

OCCUPANCY BY *HYLAEUS* OF SUBTERRANEAN HALICTID NESTS (HYMENOPTERA: APOIDEA)¹

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Hylaeus (Colletidae) is well known to nest in various preformed cavities. It is most commonly reported in hollow stems (Stoekert, 1933; Malyshev, 1936; Michener, 1965; Stephen et al., 1969) but also may occupy cynipid wasp galls (Stoekert, 1933; Laroca, 1971) and dead wood (Perkins, 1899; Michener, 1965). However, nest sites are not limited to plant materials. Smith (1855) reported cells in hollow pieces of "flint stone"; Ferton (1932), in earthworm burrows; and Perkins (1899), in ground. The present paper concerns nests of *H. bisinuatus*² in burrows of a halictine bee in an earthen bank; this is the first record of *Hylaeus* occupancy of nests of another hymenopteran.

H. bisinuatus has also been found in North America nesting in soda-straw traps and nail holes (R. R. Snelling, pers. comm.) and in Europe in hollow briar (*Rubus*) stems (Stoekert, 1933). Thus this species evidently has behavior which is flexible enough to enable it to nest in a variety of preformed holes in a wide geographical area.

In early July to early August, 1974, six nests of *H. bisinuatus* were found among those of *Lasioglossum* (*Dialictus*) *zephyrum* (Halictidae: Halictinae) in a nesting aggregation in vertical banks of the Kansas River, near Eudora, Douglas County, Kansas. Although the *Lasioglossum* nest aggregation is enormous, extending for about 1 km up and down the river, all the *Hylaeus* nests were found in about 10 square meters where the bank faces northwest.

The burrows occupied by *H. bisinuatus* were obviously former nests of *L. zephyrum*. In two nests vacant cells of *L. zephyrum* were near those used by *H. bisinuatus*; abandoned cells of *L. zephyrum* probably would have been found in all nests by following main burrows farther into the soil. Cells of *Hylaeus* were constructed in cells of the *Lasioglossum* still having the shape and wax-like lining

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²*H. bisinuatus* (Förster, 1871), described from Europe, is a senior synonym of *H. stевensі* (Crawford, 1913), described from North America, where it is probably adventive (R. R. Snelling, pers. comm.).

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characteristic of the halictine. The longitudinal axes of the burrows and cells of the nests were horizontal as is typical for nests of *L. zephyrum* in vertical banks (Batra, 1966). Burrows and nest entrances were similar in size to those of *L. zephyrum*. Thus there is no evidence that the *Hylaeus* did any nest excavation; it appears to have merely used available nests for its own purposes. Furthermore there is no evidence that the *Hylaeus* entered occupied *Lasioglossum* nests, although this possibility exists.

All six *Hylaeus* nests were discovered after their entrances had been closed, each with a sheet of a cellophane-like material flush with the surface of the soil bank. The sheets had striations radiating from their centers and small openings along their margins. A female of *H. bisinuatus* was discovered licking across a nest entrance already closed by a "cellophane" sheet. Evidently she was finishing the closure. She revolved around the entrance 3 times in 18 minutes while she licked 22.5 times per minute ($n = 2$ min) across the sheet; during this time she took occasional rests of several seconds each. During each lick the tip of her proboscis moved from her midventral area to a point in front of her head.

For identification she was captured before she finished the closure and two days later (on 5 July) her nest was examined (Fig. 1). All three of the cells in her nest were provisioned with a soft yellow material, most likely a mixture of pollen and nectar as is used by

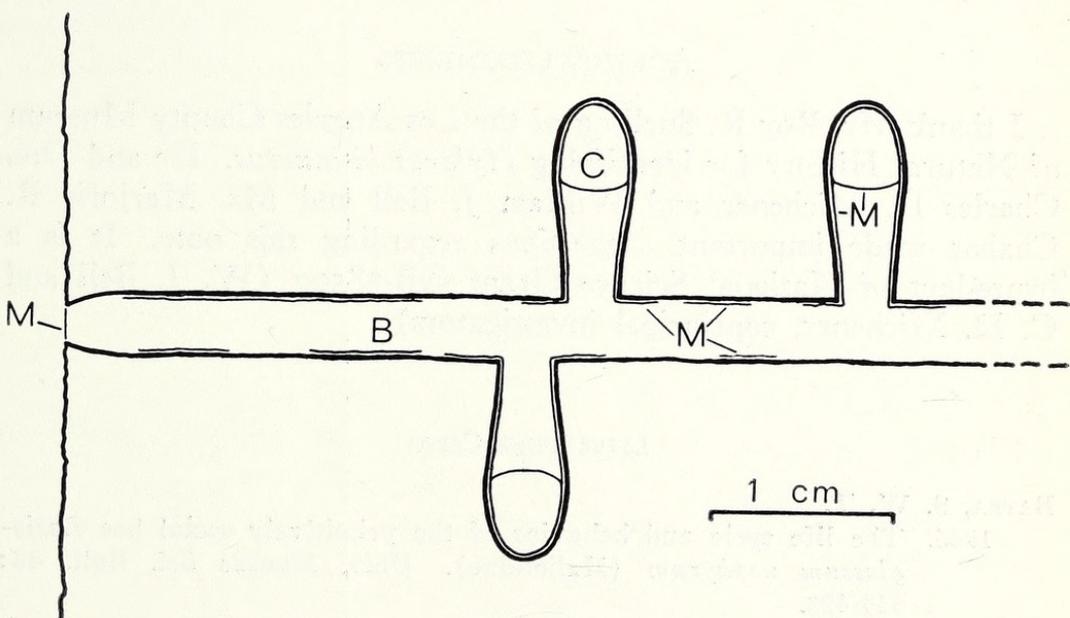


Fig. 1. Top view of a nest of *Hylaeus bisinuatus* made in a nest of *Lasioglossum zephyrum*; B, main burrow; C, *Hylaeus* cell inside *Lasioglossum* cell; M, cellophane-like membrane secreted by the *Hylaeus*.

other *Hylaeus*, and each contained a larva. One larva became a prepupa on 6 July, a pupa on 7 July, and an adult female on 14 July; the other larvae were small and died.

Nests had from 1 to 3 *Hylaeus* cells ($\bar{x} = 1.7$, $n = 6$ nests), each in a different *Lasioglossum* cell (Fig. 2). Both *Hylaeus* cells which were measured were 5 mm long and 3.5 mm in maximum diameter and at the ends of *Lasioglossum* cells. The walls of the cells had old wax-like lining deposited by *L. zephyrum* (Batra, 1966). *H. bisinuatus* laid down two other cell linings to form its cells: (1) a very thin "cellophane" layer visible under a microscope ($30\times$) only when light strikes it at a certain angle and (2) a slightly thicker "cellophane" layer over the first one. This thicker layer also covered walls of lateral burrows and parts of main burrows. A sheet of what appeared to be this same second layer closed off each cell and with the unaided eye the halictine cells appeared to be constricted where such a sheet was placed. Complete removal of the cellophane-like material, however, shows the unmodified form of the halictine cell.

H. bisinuatus used cells of *L. zephyrum* that were 0.8 to 4.5 cm ($\bar{x} = 3.3$ cm, $n = 6$ nests) from the nest entrances. Since *L. zephyrum* constructs cells this close to the surface of a soil bank only in spring or early summer, the *Hylaeus* must have used early-season *Lasioglossum* cells made in the year of this study or possibly in the previous year.

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