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OBSERVATIONS ON THE NESTS AND PREY OF *SPHODROTES NEMORALIS* SP. N. (HYMENOPTERA: SPHECIDAE)

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Abstract

The nesting behaviour of a small aggregation of *Sphodrotes nemoralis* sp.n. at Kuranda, Queensland, is described briefly. On the basis of behaviour and of structure, *Sphodrotes* Kohl appears to be most closely related to the African genus *Paranysson* Guérin-Ménéville. A description of the species is appended.

INTRODUCTION

Sphodrotes Kohl is a little known genus of solitary wasps, so far as known confined to Australia. It is poorly represented in most collections, and nothing has been reported regarding the prey and nesting behaviour. Turner (1914) presented a brief review of the five known species, but the genus has since been neglected. Turner considered *Sphodrotes* closely related to the African genus *Paranysson* Guérin-Ménéville and to form, with *Sericophorus* Swainson and Shuckard and *Zoyphium* Kohl, the subfamily Paranyssoninae of the family Crabronidae. The latter two genera are now placed in the subfamily Larrinae of the family Sphecidae (Riek 1970). It is of interest to ask what light, if any, knowledge of the nests and prey of *Sphodrotes* may shed on the classification of these wasps.

I encountered a species of *Sphodrotes* in some abundance near Kuranda, Queensland, 7-13 November 1972. I was unable to identify this species from Turner's keys and descriptions, and I therefore sent specimens to the British Museum (Natural History) for comparison with Turner's types. Mr C. R. Vardy very kindly made these comparisons and confirmed my impression that the species was undescribed. It is described below as *S. nemoralis* sp. n.

ETHOLOGY

The wasps were found on a gently sloping, sandy bank of the Barron River, about 0.5 km north of Kuranda, elevation about 320 meters. The area was shaded throughout much of the day, and the ground was littered with leaves and debris from the eucalypts that provided the shade. Two species of *Bembix* F. and a species of *Sericophorus* nested in the bank, but their nests were mainly in bare and sunny places, while the *Sphodrotes* occurred mostly in shaded places and nested beneath the litter. Both males and females flew about close to the ground, often landing on the litter or on low vegetation. Fourteen females and four males were captured, and five nests were located, but the total number considerably exceeded this, possibly 50 nesting females in an area measuring about 8 m^2.

The flight of this species is slow and somewhat undulating, silent even when females are approaching their nests with prey. When the wasps land, they hold the wings obliquely upward and move the abdomen up and down slowly and rhythmically, very much in the manner of wasps of the genus *Gorytes* Latreille. The prey is held well forward, grasped with the mandibles and possibly also with the front legs. Prey-laden females descend rather slowly to their nests, landing on leaves or sticks and walking quickly beneath the litter. It was possible to locate nests only by watching females, as all were well hidden by debris. Four of the five nests located were close to the base of trees, where the soil was full of roots. Each nest had a small mound of soil at the entrance, measuring 12-20 cm long by 5-9 cm wide and about 1 cm deep, with the burrow penetrating the earth obliquely at one end of the mound. The nests found were widely spaced, 1-4 m apart. All nest entrances were left open at all times.

Although all burrows were at first oblique, at a 35-50 degree angle with the surface, at a depth of 5-8 cm they became vertical, passing straight down or bending

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around roots to a depth of 35-39 cm, where they ended blindly. Burrow diameter was about 6 mm. In one burrow I found two paralyzed bugs at the blind end, and I assume that prey are stored here before being placed in a cell, as is common in some groups of Sphecidae. Because of the difficulties in making deep excavations in very friable soil containing many large roots, I was able to find cells in only one nest. In this case there were four cells, at depths of 45-52 cm, some 10-20 cm from the end of the burrow, directly below or slightly to one side (Fig. 6). Cells were widely spaced, at least 4 cm apart, and were nearly spherical, about 1 cm in diameter. Each was packed tightly with paralyzed bugs, 6-15 per cell. I failed to find an egg, but two cells contained small larvae and one a dipterous maggot. The wasp larvae were not reared successfully, but the maggot formed its puparium shortly and produced an adult fly, a species of *Protomiltogramma* Townsend, about six weeks later. I judge that each cell and the burrow leading to it is dug after several prey have accumulated in the burrow; after the prey have been placed in the cell and the egg laid, the burrow leading to it is closed off.

All prey taken from nests or from provisioning females, 40 specimens in all, proved to be immature Pentatomoidea measuring 2-5 mm in length. These were sent to Mr G. F. Gross, of the South Australian Museum, Adelaide, who reports that three or more species were represented, but none can be identified with confidence even to the family level. One female was seen carrying a larger bug, possibly an adult, but unfortunately I was unable to capture her.

One female was seen digging out the entrance of her nest after I had removed the litter covering it and accidentally pushed some sand into the hole. She backed out of the entrance repeatedly, each time walking on all three pairs of legs and carrying a lump of soil in her mandibles. Each time the lump was dropped 1-2 cm outside the entrance and scraped backward beneath the body with several thrusts of the legs (chiefly the front pair, but to some extent also the other two pairs). The wasp would then run quickly back into the burrow, only to back out again in a few seconds and repeat the process.

Discussion

Since a species of *Sericophorus* was nesting in some numbers near the *Sphodrotes*, there was ample opportunity to compare members of the two supposedly related genera. Both make burrows that are mainly vertical and are left open during provisioning, and the arrangement of cells is similar. However, there are many striking differences, not only in type of prey, manner of prey carriage, and nature of the mound at the entrance, but also in manner of flight, construction of the nest in firmer and barer soil, and so forth (for a recent discussion of *Sericophorus*, see Matthews and Evans 1971).

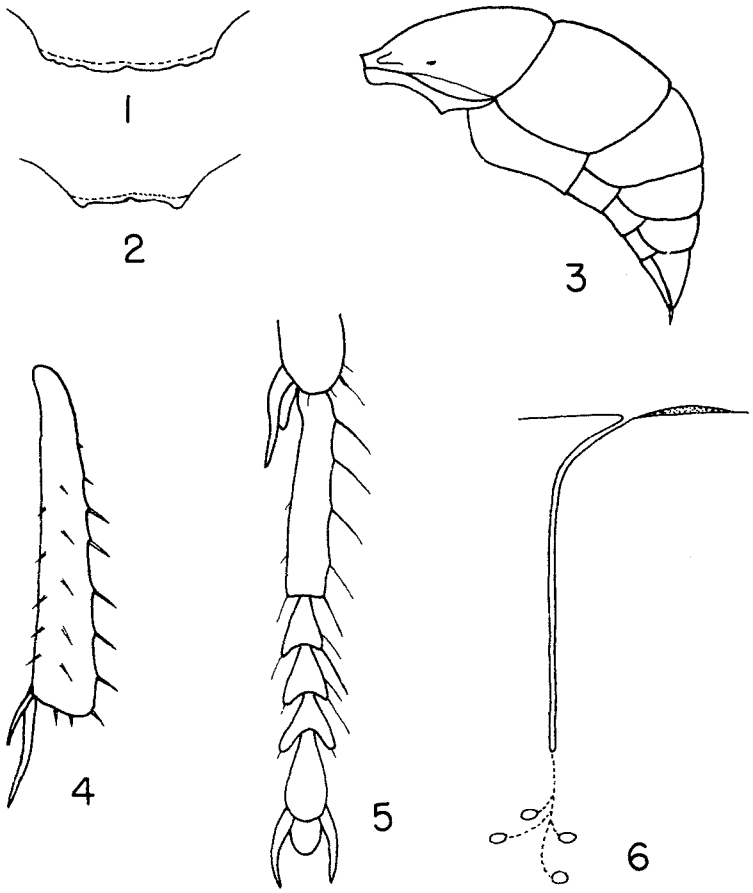
A greater similarity is apparent between the behaviour of *Sphodrotes* and that of *Paranysson*, as described by Bequaert (1933). *P. melanopyrus* (Smith), found by Bequaert nesting in Katanga, central Africa, is also a predator on pentatomid bugs. The burrow is deep and vertical, the cells constructed from lateral branches near the bottom. Each nest was found to have an elliptical mound at the entrance, although in this case the oblique opening of the burrow apparently ran through the long axis of the somewhat compacted mound.

Sphodrotes is also closely similar to *Paranysson* in general habitus as well as in many structural details, and the two genera appear to form a natural tribe or subtribe belonging to the miscophine complex of the subfamily Larrinae. Although *Sericophorus* belongs to this same complex, I doubt if the relationship to *Sphodrotes* and *Paranysson* is especially close.

Description of Species

Sphodrotes nemoralis sp. n.

Types.—Holotype ♀, *allotype* ♂, QUEENSLAND: Kuranda and vicinity, 4-13 Nov. 1972 (H. E. Evans) [Australian National Insect Coll., Canberra]. *Paratypes.*—13♀♀, 3♂♂, same data as type, 3♀♀ bearing Evans' note nos. A499, 515, 517; 1♀, 1♂, Kuranda, Qd, 1916-27 (F. P. Dodd) [Australian National Insect Coll.,



FIGS. 1-6.—*Sphodrotes nemoralis* sp.n.: (1) anterior margin of clypeus of female; (2) anterior margin of clypeus of male; (3) lateral aspect of female metasoma; (4) hind tibia of female; (5) front tarsus of female; (6) profile of nest (sections of burrow indicated by dashed lines are hypothetical, as they could not be traced).

Canberra; British Museum (Natural History), London; Queensland Museum, Brisbane; U.S. National Museum, Washington].

Holotype female

Length 10 mm; fore wing 8 mm. Head black except mandibles ferruginous (black at extreme base and apex); scape rufotestaceous on apical fourth, antennomeres 2-6 somewhat ferruginous beneath, antennae otherwise black; mesosoma black except posterior pronotal lobes and tegulae ferruginous; legs black except ferruginous on apical 0.2 of femora and beyond, except hind tarsi dusky above; metasoma predominantly black, rufotestaceous as follows: tergite 1 along sides and in a broad median dorsal band, also in a narrow band along posterior margin; most of sternite 1; tergite 2 in a narrow band along posterior margin; tergites 3-5 and sternites 2-5 with more indistinct posterior bands; apical segment dusky ferruginous. Body with very dense conspicuous, golden pubescence over lower half of head, posterior margin of pronotum (including lobes), spots on upper mesopleura, posterior part of mesoscutum, and most of propodeum; metasoma with dense golden pubescence on posterior bands of tergites 1 and 2 and over all of tergites 3-5 and sternites 2-5. Body devoid of erect hairs except for a few on the metasomal venter. Wings lightly tinged with yellowish-brown, fore wing clouded more darkly over first two submarginal cells and again apically, beyond third submarginal cell.

Clypeus weakly notched medially and with short but broad, polished projections on each side of anterior margin (Fig. 1). Inner eye margins subparallel, weakly convergent above, distance between eyes at their tops 0.93 X distance between eyes at level of antennal insertions; distance between eyes at their tops 0.8 X eye height; ocelli in about a right triangle, distance between posterior ocelli subequal to distance between posterior ocelli and nearest eye margin. First four antennomeres in a ratio of 24:6:14:13, third

antennomere 3 X as long as thick. Front with coarse punctures which are separated for the most part by slightly less than their own diameters. Mesoscutum and scutellum also coarsely punctate, surface between punctures rather dull, alutaceous; mesopleura with punctures slightly larger and surface between them more shining; basal triangular area of propodeum with a median carina flanked by large foveae, posterior slope with a large pit followed by a median carina, sides subdentate; propodeum anterolaterally, below the spiracles, with a series of strong but short horizontal ridges, the surface in front of these ridges shining and devoid of large punctures up to the deeply pitted metapleura. Front basitarsus with 5 pecten spines that are barely longer than width of tarsus (Fig. 5); hind tibia with low, widely spaced serrations, each giving rise to a spine (Fig. 4). Metasoma very slender basally, tergite 1 expanded very gradually and evenly to its apical breadth (Fig. 3); tergites 1-5 dull, coarsely punctured, but tergite 6 shining and with shallower punctures; sternite 2 strongly convex and with very coarse punctures.

Allotype male

Length 9 mm; fore wing 7.2 mm. Color of body, wings, and appendages as in female; golden pubescence much as in female although somewhat less dense and conspicuous. Apical margin of clypeus with a pair of prominent lateral teeth, weakly notched medially (Fig. 2). Inner eye margins very weakly diverging above. First four antennomeres in a ratio of 20:5:10:9, third antennomere 1.7 X as long as thick; flagellomeres roundly produced beneath, such that the flagellum is somewhat crenulate in profile. Punctures of head and mesosoma much as in female, but mesopleura less shining between punctures; propodeal sculpturing as in female. Basal metasomal tergite evenly and gradually expanded from base, as in female; subgenital plate broadly rounded apically.

Variation

Little variation is to be noted in size, sculpture, and most structural details. However, two features subject to variation should be mentioned. Turner (1914) used as a species character the relationship of the first recurrent and first intercubital veins of the fore wing. In this series, the first recurrent meets the cubitus a short (but variable) distance beyond the first intercubital in most specimens, but in one male these veins are interstitial, and in one female the first recurrent actually reaches the cubitus basad of the first intercubital on one side, although interstitial on the other. Another variable feature is the coloration of the first tergite, wherein the basal rufous area may occupy no more than half of the tergite or may be larger, in several specimens (including the type and allotype) attaining the transverse posterior band.

Remarks

This species is distinctive in its coloration and the distribution of brilliant golden pubescence, also in the shape of the first metasomal segment. The females run reasonably well to *marginalis* Turner in Turner's key (1914), but that species differs in the sculpturing of the mesopleura and the more hyaline wings. The males run in part to *pilosellus* Turner, but that species differs in the form of the first tergite and in having the horizontal ridges on the sides of the propodeum extending to the metapleural groove.

Acknowledgments

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