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Scientific note

A scientific note on the reproduction of two bumblebee queens (*Bombus hypnorum*) infested by the nematode *Sphaerularia bombi*

Peter-Frank Röseler
Zum Ochsengrund 9, 97222 Rimpar, Germany

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***Bombus hypnorum / Sphaerularia bombi /* parasitism**

The nematode *Sphaerularia bombi* Dufour is an obligatory parasite of *Bombus* Latr. queens and *Psithyrus* Lepeletier females. The 1–2 mm large female is fixed in the muscle layer of the foregut, the genital tract is everted into the cavity of the abdomen of the host and it enlarges up to 2 cm (Fig. 1). The biological cycle is described in detail by Madel (1966, 1973), Poinar and van der Laan (1972) and Pouvreau (1974). It is generally accepted, that parasitized queens are not able to form eggs and with it to found colonies. The ovaries are not developed. Since the corpora allata remain small, an inhibition of the endocrine system by the parasite is assumed (Palm, 1948; Röseler, 1967). However, on 18.3.1964 I captured a queen of *B. hortorum* L. collecting pollen (Röseler, 1967). The queen had oviposited, the ovaries contained ready eggs. In the abdomen there was an genital tract of *S. bombi,* but eggs were not yet released. Here I report about two infested queens of *B. hypnorum* L., both of them founded a colony and reared sexuals.

Bumblebee colonies were started by single queens in a climate room at 25–28 °C in a combination of a nest box (30 × 20 × 20 cm) and feeding box (30 × 20 × 15 cm). In the latter diluted honey was offered, pollen was placed into the nest hole. All newly emerged workers and queens were individually marked and counted. The number of drones was not considered, since they could also derive from workers.

Five colonies not manipulated by experiments were chosen as control. Queens generally oviposit immediately after they have constructed the egg

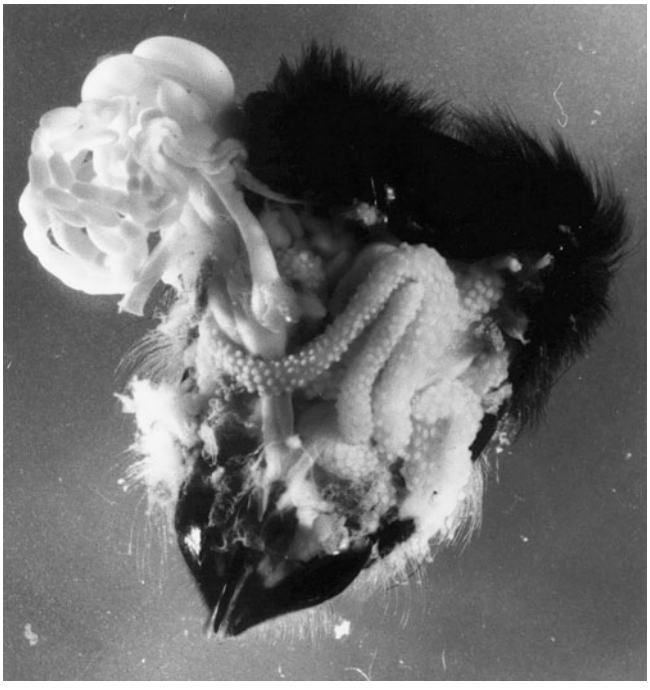

Figure 1. Abdomen of *B. hypnorum* queen A dissected from the ventral side. Left the ovaries turned out, four genital tracts of *Sphaerularia bombi* in situ.

Table I. Production of females and the appearance of first drones in parasitized and non parasitized colonies of *B. hypnorum*.

Colony	n workers on day 20	n females total	n workers	n queens	days until first drone
non parasit. n = 5, Means ± SD	37 ± 9.2	456 ± 104	324 ± 84	132 ± 64	45 ± 4.1
A) parasit. by 4 *Sph. bombi*	18	305	158	147	44
B) parasit. by 1 *Sph. bombi*	16	172	133	39	39
T-test	0.05	0.05	0.05	n.s.	n.s.

hole. Parasitized queens: Queen A was collected on 26 March 1974 and transferred into a nest box on 30 March. On 2 April she constructed a nest cavity and an egg hole on the pollen lump. The first oviposition took place on 10 April. Queen B was collected on 29 March 1981 and transferred into a nest box on 30 March. On the following day she constructed a nest cavity and two egg holes on the pollen lump. The first eggs were laid on 4 April.

The results (Tab. I) show, that queens of *B. hypnorum* are able at least in captivity to found a colony despite the infestion by the nematode *Sph. bombi.* A main difference to non parasitized queens exists in the early stage of nest initiation and in the number of descendants. In parasitized queens the start of egglaying after formation of the egg hole was delayed by three and eight days, respectively. The egg production was lowered and the colonies remained significantly smaller than those of non parasitized queens. The switch to lay unfertilized eggs, a sign for the loss of dominance, occurred some days earlier only in queen B.

Probably both queens were infested only in spring. Then the queens had an advantage in the development of ovaries over the parasite, which was not more able to inhibit the activated corpora allata and egg production. Another question is, whether the successful colony development is an effect of captivity. Here food is available in surplus and requires no energetically expenditure flight costs and the temperature is constant. Röseler (1967) has shown, that the nutrition influences the size of corpora allata. Parasitized queens of *B. terrestris* in captivity had smaller glands than non parasitized queens, but they were a third larger than in parasitized queens in nature. The capture of an infested *B. hortorum* queen with developed ovaries however indicate, that even free living parasitized queens seem to be able to start a nest.

Note scientifique sur la reproduction de deux reines de bourdons (*Bombus hypnorum)* parasitées par le nématode *Sphaerularia bombi.*

Eine wissenschaftliche Notiz über die Reproduktion zweier Hummelköniginnen (*Bombus hypnorum*), die von dem Nematoden *Sphaerularia bombi* parasitiert waren.

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