

NOTES AND COMMENTS



Unusual honey pot building behaviour in captive reared bumble bees *Bombus terrestris*

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Many species of bee are known to use extra materials from the environment, such as mud or resin, to supplement the wax that is used to construct their nests. Although bumble bees use extra materials within their nests, the honey pots they construct to contain food within the nest have always been thought to be made out of just wax and pollen. Here, we report observations of honey pots being built out of a novel material from the environment (a putty-like adhesive) in several captive colonies of the bumble bee *Bombus terrestris*. This is the first time that the use of novel environmental material has been reported for these structures in the genus *Bombus*.

The nests built by the Apidae frequently include materials harvested from the local environment (Roubik, 1989; Nakamura and Seeley, 2006; Leonhardt and Blüthgen, 2009). The nests built by bumble bees *Bombus* spp. often reflect the material available within the colony's habitat as well as the physical location of the nest, and are constructed out of wide range of naturally occurring materials found in the area (e.g. Sakagami *et al.*, 1967; Taylor and Cameron, 2003; Hoffman *et al.*, 2004; Hines *et al.*, 2007). By contrast, structural components relating to the brood and food storage (consisting of brood cells and pots for honey and pollen) appear to be highly conservative in their composition, and are normally constructed from wax (e.g. Michener and LaBerge, 1954; Sakagami *et al.*, 1967) or a mixture of wax and pollen (Sladen, 1912; Frison, 1927; Taylor and Cameron, 2003). Despite acknowledgment that within the Apidae, wax can differ radically in structure according to both age and function within a nest (e.g. Hepburn and Kurstjens, 1988) and in its physical properties between species (Buchwald *et al.*, 2006), no discussion has been given to the composition of the materials used by bumble bees for constructing the 'wax' structures within their nests.

Between August and October 2009, we observed novel construction behaviour in two commercially reared nests of *Bombus terrestris* (Syngenta Bioline). These bees were housed in a laboratory in plastic nest boxes that were attached to a flight arena by a short plastic tunnel, as described by Whitney *et al.* (2008). They were fed with a

standard supply of dried and frozen "Premium Spanish Bee Pollen" (Naturally Green; Reading, UK) which was dropped directly into the nest box, and 30% v/v sugar solution (which was provided in artificial flowers within the flight arena: see Spaethe *et al.*, 2001). The transparent Perspex roofs on both of the flight arenas these nests were attached to were secured on top of the arena walls using *Blu-Tack*[®] (Bostik; Leicester, UK), a pale blue, putty-like adhesive. On several occasions, workers were observed chewing at the ends of the *Blu-Tack*[®] that extended into the arena, and the substance had been visibly manipulated into hundreds of small (<1 mm) balls which were scattered across the floor of the arena. Over the period, a number of pots identical in structure to the individual honey pots found in the nest boxes were constructed in the arenas by a series of non-foraging workers (Fig. 1), who otherwise spent their time aggregated in the arena corners. These pots were constructed towards the far end of the flight arena, at the furthest points away from the entrance to the nest box (at least one metre away). For several weeks afterwards, we observed that these pots were filled with a liquid that we assume was the sugar solution collected from the artificial flowers in the arenas, as no other liquid was available. Although not an identical colour to the *Blu-Tack*[®], the pots constructed in the arenas were a dirty blue in colouration, suggesting that the putty had been mixed with wax and / or pollen during construction. All these pots were constructed in the arenas; no blue pots were visible within the nest boxes.

To our knowledge, this novel behaviour has not previously been reported in any species of *Bombus*. We would suggest that this use of non-natural resources demonstrates a previously unrecorded action in the bees' repertoire of behaviours, rather than simply being an artefact caused by the artificial nature of the experimental design. Being able to innovate and use suitable scavenged materials could reduce the costs faced by a colony. Producing wax in large quantities is undoubtedly an energetically expensive activity if we assume costs are similar to those recorded for honey bees *Apis mellifera* (Hepburn *et al.*, 1984), and being able to dilute this cost with a suitable substitute



Fig. 1. *Bombus terrestris* workers clustered around a nectar filled honey pot built with a mixture of wax and Blu-Tack® putty. A completed pot is visible in the top right corner.

will contribute to building the colony faster. We would also suggest that a closer examination of the components used in constructing wax structures in the nests of wild bumble bees may reveal that suitable materials from the environment are frequently included in the internal structures.

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