, as well as at other sites in Phetchabun Province, we observed several individuals of a rather similarly patterned and -sized bug identified as *Dindymus* sp. cf. *rubinigosus* (Pyrrhocoridae) which we consider to be one potential model. Another similar S. E. Asian pyrrho-

corid bug that is widespread in the area, though we did not find on this trip, is *Antilochus coquebertii* (Fabricius, 1803), and it also would seem to be another potential aposematic model. Our supposition that hemipterans are the models is further supported by the hind leg concealment behaviour of *A. melanopuncta* and one of us (MASV) has observed similar leg concealment in another, wasp-mimicking, sesiid, *Pyrophleps ellawi* Skowron Volponi, 2017. Because of the lack of very precise resemblance, perhaps imposed by the essential morphological differences between most Lepidoptera and Hemiptera, we consider unlikely that the moth has just a single model. It is quite possible that the conspicuous colouration of *A. melanopuncta* serves different roles depending on the situation, resting/puddling individuals being apparently warningly coloured from a distance, resembling a warningly-coloured hemipteran at closer range, and individuals in flight perhaps resembling something else that is unrewarding to visual predators.

Experimental testing the above mimetic hypothesis for *A. melanopuncta* is currently virtually impossible since no localities are known where it would be easy to obtain living individuals, for example, to test the moth's palatability to a range of potential or surrogate predators. The proposed models are far more tractable in this respect, and it ought to be straightforward to obtain sufficient to carry out tests of their palatabilities. Since black-and-red, putatively aposematic, hemipterans are widespread, frequently abundant and occupy many types of habitat, it would seem to be exceedingly unlikely that a spatial correlation approach would provide and test of the hypothesis.

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Figure legends

Fig. 1. Living individuals of *Akaisphecica melanopuncta* and putative model bug in Phetchabun, Thailand. (a - c) Moth drinking at a mineral seepage: note that the highly tufted (plumose) hind tibiae and tarsi are normally largely concealed below the wings except when walking and in (c) how the pseudo-ovipositor is often angled sub-vertically; (d) a potential model pyrrhocorid bug present at the same location, most likely *Dindymus* sp. cf. *rubinigosus*.