19806

The whited sepulchre - the nesting of Chalybion tibiale (Fabr.)

F.W. Gess and S.K. Gess

In two previous articles in the present journal (Gess and Gess, 1977 and 1980) accounts were given of the nesting of species of the wasp family Pompilidae. Characteristic of that family is that provisioning of the young is solely with paralysed spiders, that each cell is provisioned with a single spider which therefore of necessity is large relative to the wasp, and that transport of the spider to the nest by the wasp is over the ground.

The Pompilidae are, however, not the only wasps provisioning their young with spiders for several genera of another family, the Sphecidae, are likewise spider-hunters. The best known species is probably the black and yellow *Sceliphron spirifex* (L.) an elongated, truly 'wasp-waisted' wasp which commonly constructs its multicellular aerial mud nest at ceiling level in houses and outhouses and with its industrious comings and goings, connected with building and provisioning, cannot be overlooked.

Chalybion tibiale (Fabr.), the species the nesting of which is the subject of the present article is, by contrast, unknown to most people as it shows less inclination to nest in houses and, when it does so, is less conspicuous. In build it is very similar to *S. spirifex* but is smaller and very different in colouration. The head, thorax, petiolated abdomen and the basal portions of the legs are black and the wings dark brown, the whole with a very pronounced blue metallic lustre. The lower portions of the legs, particularly of the hind pair are rusty-orange, however, and are therefore very noticeably different in colour from the rest of the wasp, a feature to which the specific epithet, *tibiale*, draws attention.

C. tibiale, unlike *S. spirifex*, is no nest builder but, for nesting purposes, seeks out suitably-sized pre-existing cavities situated above ground level. Nesting may thus take place in holes, in woody stems of shrubs and trees and in wooden structures, and in crevices, in vertical earthen banks and masonry walls. Building by the wasp is limited to a few modifications within the selected pre-existing cavity.

As a consequence of its nesting behaviour, *C. tibiale* is one of an assemblage of wasps and bees which readily make use of trap-nests, devices facilitating the study in the field of the nesting of species utilizing pre-existing cavities. A trap-nest of the type used by the authors consists of a rectangular wooden block 160mm by 20mm by 20mm with a round-bottomed channel routed out along one of its long sides. The channel, of equal depth and diameter, is closed at one end by a wooden plug and is covered along its length firstly by a perspex strip taped into place and then by a light-excluding wooden lid held in place by elastic bands. Periodic brief removal of the lid allows observation of nesting activities in any trap-nest that has been accepted by a wasp or bee. Trap-nests with channels of different diameters are offered to attract wasps and bees of different sizes.

The present account of the nesting of *C. tibiale* is based largely upon three instances of utilization by this species of such trap-nests at Hilton, a farm near Grahamstown. The trap-nests, two of 6,4 mm diameter and one of 9,6 mm diameter, were some which among others had been tied horizontally at heights of 10–130 cm above the ground to a dead tree stump in thick riverine bush.

The search by a female *C. tibiale* for a suitable nesting cavity having been successfully concluded, nesting is initiated by the introduction into the cavity of mud with which the wasp constructs a preliminary plug. This may be applied to the blind inner end of the cavity or may take the form of a 2 mm thick partition constructed some distance from it. In either case, the preliminary plug forms the smooth inner

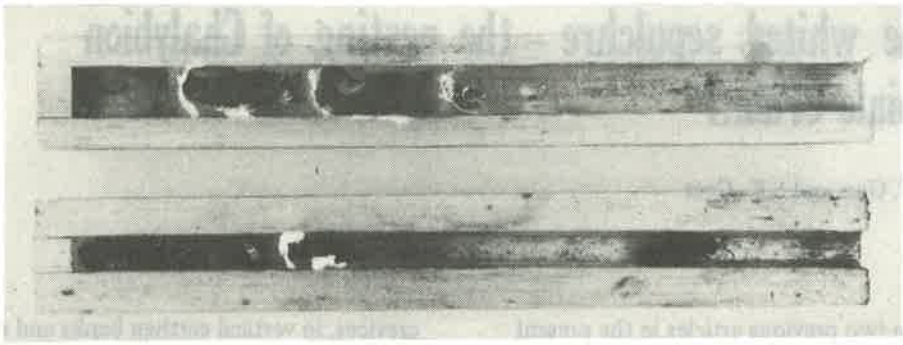

Fig. 1 Two incomplete nests of *Chalybion tibiale* (Fabr.) in trap-nests – note layers of 'white-wash' (x 0,64)

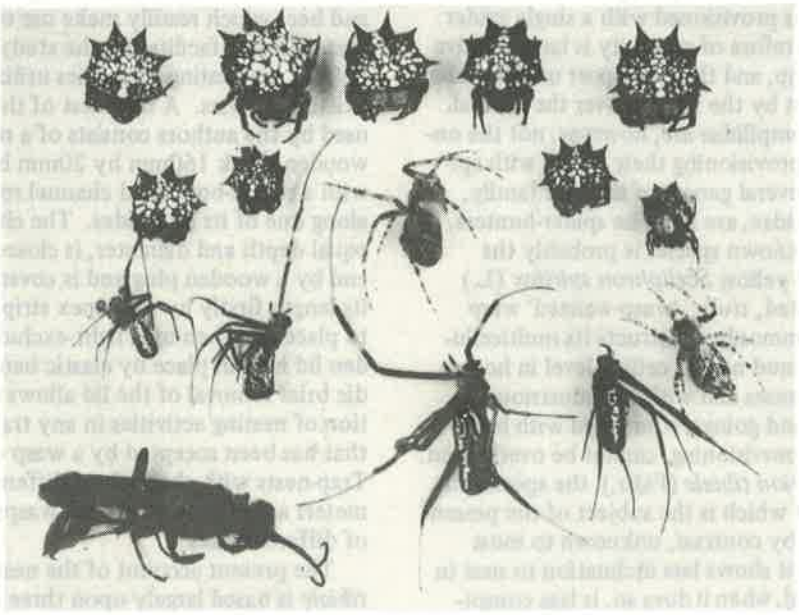

Fig. 2 *Chalybion tibiale* (Fabr.) female and prey spiders, the provision of one cell. (x 2,1)

Fig. 3 *Araneus* sp. bearing feeding young larva of *Chalybion tibiale* (Fabr.). (x 2,75)

end-wall of what will be the first of a number of cells arranged in linear series along the length of the cavity. The preliminary plug, like all subsequently constructed cell partitions, is dished. That is the inner surface, the surface towards the blind inner end of the cavity, is convex and the outer surface, the surface towards the cavity opening, is concave. This dishing of the cell partitions, the result of their being constructed by the wasp from their outer side, is common to many tube-nesting wasps and has an important function as will be shown.

Construction of the preliminary plug is followed by hunting for prey. After the cell has been fully provisioned and has been furnished with an egg, it is sealed with a mud partition as described above and hunting and provisioning of the second cell commences. The sequence is repeated until the cavity is filled or nearly filled with cells after which a final closure is constructed. Thereafter the completed nest is abandoned.

A curious and characteristic behavioural feature of *C. tibiale* which is shared with some related species is the habit of 'white-washing' the outwardly-facing concave surface of the cell partitions and of the final closure. A preliminary plug built at a distance from the inner end of the cavity is similarly whitened but not one applied directly to the inner end itself. The 'white-wash', clearly visible in Fig. 1, is believed to be composed of uric acid obtained by the wasp from bird droppings.

Provisioning of the cells is with small, incompletely paralysed, immature and adult spiders of both sexes belonging predominantly to the family Argiopidae (= Araneidae) (orb-web spiders). Genera represented in the prey found in the cells provisioned at Hilton during January and February were: *Araneus, Argiope, Caerostris, Cyclosa, Isoxya* and *Nephila.* By far the most commonly represented species (fifty individuals out of seventy-two) was *Isoxya cicatricosa* C.L. Koch, in Fig. 2 the spiny-abdomened species in the top and second rows.

Second, with nine individuals, was *Nephila pilipes fenestrata* Thorell, in Fig. 2 the long-legged and long-abdomened species in the bottom row. In addition to Argiopidae, seven spiders of other families were represented in the provision, namely Theridiidae (*Rhomphaea* sp., six individuals) and Zodariidae (one individual).

The number of spiders constituting the provision of a single cell varied from fourteen to thirty-four. In those instances in which adult wasps were successfully reared from eggs laid in provisioned cells, it was found that female-producing eggs were laid in cells supplied with a greater amount of provision, in terms of number of prey spiders and therefore total mass, than was the case with respect to male-producing eggs.

Oviposition is upon one of the prey spiders constituting the cell provision. The egg, 2,9 mm in length, is attached to the base of the spider's abdomen, its anterior end being directed ventro-laterally. The newly hatched larva remains orientated in the same position as that of the egg from which it emerged (see Fig. 2, spider at middle of second row, and Fig. 3). Only after it has completely devoured the soft parts of the spider does the larva begin to feed upon another. As four of the five cells examined still contained unhatched eggs or newly-hatched larvae, each feeding upon its first spider, it was possible to establish which spider was chosen for oviposition. In each case it was an *Araneus* sp., which was remarkable as in three of the cells this spider was the only one of its species present and in the fourth cell it was one of only two. From the examination of cells during the process of provisioning and from the position within the cells of egg- or young larva-bearing spiders, it furthermore appears that oviposition is upon one of the first few prey to be introduced into a cell.

It would appear that in provisioning these cells the wasps made a special effort to obtain an individual of *Araneus* sp. on which to oviposit and having done so in an early stage of cell provisioning continued to provision with a variety of other species. Possibly *Araneus* was preferred for oviposition due to its having a thin and soft abdominal integument easy for the newly hatched larva to puncture and penetrate at the commencement of feeding. *Isoxya cicatricosa,* the most common prey species, by contrast has a very hard exoskeleton.

One day only appears to elapse between oviposition and the hatching of the larva, after which ten to twelve days are taken by the larva to consume the soft edible portion

of the provision and to reach larval maturity. After a further day or two, spinning of the dark brown papery cocoon within a sparse pale outer covering of silk is commenced and soon completed. A long period of inactivity within the cocoon follows, the adult wasp emerging from the cocoon, the cell and the nest the following summer, nearly a year after it began life within the egg.

In order not to be trapped within the nest it is clearly of importance that the young adult wasps emerging from their cocoons should be orientated to face the way out – that is to face the opening of the nesting cavity. This is achieved by reference to the, before mentioned, dished cell partitions. Each mature larva, when spinning, orientates itself to lie within its cell so that its head points towards the convex end and its hind end points towards the concave end. It consequently faces the outer end of its cell and therefore also the cavity opening. The wasp in the outermost cell emerges first, followed by that in the second outermost cell and so on, in reverse sequence to that in which the cells were constructed and provisioned.

A fundamental difference between the nesting behaviour of the spider-hunting Sphecidae, exemplified by *C. tibiale,* and that of the Pompilidae is that each cell is provisioned with numerous small spiders by the former and with a single large spider by the latter. Instead of having to drag or at best carry a large, heavy, cumbersome prey laboriously over the ground as does a pompilid, a spider-hunting sphecid is able to take off with her small lightweight pry held beneath her and to carry it in flight swiftly and directly to the nest. Concomitant with the ease of prey transport is the fact that the nests of many of these sphecids are situated not in the ground but well up above it.

Probably of greatest importance, however, is that by taking only small spiders, these sphecids are better able to avoid competing with pompilids for prey. Indeed, far from being in competition where they occur together they are complementary in their requirements with respect to prey and both are therefore able to make a good living.

REFERENCES

Gess, F.W. & Gess, S.K. (1977). Bricks without straw: the nesting of the wasp *Dichragenia pulchricoma* (Arnold). *The Eastern Cape Naturalist* 61:6 –8. *The Eastern Cape Naturalist* 61:6–8.

Gess. F.W. & Gess, S.K. (1980). Spider vanquishers: the nesting of *Tachypompilus ignitus* (Smith) and *Batozonellus fuliginosus* (Klug). *The Eastern Cape Naturalist* 69:4–7

F.W. Gess and S.K. Gess, Albany Museum, Grahamstown, 6140.

Crocodiles and schistosomiasis

Two ecologists, Christ Appleton and Mike Bruton have revealed an unusual reason for conserving the Nile crocodile *Crocodylus niloticus.* Writing in the 'Annals of Tropical Medicine and Parasitology', they state that fear of crocodiles (and hippopotami) has compelled African people in north-eastern Zululand to use small shallow water bodies, instead of deep bays of lakes which are inhabited by crocodiles, for domestic water supplies. The shallow pools are infested with the snail *Bulinus (Ph.) globosus,* which transmits the parasite for human urinary schistosomiasis, a widespread affliction in the area. The deep bays, on the other hand, are inhabited by another snail *Biomphalaria pfeifferi,* which transmits human intestinal schisotosomiasis, but this parasite is rare, probably due to lack of human contact with the deeper water bodies as a result of the fear of crocodiles.