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Biodiversity Record: Leafcutter bee and small carpenter bee feeding on a stinkhorn fungus

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Subjects: Stinkhorn fungus, *Phallus* sp. (Basidiomycota: Phallaceae);
Broad-headed leafcutter bee, *Megachile laticeps* (Insecta: Hymenoptera: Megachilidae);
Plume-vented small carpenter bee, *Ceratina perforatrix* (Insecta: Hymenoptera: Apidae);
various flies (Insecta: Diptera: Sepsidae, Drosophilidae, Neriidae and Syrphidae).

Subjects identified by: Zestin W. W. Soh (insects); Amy M. F. Choong and Serena M. L. Lee (fungus).

Location, date and time: Singapore Island, Choa Chu Kang Park; 30 May 2021; 0830–0930 hrs.

Habitat: Secondary forest.

Observer: David Wirawan.

Observation: The fruiting body of a stinkhorn fungus (~12 cm in height) was observed being visited by insects (Fig. 1). A *Megachile laticeps* and a *Ceratina perforatrix*, both females, repeatedly landed on the cap of the stinkhorn and licked the mucilaginous gleba for about 30 seconds to a minute each (Fig. 2A, B). Various flies of at least four families (Sepsidae, Drosophilidae, Neriidae and Syrphidae) were also seen feeding on the gleba (Fig. 2A–D).

Remarks: The caps of stinkhorns bear a mucilaginous structure containing the fungus' spores, known as gleba (Cabral et al., 2019). Flies feed on the gleba and facilitate spore dispersal through their excrement (Tuno, 1998). Various other insects, particularly beetles, may also visit the fungi and assist in spore dispersal (Tan, 2008; Yamashita et al., 2018).

Bees are rarely documented visitors of stinkhorn fungi, with the notable exception being eusocial stingless bees in Central and South America (Roubik, 1989; Burr et al., 1996; Oliveira & Morato, 2000). Here we present potentially novel records of feeding on a stinkhorn by *Megachile* and *Ceratina*, which are solitary and subsocial bee species respectively. Our observation suggests that the bee community's interaction with stinkhorn fungi may be greater than previously known. As the two bee species were recorded licking the gleba rather than collecting it in their scopae, the bees could facilitate spore dispersal via the gut in a similar manner to the flies. The gleba may also potentially serve as a supplementary nutritional resource for the bees (Roubik, 1989). Further investigations are necessary to determine if these bee–fungi interactions are mutualistic (Burr et al., 1996; Oliveira & Morato, 2000).

Literature cited:

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Fig. 1. *Phallus* sp. at Choa Chu Kang Park, in situ. (Photograph by: David Wirawan).

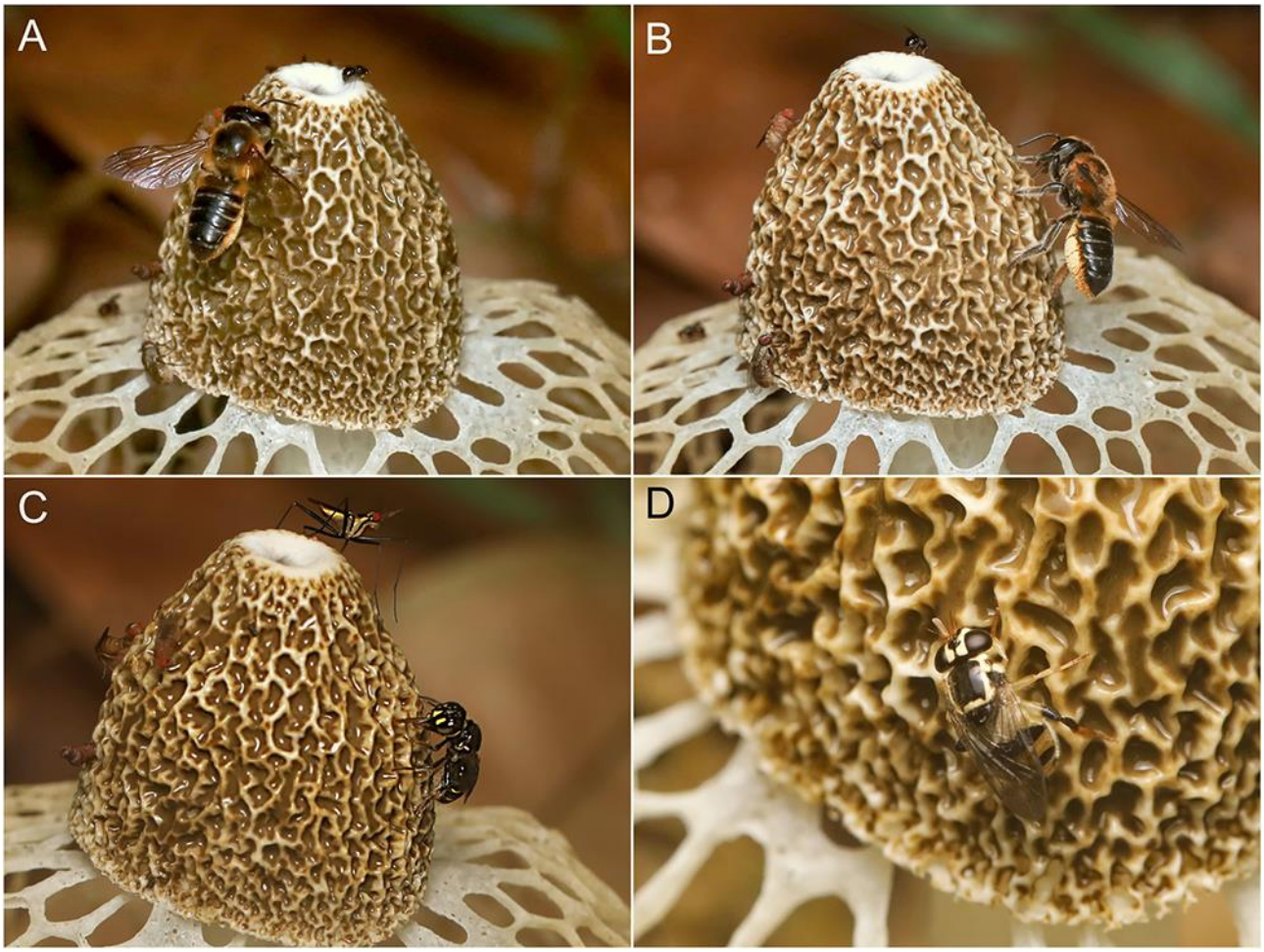

Fig. 2. Various bees and flies feeding on the cap of the *Phallus* sp. A, B, *Megachile laticeps* with sepsid and drosophilid flies; C, *Ceratina perforatrix* and a neriid fly; D, a syrphid fly, *Graptomyza* sp. (Photographs by: David Wirawan).