

A New Record of a Parasite of Honey Bees in Sabah, Malaysia, Borneo: An additional danger for worldwide beekeeping?

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Introduction

During the last several decades, several parasites and pests of honey bees have successfully made their way to the US and Europe. The examples of *Varroa destructor* and the small hive beetle clearly demonstrate that many of the severe difficulties and problems could have been avoided if these two parasites would have been considered in time as prospective invaders. These parasites, new to the strains of honey bees and to beekeepers in those countries, caused heavy economic and environmental damage. We must not expect that the invasion of organisms detrimental to our bees has come to an end. It is very important for the future of beekeeping that we protect our bees against "new" pests better than we have in the past.

Here, we will not discuss matters of bee transport and quarantine, which are subjects of national authorities and legislation. Our approach is to extend our knowledge of honey bee pathology in the US and Europe to other parts of the world where information on bee parasites is still non-existent or very sparse. We have newly identified a parasitic fly in Borneo that

attacks honey bees. We think it is essential that information about this fly be widely distributed in the case that this new pathogen might spread to the U.S.

There was a 1974 publication by E. Hüttinger in the Austrian bee journal "Bienenvater" entitled "Dickkopffliegen (Conopidae, Dipt., Ins.), wenig beachtete Bienenparasiten" (or, "Thick-headed flies (Conopidae, Dipt., Ins.) neglected bee parasites." He lists six species, of thick-headed flies and two of these belonged to the genus of *Physocephala* species which were raised successfully from *A. mellifera*. The natural hosts of the listed species are not honey bees. But the findings demonstrate the ability to adapt to related genera of their hosts and thus to a likelihood of a parasite switching within the *Apis* species.

Studies on crawling and dead bees in the bee yard

In the bee yard of the Agricultural Research Station Tenom in the Northeastern part of Borneo many bees were observed crawling on the ground underneath the hive. In some cases there

were hundreds of dead bees nearby, especially when there were several colonies side by side. We collected crawling and also dead bees. By pressing the abdomen, two blackish stigmata extruded from the sting chamber (fig. 1)

In the lab we dissected these bees under the stereo microscope, but it was possible to observe the fly larvae and pupae with the bare eye. In the still crawling bees we found fly larvae with narrow anterior segments (proboscis) and at their end stigma for breathing (fig. 2). They almost filled the whole abdomen. In this stage the thin proboscis (tongue) obviously could be extended to pass through the peduncle ("waist" of the bees) and to eat the flight muscles within the thorax of the bee. The dead bees mostly contained fly pupae (fig. 3). The position of their stigma was always in the sting chamber, so the fly could obtain oxygen even within the dead bee. The fly larvae as well as the pupae clearly pointed to the genus of conopid flies.

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Figure 1: Two stigma protruding from the sting chamber



Figure 2: Larvae of a conopid fly

Figure 3: Pupa of a conopid fly partly removed from a dead bee.



Experiments on the infection rate

To evaluate the infection rate we installed dead bee traps (Gary traps modified for *A. cerana*). We monitored the colonies for at least 4 weeks. We collected more than 300 dead bees at each colony and again examined them for fly larvae and pupae in the lab under a stereo microscope. From 13 tested colonies in different locations 12 were infested. The infestation rate of the dead bees ranged from 10 to 90% per colony. There was a tendency that the most highly infested colony had more dead bees compared to the one in which we did not find any or a low number of the progeny of the fly. We could not yet evaluate the damage of the colony and the loss of the honey crop.

Producing the adult fly and its observation

Up to this point, we had not observed the adult insect. So we maintained some dead bees on some humid soil within several jars. After about 2 weeks an adult conopid fly (fig 4) hatched from the abdomen of the bee. After being familiar with the appearance of the conopid flies we observed them feeding on nectar from flowers. Attacks to bees were only seen at the hive where the flies perched nearby on flowers or branches. From time to time they swooped down to bees at the entrance of *Apis cerana* colonies.

We also observed these conopid flies near *A. koschevnikovi* and *A. dorsata* colonies and consequently collected and dissected crawling or dead bees of these species. There we also found larvae and pupae. The emerging flies looked extremely similar to the ones from *A. cerana*.

Identification of the parasitic fly

We sent adult flies that emerged from *A.*



Figure 4: Adult fly

cerana to the Natural History Museum in London for species determination. They were examined by Nigel P. Wyatt and identified as *Physocephala paralleliventris* Kröber. This species was described in 1924 by a German biologist from northern Borneo. According to this fly specialist, there do not appear to be any published host records of this species. In general, conopids parasitize a wide range of stinging Hymenoptera (wasps and bees), but there are relatively few records from *Apis* species, and up to now these are invariably from *A. mellifera*.

Discussion

If the parasitic flies can infest three *Apis* species, this may indicate a great danger for *A. mellifera*. In the Indonesian part of Borneo modern beekeeping is practiced with *A. mellifera*, and if colonies are transported to other areas, it increases the possibility of transferring the parasite to other countries with a similar climate. We think it is important that beekeepers all over the world be aware of this new record of a bee parasite.

Further, we recognized the parasitic fly only by collecting dead or crawling bees in the bee yard, but not by dissecting bees within the colony. The infection occurs when the fly deposits eggs on flying bees - probably foragers. Thus, it may be difficult to recognize an infested bee within the hive. All beekeepers should watch not only their hives, but also their bee yard carefully for crawling or dead bees.

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