

SHORT COMMUNICATION

Conopid Fly (Diptera: Conopidae) Attacking Large Orchid Bees (Hymenoptera: Apidae: *Eulaema*)

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Conopidae is a large and widespread family of parasitic flies. The conopid genus *Physocephala* is often associated with the social bumble bees (Hymenoptera: Apidae: *Bombus*). Smith (1966) lists 13 named *Physocephala* species and their hosts, of which 11 were known to attack *Bombus* in the Nearctic and Palaearctic regions. In Europe, their parasitic association with bumble bees has been the subject of significant research. In a recent review, Schmid-Hempel (2001) concluded that conopid parasitization is common in bumble bee foragers, and that the flies have a preference for foragers of larger species. The fly deposits an egg on the adult host, which is killed by an endoparasitic larva within 10–12 days after oviposition. After parasitization, the host changes behavior, visiting different plants from those of non-parasitized relatives. Ultimately, the host digs itself into the ground and dies (Schmid-Hempel, 2001). Studies of parasitization of large orchid bees (Apidae: *Eulaema*) have revealed numerous nest parasites (Cameron and Ramírez, 2001, and references therein). However, to our knowledge, other than a speculation by Bennett (1966) that conopids should parasitize some of the larger Euglossini, no euglossine bee or other neotropical bee has been reported as a host for conopid flies.

On 19 September 2001, at 0945 hr, a *Physocephala rufithorax* Kröber (Diptera: Conopidae) was observed repeatedly attacking certain of the male orchid bees (Apidae: Euglossini) attracted to chemical baits. The chemical attractants were placed in the buffer zone of the Tambopata Reserve and the Bahuaja-Sonene National Park, Madre de Dios, Peru, about 700 m into the forest from the riverbank opposite the Tambopata Jungle Lodge (225 m a.s.l., 12°49.456'S, 69°24.163'W). For details about the area, refer to Erwin (1985). The orchid bee species arriving at the site were attracted to the five most common baits recommended for sampling euglossine bees in that region (Pearson and Dressler, 1985). The temperature at the time of observation was 24.8°C and there was no rain during the day. Situated 12 m from the baiting site was an active surface-nesting colony of the Amazonian bumble bee, *Bombus transversalis* (Olivier).

While making a general survey of male orchid bees, a single female of *P. rufithorax* was observed attacking orchid bees of the large *Eulaema* (18–31 mm), including *Eulaema* cf. *meriana* (Olivier) (refer to discussion of species mimicry in Dressler, 1979) and *E. cingulata* (Fabricius), even though the smaller *Euglossa* spp. (9–19 mm) were more abundant on the baits at the time of observation. The conopid fly alighted on the upper surface of the leaves of a nearby tree, approximately 1.2 m above ground (the same height as the baits) and about 1 m from the primary chemical attractant (methyl salicylate). From there the fly attacked the *Eulaema* at high speed, striking it to the ground. Once on the ground, the conopid flew off, while the male *Eulaema* lay stunned, unable to fly for several seconds. This behavior of in-flight attack in the vicinity of chemical baits is analogous to observations of conopid attacks on European bumble bees foraging at flowers (Schmid-Hempel, 2001; P. Schmid-Hempel, pers. comm.). The fly returned to its vantage point on the tree to groom before making another attack. Grooming involved rubbing the hind tarsi together for several minutes and, intermittently, rubbing the exposed cercus and syntergites 8 + 9 (terminology according to McAlpine *et al.*, 1987) backwards and away from the body with the hind legs (approx. 6 times lasting 3–4 seconds). The fly was observed to attack no fewer than five males of *Eulaema* over ten minutes, whereupon it was collected for identification and documentation. None of the attacked bees were used for further study in the laboratory.

The observation of a euglossine-conopid association is worthy of note in the context of host-parasite evolution. Two of the eusocial apid tribes, Bombini and Apini, are well-known conopid hosts (Smith, 1966; Schmid-Hempel, 2001), and the parasites may show a generalized preference for social, or rudimentarily social species such as *Eulaema*. They seem to prefer relatively large hosts, as appeared to be the case in *Physocephala*'s preference for the larger *Eulaema* over the smaller *Euglossa* species in this observation.

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If infected *Eulaema* dig themselves into the ground, as do infected European bumble bees, it is not surprising they are not recorded from nest studies. However, if *Eulaema* are common hosts for conopid flies in Neotropical forests, it is strange that they have not been observed and reported before at baits, either through our own extensive baiting of orchid bees (3000+ specimens collected), or that of others. It is tempting to speculate, given the close host-parasite relationship between *Bombus* and Conopidae, that the fly was present at the baiting site not because of the orchid bees, but because of its initial attraction to the nearby ground nest of *Bombus transversalis*. On the other hand, while quantifying foraging activity rate of the nearby *B. transversalis* colony between 0600 hr and 0930 hr prior to baiting, no conopid flies were observed at the nest. Ongoing field studies of *B. transversalis* colonies should provide additional information on this subject.

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Literature Cited

- Bennett, F. D. 1966. Notes on the biology of *Stelis* (*Odonotstelis*) *bilineolata* (Spinola), a parasite of *Euglossa cordata* (Linnaeus) (Hymenoptera: Apoidea: Megachilidae). *Journal of the New York Entomological Society* 74:72–79.
- Cameron, S. A., and S. Ramirez. 2001. Nest architecture and nesting ecology of the orchid bee *Eulaema meriana* (Hymenoptera: Apinae: Euglossini). *Journal of the Kansas Entomological Society* 74:142–165.
- Dressler, R. L. 1979. *Eulaema bombiformis*, *E. meriana*, and Müllerian mimicry in related species (Hymenoptera: Apidae). *Biotropica* 11:144–151.
- Erwin, T. L. 1985. Tambopata reserved zone, Madre de Dios, Perú: history and description of the reserve. *Revista Peruana de Entomología* 27:1–8.
- McAlpine, J. F., B. V. Peterson, G. E. Shewell, H. J. Teskey, J. R. Vockeroth, and D. M. Wood. 1987. *Manual of Nearctic Diptera*. Vol. 2. Research Branch, Agriculture Canada, Monograph No. 28, Ottawa, pp. 675–1332.
- Pearson, D. L., and R. L. Dressler. 1985. Two-year study of male orchid bee (Hymenoptera: Apidae: Euglossini) attraction to chemical baits in lowland south-eastern Perú. *Journal of Tropical Ecology* 1:37–54.
- Schmid-Hempel, P. 2001. On the evolutionary ecology of host-parasite interactions: addressing the question with regard to bumble bees and their parasites. *Naturwissenschaften* 88:147–158.
- Smith, K. G. V. 1966. The larva of *Thecophora occidentalis*, with comments upon the biology of Conopidae (Diptera). *Journal of Zoology (London)* 149:263–276.