A scientific note on the nest and colony development of the Neotropical bumble bee Bombus (Robustobombus) melaleucus

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Scientific note

A scientific note on the nest and colony development of the Neotropical bumble bee *Bombus (Robustobombus) melaleucus*

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***Bombus (Robustobombus) melaleucus* / bumble bee / Neotropical / nesting biology**

Bombus melaleucus (Handlirsch, 1888) is a member of the subgenus *Robustobombus* (Williams, 1998), which is nearly unknown. In contrast, the subgenus *Fervidobombus* is much better understood. These two subgenera are very isolated from phylogenetical and morphological points of view (Williams, 1998). However, at present there are too few available data to allow for a comprehensive subgeneric discussion.

B. melaleucus is a very rare bumble bee which occurs in primary rain forest of the Cordillere mountains in Colombia (450–2100 m above sea level, Ospina, 1984). This species may be close to extinction due to intense deforestation (Ospina, 1984). *Bombus melaleucus* is also very difficult to study because workers usually forage in the forest canopy (personal observations). As a result the biology of *B. melaleucus* is poorly known. Here we describe for the first time the nesting biology and colony development of *B. melaleucus*. This is also the first available description of the nest and colony development of a *Robustobombus* species.

The nest was located near *Guadua angustifolia* plants at 1340 m above sea level in vereda El Porvenir (4° 52'N, 74° 50'W) by following a returning pollen forager. The entrance tube (∅ ~5 cm, 55 cm long) was covered with dry plant material. The bottom of the nest cavity (30 × 20 × 15 cm; probably an abandoned small mammal nest) was ~34 cm below the soil surface. The ellipsoidal nest did not completely fill the cavity (nest size with involucrum = 21 × 17 × 4.3 cm). The involucrum (*G. angustifolia* leaves, other plant particles and small roots held together with wax) completely covered the inner nest except for a small entrance (∅ ~2 cm). Although the surrounding soil was extremely wet, as reported previously for *B. (Fervidobombus) transversalis* (Olesen, 1989), the involucrum was dry. No nest parasites were found. All individuals, including returning foragers, were caught with aerial nets and the nest was transferred to the laboratory (Fig. 1). Workers were very aggressive during collection, similar to *B. (Fervidobombus) atratus* (Sakagami et al., 1967; Sakagami, 1976).

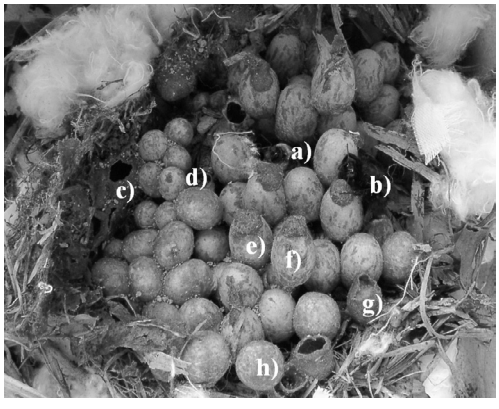

Figure 1. Inner nest architecture: (a) worker; (b) queen; (c) wax honey pot; (d) drone cocoon; (e) closed egg cells; (f) queen cocoon; (g) wax pollen pot; (h) queen larvae in spinning phase.

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In addition to the single foundress and 42 workers (total length = 16.0 ± 3.39 mm [mean ± s.d.]), the nest included 43 queen cells and 19 unhatched cells (one worker and 18 males). The wax honey pots were located close to the nest entrance (N = 11; ∅ = 9.5 ± 1.56 mm [mean ± s.d.]; height = 20.6 ± 4.24 mm [mean ± s.d.]; Fig. 1). Post-emergence worker cells used for honey storage were scattered throughout the inner part of the nest (N = 5; ∅ = 9.6 ± 0.55 mm; height = 15.0 ± 0.42 mm [mean ± s.d.]). A wax pollen pot was in the nest periphery (∅ = 11.3; height = 15.7 mm; Fig. 1). Post-emergence worker cells with pollen were located in the centre underneath queen cells (N = 4; ∅ = 11.6 mm; height = 12 mm; size only estimable for one cell). The cocoons containing larvae (N = 3; ∅ = 26.4 ± 0.06 mm [mean ± s.d.]) and egg cells (N = 4; ∅ = 5.2 ± 0.08 mm [mean ± s.d.]; height = 3.8 ± 0.09 mm [mean ± s.d.]) were located on queen cells in the nest centre. While the honey and pollen wax pots and the closed egg cocoons were dark brown, the pre-and post-emergence cocoons were beige with dark brown spots. The unhatched cocoons were in the nest periphery close to the wax honey pots (Fig. 1).

One worker hatched immediately after transfer. The young queens (N = 39, total length = 23.9 ± 0.33 mm [mean ± s.d.]) started hatching after 20 days (30.7 ± 5.61 days [mean ± s.d.]) and the drones (N = 14, total length = 17.2 ± 0.31 mm [mean ± s.d.]) after 27 days (30.9 ± 1.98 days [mean ± s.d.]). Queens and workers can be easily discriminated due to their size (see above) and behaviour. Queens do not forage and usually walk around the nest without a specific task. A series of pictures showing workers, queens, males and nest details is available on request from P. Neumann.

In contrast to the bumble bee species of the subgenus *Fervidobombus* in the lowland Neotropics (Moure and Sakagami, 1962), which nest on the ground surface, *B. melaleucus* nests seem to be subterraneous. *Bombus melaleucus* appears to be monogynous, unlike *B. atratus* (Moure and Sakagami, 1962). The number of individuals in *B. melaleucus* colonies seems less than in the lowland *Fervidobombus* species (*B. atratus*: up to 350 individuals, Moure and Sakagami, 1962; *B. (Fervidobombus) pullatus*: up to 343 individuals, Janzen, 1971; *B. transversalis*: up to 350 individuals, Cameron and Whitfield, 1996). The basic inner nest architecture was similar to other *Bombus* species (Olesen, 1989). However, no old empty worker cells were found. This indicates that *B. melaleucus* destroys the silk, which is very unusual. In contrast to other Neotropical bumble bee species of the subgenus *Fervidobombus* (Moure and Sakagami, 1962; Janzen, 1971; Cameron et al., 1999), the colony started producing female sexuals earlier than males. Our observations on *B. melaleucus* indicate differences to other Neotropical species, which may largely reflect phylogenetic differences. This creates demand for more research in all areas of the biology of *B. melaleucus*.

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Eine wissenschaftliche Notiz zum Nestbau und zur Kolonieentwicklung der neotropischen Hummel *Bombus (Robustobombus) melaleucus.*

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