NOTES AND COMMENTS

A non-invasive and non-destructive method for observing in-hive behaviour of the Australian stingless bee, *Austroplebeia australis*.

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The nest architecture of stingless bees is complex and fragile, making observation of their in-hive behaviour difficult and, consequently, limiting available information (Wille and Michener, 1973). Destructive sampling of hives is an unsustainable practice, particularly when dealing with a genus of social bees that is difficult to propagate, such as Austroplebeia (Dollin and Heard, 1999; Slaa *et al*., 2006). Previous methods used to observe behaviour, such as observation hives with Perspex lids, have limitations in their use and effectiveness, and experimental colonies must be transferred to specially modified observation nests before studies can begin (Hart and Ratnieks, 2002). This creates demand for a non-invasive and non-destructive method of observation and here we report on the development of such a method.

Studies were carried out from 10 May 2006 (autumn) to 22 August 2006 (winter) at the University of Western Sydney's Hawkesbury campus, Richmond, NSW, Australia (33°36'S, 150°47'E) using four *Austroplebeia australis* colonies, obtained from a commercial stingless bee producer ("Australian Stingless Native Bees", Dalby, Queensland, Australia, 27° 11'S, 151°16E, www.zabel.com.au). Each colony was well established in an OATH (Original Australian Trigona Hive) box (Dollin and Heard, 1999) and was housed in one of two controlled temperature (CT) rooms (2m x 3m x 2m) set at 28 ± 2°C, as *A. australis* is naturally found in subtropical and tropical regions, north of 32°22'S (Dollin and Heard, 1999).

An observation platform (OP) was installed on each OATH hive. Each OP was constructed around a plastic Petri dish (Ø15 cm) (Sarstedt, Mawson Lakes, South Australia, Australia). Three holes were melted into the side of the Petri dish base using a butane micro torch (Hotery Product Corp., Taiwan). As the plastic was heated, a short piece of silicone tubing (Ø10 mm) was pressed against the heated area and twisted into place. Once cooled, the tubing was removed and the remaining holes were prepared in the same manner, taking care not to crack the plastic that had become more brittle with heating (Fig. 1).

To allow the colonies natural access to foraging, an external entry tube (1 m x Ø10 mm), passing through a hole drilled in the CT room wall, was connected to one hole in the Petri dish. One 10 cm and one 3 cm length of tubing (Ø10 mm) were inserted in the remaining two holes in the Petri dish base. Gaps between the tubing and the rim of the holes were sealed with Blu Tack® adhesive putty (Bostick, Thomastown, Victoria, Australia 3074).

The OP assembly was placed on a 40 mm high paving stone, covered with white paper, to elevate it to the same height as the OATH entrance. The 10 cm tube was connected to the OATH entrance and the 3 cm length tube was closed off with a disc of Blu Tack®. During winter, the 3cm tube was used to attach a supplementary feeder jar to the hive. Then, during the experimental period, the feeder jar was removed and this tube was used to obtain access to the inside of the OP, with minimal disturbance. A thin roll of adhesive putty was laid around the upper rim of the Petri dish base and the Petri dish lid was inverted, set on top and sealed in place.

During the first hour of OP installation the *A. australis* colonies showed behaviour consistent with acceptance of the

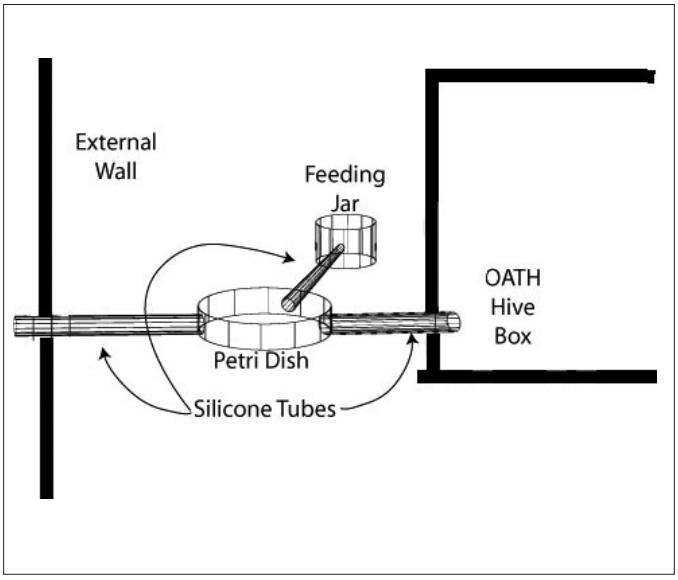

Fig 1. Observation platform assembly, connected to feeder jar and experimental hive.

structure as part of their nest, including patrolling OP structure and sealing detected gaps with cerumen (resin and wax mixture) (Michener, 1974). Within one week entrances to the OPs had been modified with cerumen structures, reducing the in-flow of cold air. Construction of honey pots inside the OPs commenced within four weeks and numerous (up to 22) honey pots had been constructed and provisioned by the end of three months. Hygienic behaviour was observed throughout the study, with small piles of debris and frass being collected and removed as weather conditions allowed.

Our methodology negates the need to transfer and reestablish colonies within specially constructed observation hives (Hart and Ratnieks, 2002). The installation of an OP onto the front entrance of an already established stingless bee hive enables the observation of some in-hive behaviour without disrupting the original colony in any way. There is no need to delay studies while the colonies establish themselves in their new box and the OP could even be incorporated into nests that occur in tree hollows.

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